Preventing Obesity in School Children in the State of Qatar

By

Dr Amal Essa Ahmad Thani AL-Muraikhi

A thesis submitted to

The University of Birmingham

For the degree of

Doctor of Philosophy

Unit of Public Health, Epidemiology and Biostatistics

School of Health and Population Sciences

College of Medical and Dental Sciences

The University of Birmingham

1st October 2010

Abstract

Introduction

Obesity has been recognized as a major public health problem worldwide that requires preventive action. Prevention is best targeted at children, but relatively few research studies have focused on obesity prevention and most of those that have, were conducted in western countries. Qatar has undergone rapid industrialisation, and childhood obesity is emerging as a health problem. However, there is little information on the determinants and no studies in this population have considered prevention.

Aims

The aims of this study are to describe the prevalence of obesity amongst 6-7 year old school children, investigate contributing factors and identify potential components for an intervention programme to prevent obesity amongst children in the State of Qatar.

Methods

The study consisted of two parts: 1) Cross-sectional survey of children in grade 1 from 12 primary schools randomly selected from the state of Qatar. Height and weight data on all children was obtained from school health records, and questionnaires were completed by parents. The aim was to assess baseline levels and risk factors for overweight and obesity in children, and describe relevant factors that may influence obesity in schools. 2) Focus groups with a range of stakeholders: Topic guides were used to explore concepts on overweight and obesity, the causes of childhood obesity,

potential barriers and facilitators to behaviour change, as well as perceptions on potential prevention interventions.

Results

There was a relatively high prevalence of overweight and obesity 16%, (15.5 % girls and 16.5% boys) which reduced progressively by increasing distance of residence from the central capital. There were no significant differences between obese and non obese children in relation to physical activity or sedentary activity levels or dietary patterns, except for higher reported consumption of sweetened beverages by overweight or obese compared to non-overweight children.

Conducting focus groups in Qatar proved quite difficult in practice and there was low participation. Nevertheless, some important and consistent themes emerged. Participants were aware of the complexity and variety of causes of obesity and identified two important causal influences resulting from rapid societal change and affluence since oil production in the country. In term of interventions, the school setting was usually prioritised and the influence of teachers in intervention delivery emphasised: “children learn from school more than they learn from their mothers”. The importance of education for parents, particularly the mothers was also a consistent theme.

Conclusion

This is the first study in the state of Qatar that has examined the risk factors for childhood obesity and used qualitative methodology to inform future obesity prevention intervention development. The prevalence of overweight and obesity in

school children in the state of Qatar was lower than that reported amongst most children in the Gulf countries and intermediate to the levels reported in developing and developed countries. Higher consumption of sugar sweetened beverages, which is an established risk factor for obesity in other studies, was found to be associated with childhood obesity in Qatar. This is important given the social changes that the community is undergoing and the rapid expansion of fast food outlets and western dietary influences. The focus group data provided important contextual information validated some findings from the cross sectional study and informs the development of future obesity prevention interventions appropriate to the local setting.

Dedication

This thesis is dedicated to my family – for my parents, my husband, and my children Noora and Ali, who have been a great source of motivation and inspiration, and who have been supported me all the way since the beginning of my PhD.

Acknowledgements

To begin with I would like to extend my thanks to Hamad Medical Corporation for scholarship funds to support this research. And to my participants, they were all busy school staff and students parents and I appreciate the time they gave to be part of this project. Without them I would not have had a thesis.

I would like to express my deep gratitude and sincere thanks to my supervisors, Dr. Peymane Adab and Professor Jayne Parry, for their valuable guidance, advice, generous assistance, and encouragement throughout all the stage of this study.

I would like to express my thanks to the staff of the Ministry of Education and Higher Education Council, the members of the schools who shared in the study, the members of the Nursing Department of the Ministry of Public Health, and the students' parents for the assistance extended to me. I am also grateful to Wegdan Abdul Rahman and Morrisa Ditz for their contribution in data entry. Without them, their hard work and contribution to the study, the project would not have been possible and successful.

Finally, thank you to my loving and supporting family I could not have finished this without you. To my husband, Khalifa and my children, Noora and Ali, thank you both for standing by me, patience in providing me the time to finish my study, endured long hours away from me and encouraging me through my studies. To my parents, my mother who travelled with me during my study period at Birmingham University and provided so much child care and emotional support, so I that I could finish my study and writing this up; to my father, for his inspiration and encouragement, thank you for being the best parents in the world.

Table of Contents

List of Tables

List of Figures

Abbreviations

APPLES	Active Programme Promoting Lifestyle in schools
BMI	Body Mass Index
BCG	Bacillus Calmelle-Guerine
BIA	Bioelectrical Impedance Analysis
CBC	Complete Blood Count
CDC	Centre of Disease Control and Prevention
CVD	Cardiovascular disease
CI	Confidence Interval
D1	District 1
D2	District 2
D3	District 3
D4	District 4
D5	District 5
DPT	Diphtheria Tetanus Pertussis
DXA	Dual-energy X-ray Absorptiometry
EMR	Eastern Mediterranean Region
FFQ	Food Frequency Questionnaire
FG	Focus Groups
GCC	Gulf Cooperation Council Countries
HMC	Hamad Medical Corporation
IOTF	International Obesity Task Force
IPAQ	International Physical Activity Questionnaire
KOPS	Kiel Obesity Prevention Studt
MET	Metabolic energy turnover
MMR	Measles Mumps Rubella
MOE	Ministry of Education
MOH	Ministry of Health
MRS	Medical Research Council
MRI	Magnetic Resonance Imaging
NCI	National Cancer Institutes
NHANES	National Health and Nutrition Examination Survey
NDNS	National Diet and Nutrition Survey
OR	Odd Ratio
OPV	Oral Polio Vaccine
PA	Physical Activity
PHC	Primary Health Care
QR	Qatari Riyal
RCT	Randomized Control Trial
SES	Socio-economic Status
SFTs	skin fold thickness
SPSS	Statistical Package for Social Sciences
UAE	United Arab Emirate
UK	United Kingdom
USA	United State of America
Wks	Weeks
WHO	World Health Organization
Yrs	Years

Overview of the thesis

This thesis addresses childhood obesity prevention, based on fieldwork undertaken in the State of Qatar. Essentially there are two complementary studies presented: a cross-sectional study based on 979 children (586 with data from parent questionnaires) from 12 primary schools in Qatar, and a qualitative study based on 5 focus groups with parents, teachers, canteen managers, and nurses from these schools and physician and Local authority. The first chapter sets the scene, whilst chapter 2 presents the methods. The following two chapters present the results of the studies, and finally the last chapter draws the thesis together with conclusions. More details of each chapter are presented below:

Chapter 1

This chapter provides an overview of obesity in children, its definition, epidemiology, and a review of obesity prevention intervention studies. The rationale for the study presented in this thesis is explained, and the study's aim and objectives are presented.

Chapter 2

This chapter outlines the methods employed in this study and through which data for this thesis were collected. First it provides an overview of the background setting for this study (the study population), then it describes the study design, study population, and instruments. Finally, the approach to analysis is presented.

Chapter 3

This chapter summarises the main findings from the parent and school questionnaires, the prevalence of overweight and obesity, dietary, and physical activity habits among 6-7 years old children in Qatar, and other characteristics of the study population. The relationship between weight status and different lifestyle and other individual characteristics, as well as school level characteristics are described. The findings are discussed in the context of the international literature.

Chapter 4

This chapter presents the finding of the qualitative study. The participants understanding of overweight and obesity, perceptions on what causal factors among school children in Qatar, beliefs of the main modifiable contributing environmental factors and identified facilitators and barriers to interventions are described.

Chapter 5

The final chapter reflects on the main findings of this thesis drawing conclusions related to childhood obesity prevention strategies for Qatar. Recommendations for future areas of research are suggested.

1 A Review of the literature

This chapter provides an overview of obesity in children, its definition and epidemiology, focusing on prevention interventions. The rationale for targeting the Qatar population, and the study's aim and objectives will be presented.

1.1 Introduction

Overweight and obesity is a major public health problem in many parts of the world, and is associated with significant impacts on both physical and psychosocial health, affecting all ages and socio-economic groups.[1;2] The prevalence of obesity is increasing worldwide including developing and developed countries and is described by the World Health Organisation (WHO) as "global epidemic". [3] Obesity is associated with many chronic diseases such as coronary heart disease, hypertension, diabetes mellitus and hyperlipidemia, and some forms of cancer. [2-9]

Obesity is a problem in Qatar and in the other Gulf Cooperation Council (GCC) countries. Several studies have been carried out to determine the prevalence of overweight and obesity in the Gulf region. These show that obesity is common among children, adolescents and adults.[10-15]

During the past three decades, Qatar has been undergoing rapid socio-economic and nutrition transformation. Increase in income parallels change in life style and adoption of western lifestyle including an increase in energy-dense foods, a decrease in transport related physical activity and an increase in leisure time inactivity[16;17], With these rapid

transitions and changes, Qatar is experiencing a shift from experiencing an under-nutrition problem only to a paradoxical situation where both over-nutrition and under-nutrition are common problems. Using similar definitions and methods, the overweight and obesity prevalence increased from 6.3% and 3.7% respectively in year 2002 (among children aged 6-7 years) [18] to 11.6% and 14.7% respectively in year 2004 (6-12 years). [19] This is further discussed in the section on epidemiology of obesity (**section *1.5***).

Few intervention studies exist for preventing obesity in children [1;20] and most have been conducted in western countries. These interventions were school based and focus on a health-education and or social-cognitive model framework. [1;21]

This thesis presents 1) National estimates of overweight and obesity prevalence for children aged 6-7 years in Qatar in 2006/2007. 2) Information on the individual and environmental factors that is associated with obesity and which contribute to the development of obesity in school children in Qatar. 3) Information to inform the development of an intervention programme to prevent obesity amongst children in Qatar.
This chapter (first chapter), provide an overview of obesity in children, its definition, and a description of the international epidemiology and its putative determinants. The aetiology will then be discussed further, focusing on possible intervention prevention measures. Against this background, the changes in dietary habits in Qatar and the Arabian Gulf Countries, aim, objectives, and the rationale of the thesis will be presented.

1.2 Child obesity is a growing problem

Obesity has been recognized as a major public health problem worldwide. The prevalence of obesity is increasing rapidly in all age groups including adult, adolescent and childhood groups in the developed and developing countries. In developed countries such as the United States of America, UK, Australia and in Europe, the prevalence is high and increasing and in some developing countries both obesity and under-nutrition co-exist.[1;3;22] Obese and overweight children and adolescents are more likely to be obese in adulthood and they are more prone to have higher morbidity and mortality, compared to the general adult population.[6;23-27] Studies have shown that about half of obese children become obese as adults, and the risk of adult obesity are twice for obese children compared to non obese children.[28]

Obesity in children leads to having significant impact on both physical and psychosocial health; and is associated with chronic diseases in the later life such as cardiovascular disease (CVD) [2;6;9], hypertension, diabetes mellitus, hyperlipidemia and early atherosclerosis [8]. One quarter of obese children have impaired glucose tolerance [29] which is considered as an independent risk factor for cancer mortality.[30] In addition there is evidence of an association between increasing obesity, and increased risk of cancers.[3-5;7] Furthermore, once obesity develops, is difficult to treat. Therefore in adults, most of those who manage to lose weight relapse within 5 years.[27] Thus strategies for preventing obesity targeting children are recommended and necessary.[31;32]

1.3 Definition of obesity

Obesity is defined as a condition in which an accumulation of excess of body fat mass occurs that may increase the risk of morbidity and premature death.[22;33;34] It was defined by Park as " an abnormal growth of the adipose tissue due to an enlargement of fat cell size (hypertrophic obesity); or an increase in fat cell number (hyperplasic obesity) or a combination of both".[35]

Body mass index (BMI) is often recommended and used for assessment of body fat for children, adolescents, and adults.[3;36-39] The WHO developed a classification of BMI for international use, based on its association with mortality and morbidity and linked to health consequences at different cut-offs.[40] The detailed issues of BMI as a measure of obesity in children and adults is discussed in more detail in section 1.4 (**Table 1.1**).

Table 1.1 WHO International classification of weight status according to BMI

Classification	BMI (Kg/m²)	Risk of comorbidity
Adult		
Underweight	<18.5	Low (but risk for other clinical problems increases
Normal weight	18.5- 24.9	Average
Overweight	25-29.9	Increased
Obese class I	30-34.9	Moderate
Obese class II	35-39.9	Severe
Obese class II	≥ 40	Very severe
Childhood	**percentiles BMI for age and sex**	
Under weight	<5	
Normal	5-84.9	
Overweight	85 -94.9	
Obese	≥95	

1.4 Measurement and assessment of overweight and of obesity

Many methods are used to measure body fat and include multisite skin fold thickness (SFTs) measurements [32;41;42], multi-frequency bioelectrical impedance analysis (BIA), dual-energy X-ray absorptiometry (DXA), underwater weighing, and magnetic resonance imaging (MRI). However, these methods are not always available, and they are expensive and complex to use requiring trained and specialized people.[37;43] There is little evidence that other measures of body fat are sufficiently practical or provide additional information to be used in the identification of overweight and obesity among children and adolescents. Consequently, for most clinical, school, public health and community settings these measures are not recommended for routine practice.

To overcome this, indirect techniques are often used; to adjust weight for height, with the most commonly used measure for both children and adults being the body mass index (BMI). BMI is determined both by weight and height, and calculated using the formula weight in kilograms divided by the square of height in meters (kg/ m^2).[8;43-48] The measure is practical, simple, inexpensive and easy to use to assess population overweight and obesity, but is prone to overestimating some peoples' weight status as it does not measure increased fat-free mass such as muscle mass. Hence, it does not distinguish overweight due to excess fat mass from overweight due to excess lean mass e.g. some professional athletes.[36;46;49]

For adults, BMI cut-offs point used to define overweight and obesity have been based on fixed BMI values related to health risk with BMI = 25-30 Kg/m² classified as overweight and BMI> 30 Kg/m² classified as obese [36] (**Table 1.1**). The relationship between BMI and body fat has been shown to vary with ethnicity. Asian populations have a higher body fat percentage at a given BMI than White Europeans, whereas in African Caribbeans body fat will be lower.[40;50]

A WHO expert consultation in 1993 concluded that Asian populations have a higher percentage body fat for a given BMI compared to European population for the same age, sex, and BMI, and they have substantially higher risk of type 2 diabetes and cardiovascular disease, even below the 25 kg/m^2 BMI cut-off. The BMI cut-off point for the observed risk in different Asian populations varies from 22 – 25 kg/ m^2; and for high risk it varies from 26 – 31kg/m^2.[40;51]

For children the situation is different as they are constantly growing, thus statistical approaches based on normal child growth charts and centiles for BMI cut-offs according to age and sex are often used.[8;43;45-48] Standard population charts and cut-offs vary widely, but for this thesis, obesity and overweight will be defined as BMI $\geq$ 95th and $\geq$ 85th percentile respectively, using the CDC reference population.[8;36;52-55]

A variety of national and international percentile references data sets are available, to calculate childhood overweight or obesity.[43;46-48] For example, the 2000 CDC growth charts for the US Centre of Disease Control and Prevention (CDC) include sex specific

BMI for age reference values for ages 2-20 year.[44;47;55;56] Another reference set developed by the International Obesity Task Force (IOTF) published in 2000 [8] is based on data on 2-18 year olds from six nationally representative populations from UK, Brazil, Hong Kong, the Netherlands, Singapore and United States. The IOTF BMI cut-offs were developed to provide a common definition that could be used by researchers and policy makers for international comparisons and are developed based on the percentiles that matched the adult BMI cut offs of 25 kg/ m^2 and 30 kg/ m^2 at 18 years.

In 2007 the WHO Department of Nutrition and Health released growth reference data for height, weight, and BMI for children age range 5-19 years to be used internationally. These reference values were based on cross sectional data collected from six countries - Ghana, India, Norway, Brazil, Oman, and North America [57] and were intended to monitor child growth in addition to providing percentile chart data which could be used to define overweight and obesity in children.

The terminology, 'overweight' and 'obesity' is used by IOTF and WHO while in the US CDC, the term 'at risk for overweight' is used, with the word 'overweight' also being used to cover values equating to obesity so to reduce stigmatizing language. Many countries such as Canada, Chile, Australia and Mexico use the US BMI reference values but have not adopted the less-stigmatizing terminology.

The different reference sets of BMI are not directly comparable, and thus they may produce different estimates of overweight and obesity.[8;44;53;56;58-60] For example, Reilly and colleagues found that IOTF recommended cut-off values for BMI had lower

sensitivity for detecting overweight compared to the UK 1990 reference values, and that sensitivity differed between the sexes so leading to an underestimation of overweight and obesity prevalence in boys compared to girls.[41;53]

All other studies showed similar findings in 6- 12 year Swiss children when they compared IOTF reference value to the CDC reference value.[37] Ramirez et al (2006) [61] compared the prevalence of overweight and obesity in northwest Mexico children by three sets of BMI reference value (WHO, CDC, and, IOTF) and they concluded that the use of the WHO reference set can overestimate the overall prevalence of obesity in children, but underestimates the prevalence of obesity when IOTF reference set is used compared with the CDC.[61]

1.5 Epidemiology of obesity

The prevalence of obesity varies worldwide but trends are increasing in both developed and developing countries.[22;47;62-64] Studies from different countries show that there is a progressive increase in obesity rates within each country but at different rates. For example, in the US the trend increased more than twofold over 25 years, in England around threefold over 10 years, and around four fold in Egypt over 18 years.[22]

In the US the prevalence of overweight among children and adolescents aged 2-19 years, increased significantly during the six year period from 13.9% in 1999 to 17.1% in 2004.[63] The prevalence of overweight and obesity in England children aged 2-10 years increased from 22.7% in 1995 to 27.7% in 2003 with levels of obesity similar for both boys and

girls aged 2-10 years. The increase in obesity prevalence was most significant among older children aged 8-10.[47]

Janssen et al. compared the prevalence of overweight and obesity in school aged youth (10-16 years) from 34 counties [65] during 2001-2002 based on self reports for height and weight (overweight and obesity were defined according to the same international childhood BMI standards). They concluded that there was variation in the prevalence across the 34 countries with overweight and obesity prevalence higher in countries like North America, Great Britain, and South- Western Europe. The highest prevalence of overweight and obesity was seen in Malta (25.4% vs. 7.9%) and the US (25.1% vs. 6.8%) and the lowest in Lithuania (5.1% vs. 0.4%) and Latvia (5.9% vs. 0.5%).[65]

1.5.1 Epidemiology of obesity in the Gulf region

In the Gulf region high levels of obesity are present among children, adolescents and adults.[11;13;14] Bagchi reported the highest prevalence of overweight in adults (BMI≥25kg/m²) to be in Kuwait, Egypt, UAE, Saudi Arabia, Jordan and Bahrain with ranges between 74% - 86% for females and 69% - 77% for males. In regard to obesity (BMI≥30kg/m²) the highest level was seen in Kuwaiti and Egyptian females (64.7% and 57% respectively). The lowest prevalence of overweight and obesity was observed in Yemen (37.5% in female and 29.7% in male) and in Sudan (36.9% in female and 23.4% in male). Overall there is also an increasing trend in overweight and obesity in school children and youths of the Eastern Mediterranean Region population.[66] Data from Qatar, Kuwait, Islamic Republic of Iran, and Lebanon show that obesity prevalence ranges between 9% - 15% among adolescent males and between 2% - 13% among adolescent

females, with the prevalence of overweight ranging from 17.4 % - 30.0% in Tunisia and Kuwaiti males, and from 13.4% - 31.8% in Lebanese and Kuwaiti females respectively.[66]

Musaiger reported the prevalence of obesity from Eastern Mediterranean Region.[67] The prevalence of overweight and obesity among school children aged (6-10 years) was 12%-25%, while among adolescents (11-18 years) it was 15%-45%. Among adults (≥19 years) the prevalence of overweight and obesity varied for men and women, among men it ranged from 30%-60%, while among women it ranged from 35%-75%.

Selected studies have been carried out to determine the prevalence of childhood overweight and obesity in the Gulf region.[10-15;18;19;68-70] Although these studies used different approaches and different age groups, the overall prevalence varies between the Gulf Cooperation Council (GCC) countries. **Table 1.2** summarises these studies.

The reported prevalence is lowest in UAE (obesity prevalence 7.9% for children ages 6-16 years in 2000)[11] (interestingly the UAE is considered to have one of the highest rates in adults), intermediate in Kuwait (obesity prevalence 19.9% in 5 - 13 years olds in 2002) [12], and highest in Qatar (obesity and overweight prevalence 14.7% and 11.6% for children ages 6-12 years in 2004)[19] and in Saudi Arabia (obesity and overweight prevalence 15.8% and 11.7% for children ages 6-18 years in 1994 [14]) and 13.5% and 13.4% for children ages 9-21 years in 2000 [70]). Some studies found a higher prevalence in girls [10;12;13;58;71] and others in boys.[15] However all reported a higher prevalence in older age groups (>10 years of age).[12;69]

Table 1.2 Comparison of Overweight and Obesity prevalence of children in GCC countries

Author, study design, year of study	Sample size	Definition used	Age groups	Prevalence of overweight/ obesity by sex	Comments
Qatar					
Alkhalaf et al [19], Cross sectional randomly selected 10 primary public schools (all schools accepted the invitation except one school did not) all classes from all grades were participating in the study 1-6 grades, 2004.	38070	CDC BMI cut-offs	6-12 years	Overweight: 11.6% Obesity: 14.7% Overweight and obesity: Girls: 28.7% Boys: 24%	Prevalence of underweight:14.6% Girls: 9.8% Boys:19.3%
Qotba and Al-Isa [18], Cross sectional cluster random sample, equal number of male and female schools in Qatar was randomly selected. All students from grade one were interviewed, 2002.	271	CDC BMI cut-offs -Skin fold thickness	Grade one (6-7 years)	Overweight: 6.3% Girls: 8.8 Boys: 3.2% Obesity 3.7% Girls: 5.4% Boys: 1.6%	Prevalence of underweight: 37.6% Girls: 23.1% Boys: 54.8%
Bener, A [68], Cross sectional study conducted, 30 (15 boys and 15 girls) schools in both urban and semiurban district (with virtually no rural areas) were selected using a multistage stratified random sampling technique, 2003-2004	3923	IOTF BMI cut-offs	12-17 years	Overweight: 23.8% Girls: 18.9% Boys: 28.6% Obesity: 6.3% Girls: 4.7% Boys: 7.9%	Prevalence of underweight 7.2% Girls: 5.8% Boys: 8.6%
Kuwait					
Sorkhou, et al., 2003 [12], children ages 5-13 yrs who were screened for obesity were included, 2002	2910	BMI IOTF cut-offs	5-13 years	Obesity 19.9% Girls: 53% Boys: 47%	Obesity is more common in females and more prevalent in older age group (age of 10

					years old) Obesity was more prevalent in the older age group (36.6%) compared with the younger age group (9.1%)
Al-Isa and Moussa, 2000 [15], Cross sectional study multi stage stratified random sample of about 12% of the target population of the elementary school children, 2000.	8957	BMI NCHS/CDC	6-10	Obesity Girls: 13.8% Boys: 15.7%	Prevalence of underweight was almost equal (3.7% boys vs. 3.8% girl)
Saudi Arabia					
Al-Nuaimi et al., 1996 [14], 3 stage stratified cluster sampling from all the 12 grad level of boys school in Saudi Arabia, 1994	9061	BMI NCHS/CDC	6-18 years (Boys only)	Overweight 11.7% Obesity 15.8%	There was a statistically significant variation between the regions. The higher percent of 18% was in Riyadh and lowest of 11% was in the southern region
El-Hazmi and Warsy, 2002 [13], National household screening programme in different province of Saudi Arabia.	12701	BMI	1-18 years	Overweight % Girls: 12.7% Boys: 10.68% Obesity % Girls: 6.74% Boys: 5.98%	Girls had higher prevalence of both overweight and obesity compared with boys
Abalkhail et al, 2002 [70], Cross sectional study in Jeddah city involved multi stage stratified random sample technique with proportion allocation through 3 stage, schools was chosen randomly from each education level one class from each education level, 2000.	2860	Wt and HT BMI	9-21 years	Overweight 13.4% Obesity 13.5%	Overweight and obesity were more marked among those of at least 13 years of age, male of high social class and students with highly educated mothers

UAE					
Al-Haddad, 2000 [11], healthy school boys and girls from the first (6-7 yrs) and fourth grades (9-10 yrs) primary schools and intermediate (12-13 yrs) and secondary schools (15-16 yrs) from Ras Al-Khaimah Emirate were included in the study, 2000	4075	BMI	6-16 years	Overweight: 16.5% Girls: 9.3% Boys: 8.5% Obesity 17.2% (7.9% in both sexes)	
Al-Haddad, 2005 [69], all the UAE students from the randomly sampled schools from 8 out of 10 educational district through 2 stage stratified cluster sample (10% of school students from each education district randomly selected), 1998-1999.	16391	BMI	4-18 years	Overweight Girls: 20.1% Boys: 17.1% Obesity Girls: 7.1% Boys: 7.7% Prevalence for the age 6-7 years old for the Overweight Girls: 18.9% Boys: 10.8% Obesity Girls: 7.8% Boys: 5.6%	Obesity increase in frequency over the age 9-18 years with 2-3 folds higher than international slandered (male higher than female).

In Qatar, few studies have been carried out to determine prevalence of overweight and obesity. All these studies used the BMI as an indicator of obesity and similar methods (see **Table 1.2** for more detail**).** For example, Qoutba and Al-Isa found that the overweight and obesity prevalence was 6.3% and 3.7% respectively in year 2002 (among children aged 6-7years)[18]. The proportion increased to 11.6% and 14.7% respectively in year 2004 (for school children aged 6-12 years) [19], and to 23.8 % and 6.3% respectively for adolescents aged 12-17 years in year 2003-2004.[68]

The Qatar community, similar to populations in many other countries, has experienced a nutrition transition. Differences in diet, social, lifestyle and environmental exposures, including recent and rapid westernization, are likely to be responsible for the variation observed.[16;17] Overweight and obesity have been identified as a serious growing problem in recent years. The epidemiological transition and westernization in Qatar is discussed in more detail in section 1.9. This emphasises the need for effective intervention to help in life style modification. While in Qatar and Gulf countries, a somewhat heavier body has been considered to be a symbol of family wealth and health in the traditional culture [17], this belief is becoming less widespread. In Western culture, obesity is generally unacceptable. Such social and cultural factors need to be considered when developing intervention strategies.

1.6 Obesity and socio-demographic factors

Socioeconomic status (SES) is usually presented as a composite index combining income, education, occupation and in some developing countries, place of residence urban or rural area.[3] The relationship between obesity and SES is complex and not consistent across different populations.

Previous studies have concluded that childhood obesity is most frequent in population groups of lower socioeconomic status in developed countries. For example, in the UK children from lower income households show higher rates of obesity prevalence than children in households with higher levels of income (15.8% compared with 13.3%).[47;72] Obesity was higher among children living in inner city areas such as London (18.2%) and North East (18.3%) than among children living in other area such as Yorkshire and Humber (11.4%) and the South East (13.4%) in year 2001 and 2002.[47]

In contrast childhood obesity is most frequent seen in upper socioeconomic status of developing countries [73;74], is associated with high-income group, most probably due to adoption of Western lifestyle.[22;64;72] A survey in four countries showed that prevalence of obesity was higher in rural areas (than urban areas) in Russia and the US but higher in urban areas in Brazil and China.[64] In the US, obesity is high in low income but in Brazil is increased in high income families, while for Russia and China there was no difference between SES or family income level.[64]

Childhood obesity variation by ethnicity has been observed in countries such as UK and US. In the UK, a survey suggested a higher prevalence of childhood overweight and obesity in African-Caribbeans and South Asians.[75;76] Moreover, in the US, higher obesity level are seen in Hispanic and African American children compared to white children.[77-79]

In conclusion, childhood obesity has rapidly emerged as a global epidemic. Studies from different countries show that there is a progressive increase in obesity rates within each country but at different rates. National estimates of the obesity problem are important for both policy-makers and public health research in order to implement effective obesity prevention and treatment strategies.

1.7 Aetiology and contributors to childhood obesity

Understanding and preventing obesity is complex. Multiple aetiological factors are responsible for the increased susceptibility to obesity, including genetic, social, behavioural and environmental factors. Inevitably obesity occurs due to an imbalance between energy intake (dietary habits) and energy expenditure (physical activity).[2;80-82] In addition personal lifestyle preferences and the cultural environment play an important role. It is difficult to reverse the obesity trend and help individuals to change their diet and increase exercise. Over the last decades, our life style has changed significantly. We have many labour-saving devices in our home and work, we drive more, eat more takeaway meals, and in larger portions. The Foresight Report in the UK builds on the scientific evidence available on obesity to help inform government strategy in combating the problem. In the report, it is argued that multiple factors contribute to the 'obesogenic environment'.[83] The 'obesogenic environment' refers to the role environmental factors may play in determining both nutrition (over consumption of energy dense foods) and physical activity (reducing the opportunity for habitual physical activity), and may operate by determining the availability and consumption of different foodstuffs and the levels of physical activity undertaken by populations.[83-85] The obesogenicity of an environment has been defined by Swinburn and Eigger as 'the sum of influences that the surroundings, opportunities, or conditions of life have on promoting obesity in individuals or populations'.[85]

The main aetiological factors are discussed below:

1.7.1 Dietary intake and food patterns

Increased prevalence of obesity in recent years has been attributed to an increased consumption of high fat intake [33;86-88], sweetened drinks [89-91], fast food [88], and

increasing portion size, although there is no clear effect of diet or enough supporting evidence available.[92] Muller and colleague, using cross-sectional data on 1468 children aged 5-7 years in Kiel north Germany, from the Kiel Obesity Prevention Study (KOPS) found that overweight was associated with unhealthy eating habits (high consumption of fast food, sweets, chips and pizza) and lower fruit and vegetable consumption.[88]

The Foresight Report [83;84] identifies changing eating habits and the nature of food as more people eat out at restaurants, availability of fast food and takeaway food delivery service, availability of cheap foods, and food marketing offers such as "buy one and get one free" as important dietary patterns that contribute to obesity. Food sources tend to be more energy dense, nutrient poor and provide plentiful calories; this increases the availability of food high in hydrogenated fats, sugars and salts, but relatively low levels of vitamins and minerals.

Consumption of sugar sweetened beverages has been implicated in several studies [89-91]. In a systematic review conducted by Malik et al [91], thirty publications were included (15 cross-sectional, 10 prospective, and 5 experimental) to investigate the relationship between soft-drink consumption and long term weight gain. Findings indicate that greater consumption of sugar sweetened beverages (particularly carbonated soft drinks) is associated with weight gain and obesity. Another study conducted by Ludwig and colleagues examined the relationship between the rising prevalence of obesity in children and consumption of sugar sweetened drinks. Data collected from 548 ethnically diverse schoolchildren from public schools in four Massachusetts communities in 1995-97 suggested a 1.6 times increasing risk of

becoming obese for each additional serving of sugar sweetened drink consumption.[89] A randomized controlled trial which enrolled 103 adolescents (13-18 years), who regularly consumed at least one serving per day of sugar sweetened beverages and assigned the intervention group to weekly home deliveries of non-calorific beverages for 25 weeks, found that decreasing sugar sweetened drink consumption had a beneficial effect on body weight and the effect was greater among the subjects who drank more sugar sweetened drink at baseline.[93]

The relationship between other dietary patterns and intake and obesity however, is less consistent. A UK study [92] based on 77 children aged 1.5-4.5 years randomly selected from 8 distinct geographic areas concluded that there was no relationship between dietary intake of total energy, fat, carbohydrate or protein and percentage of body fat in children. Smithers and colleagues [94] using data on 1701 children aged 4-18 years from the National Diet and Nutrition Survey (NDNS) found that total energy intake in the 1998 survey was lower than that reported in the 1983 survey despite children in the former being taller and heavier.[94] This finding was interpreted to suggest that dietary factors have not contributed as much to the rise in obesity prevalence, although the possibility of under reporting of food and drink consumption must be considered.

1.7.2 Physical activity and sedentary behaviour

There is some debate about the importance of physical activity as an important contributor to obesity and whether interventions can increase overall activity levels.[95] Studies have shown that reduced physical activity, and increased sedentary time such as watching television and playing computer games are associated with increased BMI and the prevalence of overweight and obesity in children.[1;54;88;96;97] In addition it

was found that inactivity was also associated with unhealthy eating practices.[88;98-100] Muller et al found that low levels of activity (which was assessed by television viewing time) were associated with higher prevalence of overweight. In children watching television more than 1 hour per day, there was a higher consumption of fast food and sweets.[88]

Limited opportunities for physical activity was also highlighted by the Foresight Report as one of the key contributors to obesity. [83;84] This includes the design of the city environment, safety, availability and access, local knowledge and supportiveness of neighbourhoods. All these issues play an important role in decline in walking and cycling over the last 30 years.

1.7.3 Changing lifestyle

Changes worldwide in lifestyle have contributed to altered dietary patterns and physical activity levels. These include adopting a "western diet", (especially high in fat) increase in availability and consumption of fast foods and increase in sedentary lifestyles in recent years. Physical activity has reduced with increased demand on cars or motorized transport, shifting work patterns from predominantly agricultural to more office based, high technology devices at home, leisure time that is predominately shifted to sedentary behaviour (like watching television and playing computer games). Children living in large cities have less access to parks and play grounds where it is unsafe to go outside. They spend more time with computers, video games and television for activity.[2;33;80;83;84]

1.7.4 Genetic and Family influences

Obesity is a feature of a number of rare medical (genetic) problems in childhood, such as Prader-Willi syndrome, Bardet-Biedi syndrome, and Leptin receptor mutation.[22;101] Genetic factor can also have influence on individual susceptibility to obesity; however the rapidity of rising epidemic of obesity suggests a genetic cause to be unlikely. Other factors like behavioural, environmental, life style and cultural environment seem to play an important role in childhood obesity epidemic worldwide.

Family influence is an important factor in children's susceptibility to weight gain. Parental overweight has been shown to be the most important risk factor for childhood obesity in several studies [102-106]; Whitaker and Dietz find that maternal obesity and birth weight have a direct relation and affect the risk of obesity later in life.[106] Another study conducted by Danielzik and colleague found that the major determinants of overweight and obesity of 5-7 years old children were parental overweight, a low SES and high birth weight.[104]

De Moira, et al [103] examined the 7 years old members of the British birth cohort 1958 (n=8552) and offspring aged 4-9 years (n=1889) born to mothers under 30 years, to evaluate risk factors for childhood obesity (1965-1991). They found that the prevalence of overweight and obesity increased by more than 50% between generations. Higher parental obesity and maternal employment may have contributed to this trend over time.[103] Consistent with existing evidence from Australia [105], a study from the UK [102] also found that higher parental overweight is important and a strong factor associated with increased childhood risk of overweight and obesity in later life.

Most overweight children have multiple environmental risk factors.[82] Correlations between parent and child habits may reflect family patterns of food intake [107], exercise [108], selection of leisure activity (duration of television watching or viewing), and family and cultural patterns of food selection has important effect on childhood obesity.[107]

In conclusion, multiple factors are responsible for obesity and its development, which include interaction between genes, environment, and behavioural life style. Imbalances of the dietary factors and physical activity patterns have strong influence on obesity, and can be considered to be the major modifiable factors. National information on the individual and environmental factors that contribute to the development of obesity would be very important for the development of prevention programs in Qatar.

1.8 Obesity prevention intervention studies

Few intervention studies exist for preventing obesity in children [1;20;100;109-128] and most were conducted in western countries, school based and the interventions were based on a health-education or social-cognitive model framework.[21] The focus of my review here was to identify systematic review articles and guidelines on childhood obesity prevention. The Cochrane, MEDLINE and the national research database and reports were searched. The numerous systematic reviews on childhood obesity prevention concluded that more research in this area is highly recommended.[21;129-131] with one systematic review specifically suggesting researchers focus on intervention development based on the knowledge of local community members, accessed utilizing qualitative methods. [129]

A Cochrane systematic review identified twenty two studies selected from 1990 to 2005, with different study designs, target populations, theoretical frameworks, outcome measures and quality of reporting.[1] Summerbell et al. were not able to combine results or generalize the findings, but on the whole they concluded that most prevention trials failed to show any impact of the intervention on overweight and obesity in children see (**Table 1.3)**.

Table 1.3 Summaries of the studies conducted in relation to childhood obesity prevention interventions

Study/ Source/ Author	Population/ Place	Methods and study size/ Design Sample	Participants age	Interventions	Duration	Out come
Baranowski 2003 [120]	US	RCT targeted African American girls and their family [day summer camp]	8-10 yrs old (n=38 girls)	Combined effects of dietary education and physical activity set in summer camps and homes (internet): • Increase fruit, vegetable and water consumption. • Enhance physical activity.	12 weeks	No differences between intervention and control
Beech 2003 [121]	US	RCT targeted African American girls and their family. [Community centre]	8-10 yrs old (n=60)	Weekly educational sessions run in community centres: • Improving nutrition • Improving physical activity	12 wks	No differences between intervention and control
Caballero 2003 [132]	US	RCT (cluster randomized trial) School based targeted American Indian students [Pathway]	8-11 yrs (41 schools-n=1704)	Multi-component trial : • School curriculum • Food service • Improve physical activity • Family involvement in program	3 yrs	**Fatness assessment** no Significant difference for BMI, skin folds or percentage body fat. **Physical activity accelerometer showed** no Significant difference between intervention

						and control, but trend was in the desired direction. **School lunch program** Significant reduction in energy from fat in intervention schools lunches. **Knowledge, attitudes and believe significant** improvement in the intervention school for all the three years.
Dennison 2004 [122]	US	RCT Pre School based [day care centre] targeted White Europeans	2.6- 5.5 years (Mean age 4 yrs) (18 day care centre-n=176 children)	Health promotion program: • Reduce television viewing by encouraging reading for both parents and children.	12 week	No Significant difference for BMI, skin folds or waist circumference. **Television viewing** was significantly reduced in intervention group on weekday and weekend's day, as well as total number of hours watched.
Donnelly et al 1996 [111]	US	Non randomised trial with control group	8-10 yrs old (438 schools (102	1- health education through school curriculum: a-Dietary education:	2 yrs	No impact on obesity (over 24 hours there was no significant difference

		School based	intervention and 236 control) - n=338)	• Increase fruit and vegetable • Decreasing fat and sugar b-Improving physical activity 2-environment change: Changing food supply in school		in dietary intakes between intervention and control groups, and intervention group less active outside school)
Epstein et al 2001 [115]	US	RCT school base targeted children of families with obese parents	Children 6-11yrs (n=26)	Dietary education: • Increase fruit and vegetable • Decreasing fat and sugar	12 months	Change in percentage of overweight in the children with either intervention reduced but were non significant
Flores 1995 [112]	US	RCT African American and Hispanic adolescent. school base	10-13 yrs (n=110)	Health education program include increase physical activity curriculum (dance /aerobic activity)	12 wks	Significant reduction in BMI and increase fitness in intervention group
Gortmaker 1999 [109]	US	RCT School based	11-12 years (10 school-n=1295)	Inter-disciplinary programme through school curriculum: 1-Dietary education: • Increase fruit and vegetable • Decreasing fat and sugar 2- Improving physical activity 3-reduced sedentary activity (TV)	2 yrs	Significant reduction in obesity in girls but not boys in intervention group

Harvey-Berino 2003 [123]	US	RCT Home visiting based targeted Native American communities.	9 month -3 years (n=40)	Parent education program: 1- improve parenting skill • Eating behaviour • Exercise behaviour	16 weeks	There was no Significant difference for intervention maternal BMI and obesity prevalence at base line and after 16 week of intervention.
James 2004 [117]	UK	RCT School based	7-11 years (6 school-n=644)	Education program: • Promote drinking water • Promote reducing carbonated drink	12 months	No differences between intervention and control for BMI and water consumption. There was a reduction in the self- reported soft drink consumption over 3 day in intervention group compared with control group.
Kain 2004 [124]	Chile	Cluster case controlled trial School based	Children in grade 3-8 10.6 year (5 school-n=2375)	Multi-component: • Nutrition education • Promote physical activity	6 month	No differences between intervention and control for BMI or skin folds. Significant reduction in waist circumference and improved shuttle run test and lower back flexibility in the intervention group.
Mo-Suwan 1998 [110]	Thailand	RCT School based	4.5 yrs (n=292) kindergarten	Physical activity programme (aerobic) Environment change model	29.6 weeks	Decrease skin fold thickness in both groups more in intervention at

						short term (29.6 week), but similar after 6 months
Mueller 2001 [114]	Germany	RCT School based and family intervention	5-7 yrs (n=1640)	1-Dietary education: • Increase fruit and vegetable • Decreasing fat and sugar 2- Improving physical activity (structured sport programme for family if parent or child were obese) 3-reduced sedentary activity (TV) educational message	1 yrs	No difference in BMI or percentage of overweight, TSF significantly less in intervention group
Neumark-Sztainer 2003 [125]	US	RCT School based	14-18 years (3 school- n= 201) girls only	• Personal and behaviour factors • Improving physical activity behaviour.	8 months	No differences between intervention and control for BMI. There was a positive change in behaviour and personal factor in the intervention school (but not significance). Change in physical activity stage was significantly higher intervention than control group.
Pangrazi 2003	US	RCT School based	9-10 years (35 schools -	Improving physical activity behaviour	12 weeks	No differences between intervention and control

[126]			n=606)			for BMI. For all students, play and physical education, and play intervention groups were significantly more active than control. For girls play and physical education, and physical education intervention groups were significantly more active than control. While for boys there was no significance difference beteen groups as control boys were more active.
Robinson 1999 [100]	US	RCT School based	8-10 yrs (n=198)	Reducing sedentary behaviours (self monitoring and reporting of TV and video game viewing)	6 months	Significant reduction for body fatness (BMI, TSF, waist circumference, and weight and height ratio).
Robinson 2003 [127]	US	RCT community based Targeting African American girls	8-10 yrs (n=61) Girls only	After school dance class [START] • Improve physical activity • Reduced sedentary behaviour • Enhance diet	12 weeks	No differences between intervention and control for BMI or waist circumference and physical activity. There was less television viewing in the intervention group

Sahota 2001 [118;133]	UK	RCT School based targeting whole school including parents, teachers, and catering staff	7-11 yrs (10 school-n=634)	Multidisciplinary programme [APPLES]: 1-teacher training 2-modification of school meals 3-development and implementation of school action plans targeting promote healthy eating and physical activity: • Curriculum • Physical education lessons • Tuck shops • Playground activity	1 yrs	No difference in BMI or dieting behaviour between intervention and control group. But there was an increase in vegetable intake in intervention group.
Sallies 1993 [134]	US	RCT School based	9.25 years (7 school-n=740)	Follow the (sports, play and activity Recreation for Kids) SPARK intervention : • Promote physical education • Self management into the school curriculum	18 months	Small differences in BMI for boys and girls between intervention group (specialist led and teacher led) and control groups. (Significance rate was not address).
Stolley 1997 [113]	US	RCT targeting inner city African American girls and their mothers	7-12 years girls only	1-Nutrition low fat and low calorie 2-increased physical activity	12 wks (1 hour /wks)	No weight change, but significantly lower fat intake in intervention group
Story 2003 [128]	US	RCT after school classes targeted African American	8-10 years (n=54) for girls only	Skill development and changing behaviour : 1- healthy behaviour	12 weeks	No differences between intervention and control for BMI or waist

		pre adolescent girls		development • Drinking water • Eating more fruit, vegetable, and low fat food 2-increasing physical activity 3-reducing TV watching 4- Enhancing self esteem.		circumference. Significant improvement in dietary practice and psychosocial variable
Warren 2003 [119]	UK	RCT School and family based	5-7 years (3 primary school- n=218)	Nutrition and physical activity curriculum delivered through lunch time clubs	14 month	No significant changes in the rate of overweight and obesity in the 3 interventions groups. Significant change in self reported knowledge and dietary intake in all intervention and control group. Physical activity had improved in the intervention groups

Out of the twenty two studies included ten were with long duration and follow up (12 months or more) [109-111;114;115;117-119;132], and twelve had short duration and or follow up (3 to 12 months).[100;112;113;120-128] The majority of intervention studies were conducted in a school setting [109-112;114;115;117-120;122;124-126;128;132;134], the remainder being conducted in family [113-115;123;128] and community.[120;121] Fourteen of the studies (6 long term [109;111;114;118;119;132;133] and 8 [113;120-124;127;128] short term) used combined dietary education and physical activity interventions. All except one long term study resulted in improvement of body weight for girls but not for boys [109], Six studies (2 long term [110;134] and 4 [100;112;125;126] short term) focused on interventions to increase physical activity alone, and only 2 long term studies [115;117] focused on nutrition education alone. None of these were effective in the reduction of overweight status in the intervention group (**Table 1.3**).

Authors of the Cochrane systematic review [1] concluded that the result of these studies were unable to demonstrate any change in weight status of children (BMI level), although it shows improvement of knowledge [132] and behaviour.[111] This could be due to the short duration of intervention where behaviour and environmental modification is unlikely, unsustainable or ineffective. All the 22 studies had some methodological weakness. Based on these findings, the best outcome might be achieved through multifaceted strategies and an approach that considers environmental, cultural and system impact in addition to individual and group behaviour change.[1]

A further review conducted by Flodmark et al. [135] found evidence from 10 trials in western countries on obesity prevention. Three studies showed that interventions had

a positive effect on obesity, while 7 reported no differences between the groups. When the combined results of the systematic literature reviews by the Swedish Council on Technology Assessment in health care (2002) based on 39 studies were considered, 15 reported a positive effect on obesity prevention, and 24 showed no effect. Intervention did not have a negative effect in any of the studies. The authors concluded that it may be possible to prevent obesity in children and adolescents by using long term multicomponent interventions although they were not able to identify specific interventions components.[135]

Another review was conducted by Hardeman et al. [21] where eleven studies were included with 9 distinct interventions. Four were conducted in the community and five were school based. Of the five which were RCT in design, only one reported a significant reduction in obesity in the intervention group. This intervention included mixed behaviour change methods (e.g. goal setting, self monitoring, and contingencies).[21]

A further evidence briefing review was conducted by the Health Development Agency [116] in the UK, where synthesis of high quality systematic reviews, meta-analyses and other lifestyle interventions was undertaken. Thirteen systematic reviews and meta-analyses [21;136-138] were included related to preventing obesity and overweight in children and adolescents. The authors concluded that there was evidence to support the use of multi-faceted school based interventions to reduce obesity and overweight in school age children, but there is limited evidence of effectiveness of school based health promotion and physical activity programme and family based health promotion and behaviour modification programmes.

Schools are an ideal setting for influencing health promoting behaviours [139] and targeting children. Schools can reach almost all children and adolescents during their first two decades in life and they spend much of their time at school, sharing meals and undertaking physical activity within and outside the curriculum. In addition there is an influence of peers which may impact on individual behaviour.[140-143] Furthermore, schools play an important role in the community, where health education takes place both inside and outside the classroom through policies that a school adopts, the physical and social environment, and the curriculum it provides. All have the potential to significantly affect the health of students and others at school.

The few studies that have examined the association between school food environment and student eating patterns suggest that the school food environment has a significant impact on food choices.[141;144] School food policies by promoting healthy eating and reducing access to foods high in fats and sugar in school may also reduce obesity levels.

The Pathways trial [132] was a 3 year school based multi- component, multi-centre school based intervention to reduce obesity in American Indian children aged 8-11 years. The programme included a school curriculum focused on healthy eating and lifestyle, changes in dietary intake and food service, and increase in physical activity. Family involvement interventions were included together with support from tribal, educational and community authorities. The trial resulted in improved food and health

related knowledge and behaviour but there was no reduction in body fat [132] (see **Table1.3**).

Another multi-disciplinary RCT conducted in the UK, the Active Programme Promoting Lifestyle in schools (APPLES) [118;133] was designed to influence diet and physical activity behaviours, targeting the whole school, parents, teachers and catering staff. The intervention included teacher training and resources, modification of school meals, tuck shop and playground activities. After one year there was no difference in change in BMI between intervention and control groups, nor was there any difference in dietary behaviour, although, children in the intervention group reported higher consumption of vegetables. Generally the APPLES programme was successfully implemented and showed positive changes at school level in the food provision (tuck shops and school meals), play ground activity, and the attitudes and knowledge of children.

Gortmaker et all conducted a RCT (Planet health), with 1295 ethnically diverse children (11 to 12 years) from 10 US schools (5 intervention and 5 controls). Behaviour choice intervention was chosen, and concentrated on the promotion of physical activity, modification of dietary intake and reduction of sedentary activity (reducing television viewing). The intervention resulted in reduced television viewing and obesity in girls but not boys, although dietary behaviour remained unchanged between intervention and control schools.[109]

Failure of previous trials to prevent obesity may be explained by neglect in considering the complex interactions linking individuals, their families and peer

groups, workplaces, neighbourhoods and wider communities.[145] Another potential reason why previous trials have had little success is the complexity in developing and evaluating trials involving several interconnecting component interventions.[1;133;146] Further more most were conducted in western countries and none in the GCC or Arab countries.

Previously, interventions targeted at obesity have focused on behavioural programmes to increase physical activity and/or reduce calorie intake. But the growth in the epidemic of obesity in recent years indicates that the major changes are environmental at the population level. Interventions must therefore focus on the environment and how behavioural factors interact with the environment. With interventions enhanced by political involvements action may promote more effective results. This can be achieved by involvement of families, school environments, community, and others in the decision making of the potential strategies and approaches to be implemented.

1.9 Changes in life style and dietary habits in Qatar and the Arabian Gulf Countries

The six GCC countries share a similar background, culture and geography. They have experienced and passed through rapid social and economic changes especially during the oil boom period (1973-1981). The result has been a dramatic improvement in health, nutritional status, and economic development. However, this rapid change in lifestyle and dietary habit as a result of increase in income has led to the development of a paradoxical nutrition situation, as both obesity and underweight are common problems.

Prior to the discovery of oil (before 1940) the Arabian Gulf countries had a relatively small population which could be classified as inhabitants and nomads. The main choices of work were agriculture, pearl diving, fishing, sea faring and trading. Fish, rice, wheat, milk and dates were the most commonly consumed foods especially in the coastal areas. Nomads consumed meat less frequently and mainly when a guest was invited. Dates were widely eaten either as snacks or with meals.[17]

The oil discovery period was between 1940 and 1970 with Qatar being the fourth state after Bahrain, Saudi Arabia and Kuwait to begin production. During this period there was a gradual but slow change in the economic development mainly due to the advent of oil. Many workers left their traditional work and joined the oil industry for better paid jobs.[17]

The oil boom period, between 1970 and 1980, was considered the golden decade of the Gulf countries. There was an improvement in the socio-economic situation, with the introduction of a western diet. Accordingly meal patterns were varied and processed foods became more common place.[17]

In general, the rapid economic growth led to increase in the socio economic and living standards and better population health status.

1.9.1 Food consumption patterns

During the last three decades there has been a drastic change in food consumption patterns in Arabian Gulf countries. The traditional diet of dates, milk, rice, bread, fish and vegetables has diversified. Red meat is consumed more frequently than fish or poultry, rice is still eaten in daily basis, wheat is mainly consumed as bread, burghol or pasta (macaroni), milk and dairy product consumption has become commonplace,

e.g. sour milk (laban), cheese, butter and yoghourt. Snacks have also diversified to include nuts, seeds, high energy processed snacks (e.g. sweet, chocolate bars and crisps) and soft drinks. Tea is the most popular drink and consumed sweetened with or without milk. Fast food has become the main choice for young people. The hot climate and marketing by the food industry encourages consumption of soft drinks and carbonated beverages.[17]

The large immigrant population have also introduced new foods and influenced the dietary habits of the region. For example, Arabs group from North Africa (mainly Palestinians, Lebanese, Egyptians and Jordanians) have introduced many popular savoury (e.g. falafel, hummus, foulmodams, tabbouli, shawarma) and sweet dishes (e.g. bakalawah and knafeh). Similarly, the Indian, Pakistanis, Iranian and other immigrants have introduced some of their popular dishes, (e.g. keema, dhal, biriyani, mutton curry, chapatti, and Iranian bread), some replacing traditional healthier options.[17]

It is particularly difficult to accurately measure individual dietary intake in this population since Gulf families often eat together from the same plate. Meals are either served in a traditional way on a large mat on the floor (especially at lunch) and all the family members gather around and eat the food by hand. Nowadays people may eat at a table in the western manner. At the table people may eat either by hand or with cutlery.

The main meal is eaten at lunch (which is usually a very heavy meal), with lighter meals for breakfast and dinner. However, with more Qataris entering the work force,

it is becoming more common to have family meals in the evenings. The midday meal on Friday, after prayers, is the main gathering of the week for many families.

Thus, Qatar has seen significant socioeconomic, demographic, and dietary changes with a shift towards a sedentary lifestyle and overconsumption dietary patterns including consumption of energy dense foods which are low in fibre and high in sugar. These changes in dietary habit are therefore important contributors to obesity, especially among resident of large cities.

1.9.2 The impact of rapid socio- economic developments on the Arabian Gulf countries

After the oil boom, the state of Qatar experienced a unique economic and social transformation. Economic development was characterized by a remarkable increase in national as well as family income. This was associated with changes in lifestyle habits leading to a pattern characterized by excessive food intake, sedentary activities and lack of exercise. Along with economic growth there has been much progress made in women's role in society. The economic growth has led to increased education and contact with the outside world. All this has led to an increasingly liberal view of women's role in Qatari culture. This can be seen in the election of a woman to a political office and that women were allowed to vote. There is still tension between women's rights and what is allowed in traditional Muslim beliefs. The work that women are allowed to do in Qatar is under the constraints of proper behavior for a Muslim woman and it must be a job that allows her to complete all her duties in the home.

There is no systematic data to show changes in levels of physical activity in the Qatari population; however, high reliance on private transport and poor public transport system, investment in education which has resulted in fewer manual occupations, higher level of access to computers are among contributing factors in limiting physical activity. Farrag and Musaiger summarized the impact of rapid socio economic development and environmental factors (home environment) are leading contributors in the growing trend in obesity on these countries as follows: (1) Family structure changed from an extended family towards a nuclear family. (2) Increase in the dependence on domestic helpers in home management and rearing of children. Most of the domestic helpers are non-Qataris and have lower educational level. (3) Fathers occupied their times in work (business and trading) leaving no time for family and children. (4) Rapid decline in breast feeding and early introduction of formula feeding. (5) Increase in the number of working mothers. (6) High speed of urbanization as a result of international migration as well as indigenous migration from rural and nomadic areas to urban centres. (7) Increase in the dependence on processed foods, and rapid and continuing expansion of fast food restaurants during the past decade and (8) High prevalence of heart disease as a consequence of obesity.[16;17]

These social and environmental changes have coincided with an increasing trend of obesity, and have probably contributed to the epidemic in the Gulf region.

1.10 Rationale for targeting the Qatar population for obesity prevention

There are few published studies on the prevalence of obesity in the state of Qatar [18;19;68] see **Table 1.2**. There have to date been no studies to assess food, dietary intake

and physical activity levels, or environmental factors that influence the development of obesity in children in the state of Qatar. It is important to target children, as treatment of obesity once developed is difficult, and there is more scope for prevention in children. Studies indicate that around the 5-7 year age groups is one of the periods at which children are at higher risk of obesity, the others being the prenatal period and adolescence.[3;20;147;148]

With evidence of increasing obesity in general in many developed and developing countries, and lack of research to tackle this problem at a national level, this is a timely study for obtaining relevant baseline data and informing health planners and policy makers in developing appropriate interventions.

1.11 Aims and objective

1.11.1 The aims of study

1- To describe the prevalence and pattern of obesity among 6-7 year old Qatari school children.

2- To investigate individual and environmental factors that contributes to the development of obesity in school children in the State of Qatar.

3- To identify potential components for an intervention programme to prevent obesity amongst children in the State of Qatar.

1.11.2 The objectives

The objectives for the study therefore include:

1- To estimate the prevalence of overweight and obesity and how this differs by sex, nationality and school district.

2- To assess the current level of physical activity and dietary habits of 6-7 year old school children in Qatar, and to assess whether there is any difference by sex, nationality, and school district level.

3- To assess which of the individual socio-demographic, behavioural, and school level factors are associated with obesity in this population, and to assess whether there is any difference by sex, nationality, and school district level.

4- To explore the perceptions of key stakeholders of factors in contributing to obesity among children.

5- To explore whether the factors identified by the stakeholders are believed to be locally relevant and amenable to change (including availability of resources, cost, interest and support, and within cultural norms).

6- To prioritise and identify components for an intervention programme based on the perceived importance and changeability of components.

2 Methods

This chapter outlines the methods employed in this study and through which data for this thesis were collected. The first section provides an overview of the background setting for this study, and then it provides the study design, study population and instruments. Finally, it outlines the approach for analysis of the data.

2.1 General background information about Qatar

The state of Qatar is an emirate in the Middle East, and one of the six Gulf Cooperation Council (GCC) countries. The others are Saudi Arabia, Oman, United Arab Emirates (UAE), Kuwait, and Bahrain, which are all very similar in their culture and habits. During recent years, the state of Qatar has witnessed tremendous development as industrialization, and modernization progress.

2.1.1 Location and Land Area

The State of Qatar is a peninsula (**Figure 2.1**), 11,532.5 sq. kms in area, situated halfway along the West Coast of the Arabian Gulf and the East Coast of the Arabian Peninsula (**Figure 2.2**).

It has a desert climate, characterized by long, hot summers and relatively warm and short winters with low rainfall. In summer, the temperature ranges between 25 and 46 degrees centigrade.

Figure 2.1 State of Qatar map

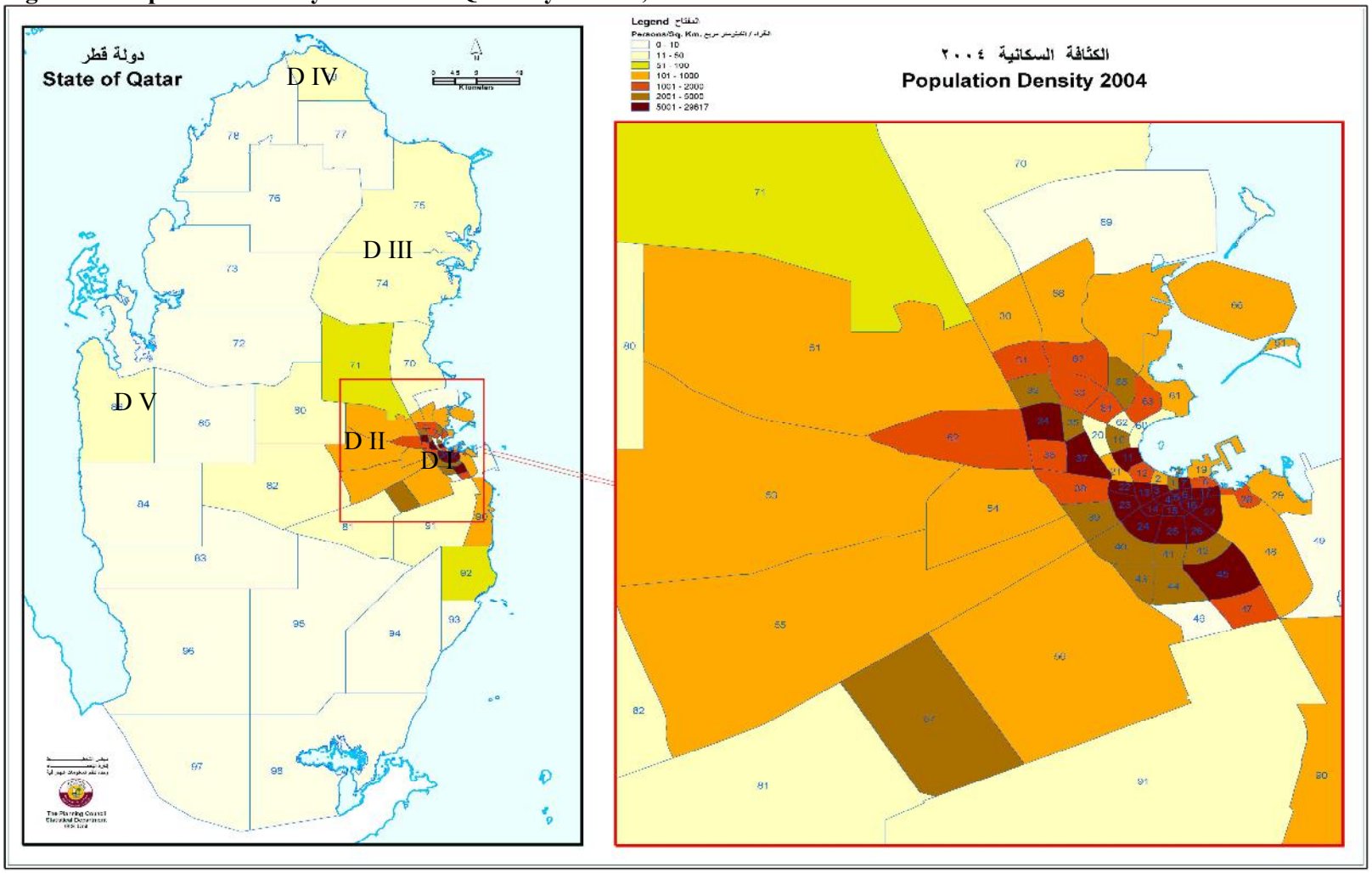
Figure 2.2 Arabian Gulf Peninsula

2.1.2 Population

The population of Qatar is increasing over time, estimated at 744,000 according to the 2004 census, compared to about 522,000 in 1997 census with an annual growth rate of 5.3%.[149] The majority (82.4%; n=612707) of the population is concentrated in Doha city, the capital, which is situated halfway along the East Coast of the peninsula (**Figure 2.3**).

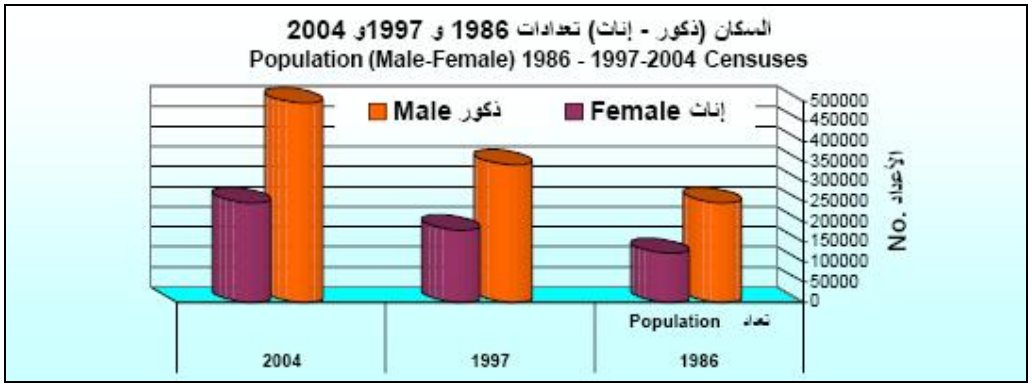
Figure **2.4** and Table **2.1** show the age-sex structure of the population of the state of Qatar in three time periods (1986, 1997 and 2004). There is an excess of men over women in all age groups, but this is most marked in the young adult population (15-64 years), and most of this is in the 20-59 age band. This reflects the large number of migrant working men who have moved to Qatar as a result of the strong economic growth.

Figure 2.3 Population density for State of Qatar by district, 2004



(Adapted from Annual Abstract report the planning council, 2008)[150]

Figure 2.4 Population of Qatar 1986, 1997, and 2004 censuses



(Adapted from Qatar in figures report the planning council, 2006)[149]

Table 2.1 Statistic indicators for the sex and age structure of the population of the stat of Qatar 1986, 1997, and 2004 censuses

Particular	Sex	Population in censuses		
		1986	1997	2004
Population	**Male**	247852	342459	496382
	Female	121227	179564	247647
	Total	369079	522023	744029
Population by broad age group				
Less than 15 years	**Male**	52610	70696	85166
	Female	49842	67009	82452
	Total	102452	137705	167618
15- 64 years	**Male**	192980	266858	405542
	Female	69784	109775	161826
	Total	262764	376633	567368
65 years and older	**Male**	2189	4242	5674
	Female	1581	2436	3369
	Total	3770	6678	9043

(Adapted from Qatar in figures report the planning council, 2006)[149]

2.1.3 Religion and Language

Islam is the country's official religion and Shari'a (Islamic law) is the main source of legislation. Arabic is the official language. English is widely spoken and commonly used as a second language.

2.1.4 Currency

The official currency is the Qatari Riyal (QR), which is divided into 100 dirham. The Exchange parity has been set at the fixed rate of US $ = 3.65QRs (which currently is equivalent to United Kingdom Pound GBP £ = 6.02117QRs).

2.1.5 Culture of Qatar

The people of Qatar are the descendants of Arabs from the Arabian Peninsula, and share a similar historical and cultural background. The pattern of life was based on the extended family where the relationships between the family members were strong. Nowadays extended and nuclear families are both found, although the preference is to live with or at least near the members of the husband's family, by means of a single extended household, walled family compounds with separate houses, or simply living in the same neighbourhood.

Gender roles are relatively distinct. Men engage in the public sphere more frequently than do women. Women have access to schooling and employment and have the right to drive. However, social culture influenced by Islam and tradition leave many women uncomfortable among strangers in public. Instead, their activities are conducted in private spaces. To provide women with more access to public services,

some department stores, malls, and parks designate "family days" during which men are allowed entry only if they accompany their families.

In addition, the composition of the present population has changed. Over the past few years many people have migrated to this region from the neighbouring areas (Najd, Al-lhsa and the Omani mainland) and with them they have brought their cultures and traditions and now the culture of Qatar exhibits the cultural traditions of many other countries too. In Doha the majority of families have one or two domestic helpers and it is estimated that 55% non-Qatari females resident in Qatar work in the domestic sector.[151]

2.1.6 Background information about education and school in Qatar

The level of education in the state of Qatar has markedly improved over time, with the illiteracy rate having reduced from 22.4% in 1986 to 10.2% in 2004; and the proportion of people completing university and higher education (post graduate degree) increasing from 7.9% in 1986 to 15.9% in 2004 (**Table 2.2**).

Table 2.2 Total number and percentage of the population (10 years and above) by educational status

Educational status	March 1986 N (%)	March 1997 N (%)	March 2004 N (%)
Illiterate	65655 (22.4)	65093 (15.4)	64346 (10.2)
Read and write	81402 (27.8)	118304 (28.0)	154580 (24.6)
Primary	42200 (14.4)	55768 (13.2)	81578 (12.9)
Preparatory	36533 (12.5)	57629 (13.5)	101692 (16.2)
Secondary	37125 (12.7)	62433 (14.8)	102575 (16.3)
Diploma	6752 (2.3)	14677 (3.5)	24319 (3.9)
University and higher education	23133 (7.9)	49236 (11.6)	100064 (15.9)
Not stated education	109 (0)	116 (0)	93 (0)
Total	292909 (100)	423256 (100)	629247 (100)

(Adapted from Annual Abstract report the planning council, 2008)[150]

Qatar has a policy of compulsory education until the end of primary school (6-12 years) with all education offered for free to all citizens until the age of 22 years (primary school through to university). Basic education provided by the state consists of three stages: Primary level (from age 6 to 12 years), Preparatory level (from age 13 to 15 years), and Secondary level (from age 16 to 18 years). The proportion of children who continue education beyond the compulsory primary level drops by almost half by the preparatory level and even further by secondary level (**Table 2.3 and 2.4**).

All the governmental schools are sex-segregated consisting of either only boys or only girls (**Table 2.3**). Government schools provide free education for the children of non-Qatari residents who work for the public sector. In addition to these schools, Qatar has a number of private schools (**Table 2.4**) as well as schools for the different Arab communities (Arabic schools e.g. Lebanese, Jordanian, Sudanese, and Egyptian) and other communities (Foreign and international schools e.g. Indian, Pakistani, British, and American), which may be mixed or sex-segregated.

Table 2.3 Number of schools and total pupils in government schools, by gender and age group (2004/2005)

Schools level	No. of Schools (%)		Total N (%)
	Boys N (%)	Girls N (%)	
Primary schools (age 6-12)	52 (48.9)	47 (51.1)	99 (100)
`Preparatory schools (age 13-15)	23 (45.1)	28 (54.9)	51 (100)
Secondary schools (age 16-18)	18 (42.9)	24 (57.1)	42 (100)
Total	93 (48.4)	99 (51.6)	192 (100)

(Adapted from Ministry of Education and Higher Education Report, 2004/2005).[152]

Table 2.4 Number of pupils in private schools by gender and age group (2004/2005)

Schools level	No. Pupils		Total
	Boys	Girls	
Arabic Kindergartens (age 4-6)	3019	2732	42 (5751)
Foreign Kindergartens	3828	3298	51 (7126)
Total	6847	6030	93 (12877)
Arabic Primary schools	4832	3108	33 (7940)
Foreign Primary schools	12640	11122	54 (23762)
Total	17472	14230	87 (31702)
Arabic Preparatory schools	1561	644	15 (2205)
Foreign Preparatory schools	4271	3466	41 (7737)
Total	5832	4110	56 (9942)
Arabic Secondary schools	1262	906	13 (2168)
Foreign Secondary schools	3095	2723	39 (5818)
Total	4357	3629	52 (7986)

Private schools are either mixed school or sex-segregated schools.

(Adapted from Annual Abstract report the planning council, 2004/2005).[150]

2.1.7 Back ground information about health services and school health service in Qatar

2.1.7.1 Health services

The health service in the state of Qatar provides preventive as well as curative and rehabilitative services. Most medical care services and medicine are provided for both citizens and residents free of charge.

Health services are provided by both governmental and private sectors (**Table 2.5**). The governmental sectors provider is Hamad Medical Corporation, which was established in 1982 and supervises five hospitals (Hamad General Hospital, Al Amal Oncology Hospital, Rumailah Hospital, Women Hospital, Alkhor Hospital, and Hamad Medical City Complex) and 23 Primary Health Centres (PHC), distributed across the country. Each PHC consists of an outpatient clinic, pharmacy, diagnostic facilities (laboratory), and medical record section. In some health centres there is also a radiology facility.

Table 2.5 Number of health services facilities in Qatar 2002-2007

Service	Years					
	2002	2003	2004	2005	2006	2007
Government Hospital	3	3	4	5	5	5
Private Hospital	2	2	4	4	4	4
Primary Health Centre	23	23	23	23	23	23
Child Emergency Care Centre	1	5	5	5	5	5
Out Patient Clinic	3	4	5	6	6	6
Medical Commission	1	1	1	1	1	1
Armed Forces Clinic	1	1	1	1	1	1
Police Clinic	1	1	1	1	1	1
Sports Medical Centre	1	1	1	1	1	1
Qatar Petroleum Clinics	5	5	5	5	5	5
Private Sector clinics	149	154	161	159	181	219
Private Pharmacies	134	140	142	142	165	185
Private Analysis and X-Ray	19	32	36	27	19	22

(Adapted from Annual Abstract report the planning council, 2008)[150]

The private health sector consists of four hospitals (Al Ahali hospital, Al-Emadi hospital, the American hospital, and the Doha Clinic Hospital) and 219 primary care clinics.

For school children, health services are provided by the Hamad General Hospital, the PHC, and school clinics in each school. In addition there are school health units which contain specialized clinics such as dental, dermatology, and ophthalmology.

2.1.7.2 School health service

All the schools have a nurse available during school opening hours, and are served by the school health units and PHCs based on the geographical location. Before enrolment in primary school, all the students are required to have a pre school examination and immunization in their relevant PHC. Each child has a complete physical examination, visual acuity check up, teeth check up, measurement of weight and height, laboratory investigations (including complete blood count, urine and stool analysis) and immunization. After completion, the medical information is recorded in two different files, the first one (student health record) issued to be submitted to school clinic and the second one the PHC medical file that contains the follow up of the child since birth and is kept in the PHC.

2.1.7.3 Health indicator

All health indicators have been improving in the State of Qatar over the last decade. Infant mortality has reduced from 10.3% in 1999 to 7.5% in 2007, and mortality in children under 5 years from 12.7% to 9.1% (**Table 2.6**). The state has a high (96 %) coverage rate of basic vaccinations during first year of life, has eradicated poliomyelitis; eliminated neonatal tetanus (**Table 2.6**); and provides safe drinking water and sanitation services.

Figure 2.5 shows that the major cause of death is related to external causes (accidents including road traffic accidents, and non-accidental deaths) particularly in men. The other main causes are diseases of the circulation system, followed by neoplasm and endocrine nutritional and metabolic disease.

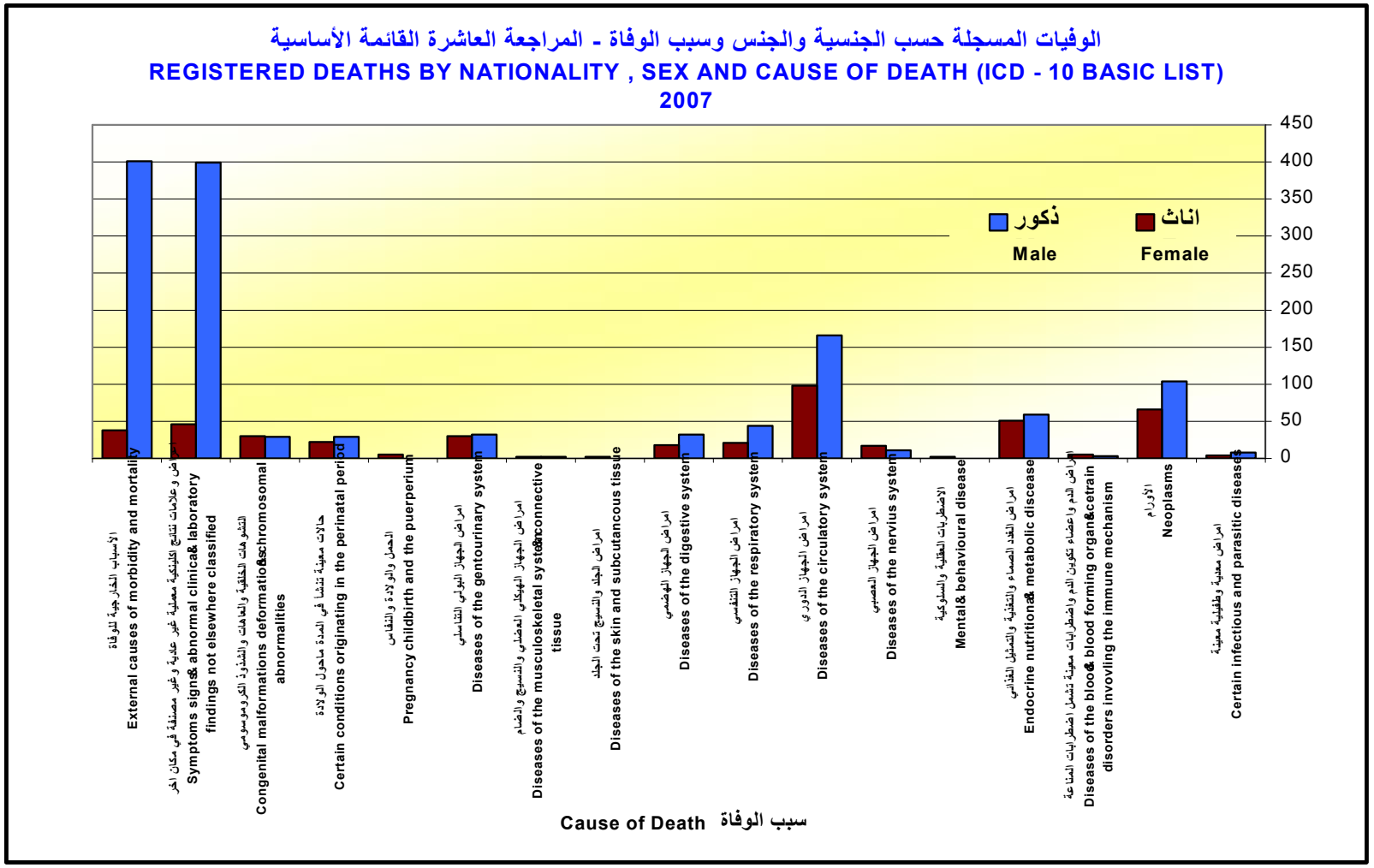
Table 2.6 Change in health indicators in the state of Qatar during the period 2002-2007

Indicators	Years					
	2002	2003	2004	2005	2006	2007
Life expectancy at birth Male female	74.6 74.4 74.7	74.6 74.4 74.7	76.7 76.8 76.5	75.5 75.3 75.8	75.8 75.9 75.7	77.8 77.8 77.9
% of infants who has birth weight ≥2500gm at birth	90.1	92.0	91.7	91.9	91.4	91.6
% of pregnant women attended by trained personnel during pregnancy	100	100	100	100	100	100
% of deliveries attended by trained personnel	100	100	100	100	100	100
% of infants attended by trained personnel	100	100	100	100	100	100
Coverage percentage of basic vaccinations during the first year of life						
BCG (at birth)	100	100	100	100	100	96
OPV 3	96	93	95	98	95	97
DPT 3	96	92	96	97	96	94
Hepatitis B 3	98	93	97	97	96	94
Measles/ MMR 1	100	93	99	100	99	92
Haemophilus Influenzae (3rd dose)	96	92	96	97	96	94
Varicella (dose 1)	95	90	98	100	98	92
Selected Morbidity indicators (Incidence rate per 10,000 population)						
Poliomyelitis	No cases	No cases	No cases	No cases	No cases	No cases
Neonatal Tetanus	No cases	No cases	No cases	No cases	No cases	No cases
Guinea worm diseases	No cases	No cases	No cases	No cases	No cases	No cases
Measles	0.6	0.3	0.4	0.9	1.7	2.9
Malaria	2.2	1.3	1	2.1	2.4	1.6

Leprosy	**0.1**	**0.2**	**0.2**	**0.3**	**0.5**	**0.3**
Tuberculosis	**4.5**	**3.8**	**3.6**	**4.1**	**4.0**	**3.3**
Diarrhoeal diseases	**5.3**	**5.5**	**2.7**	**4.7**	**5.7**	**12.6**
Sexually Transmitted Diseases (includes AIDS)	**6.6**	**9.2**	**8.5**	**7.6**	**7.4**	**3.8**
Mortality indicators						
Crude death rate per 1000 population	**2.0**	**1.8**	**1.8**	**1.9**	**2.1**	**1.5**
Infant mortality rate per 1000 live Births	**8.7**	**10.7**	**8.6**	**8.2**	**8.1**	**7.5**
Children under 5 years mortality rate per 1000 live births	**10.2**	**12.4**	**10.4**	**10.4**	**10.7**	**9.1**
Maternal mortality rate per 100,000 live births	**No cases**	**23.3**	**7.6**	**22.4**	**7.1**	**31.9**
Perinatal mortality/ 1000 live births	**7.9**	**10.6**	**8.6**	**10.4**	**9.2**	**Not available**

(Adapted from Annual Abstract report the planning council, 2008)[150]

Figure 2.5 Registered deaths by sex and cause of death (ICD – 10 basic list) 2007



(Adapted from Annual Abstract report the planning council, 2008)[150]

2.2 Study design and approach

2.2.1 Study location and target population

This study was undertaken in the state of Qatar. The target population for this study was first grade government primary school children, aged 6 to 7 years; therefore the remainder of this discussion will focus on the government primary schools only.

The State of Qatar is divided into 5 districts for the purpose of schools and education. **District 1** (D1) is the capital city of the state of Qatar. Located on the Arabian Gulf, it had a population of 612707 in 2004 around 82.4% of the population being concentrated in the capital. **District 2** (D2) around Doha area, is located north of Doha city, with a population of 63046. **District 3** (D3) Alkhour area is located in the north east coast of Doha city and is home to many employees of the oil industry, with a population of 31547. **District 4 and 5** (D4 and D5) industrial area is located more than 80 kilometres from Doha city with a population of 17277 and 12674 respectively and were not included in this study.

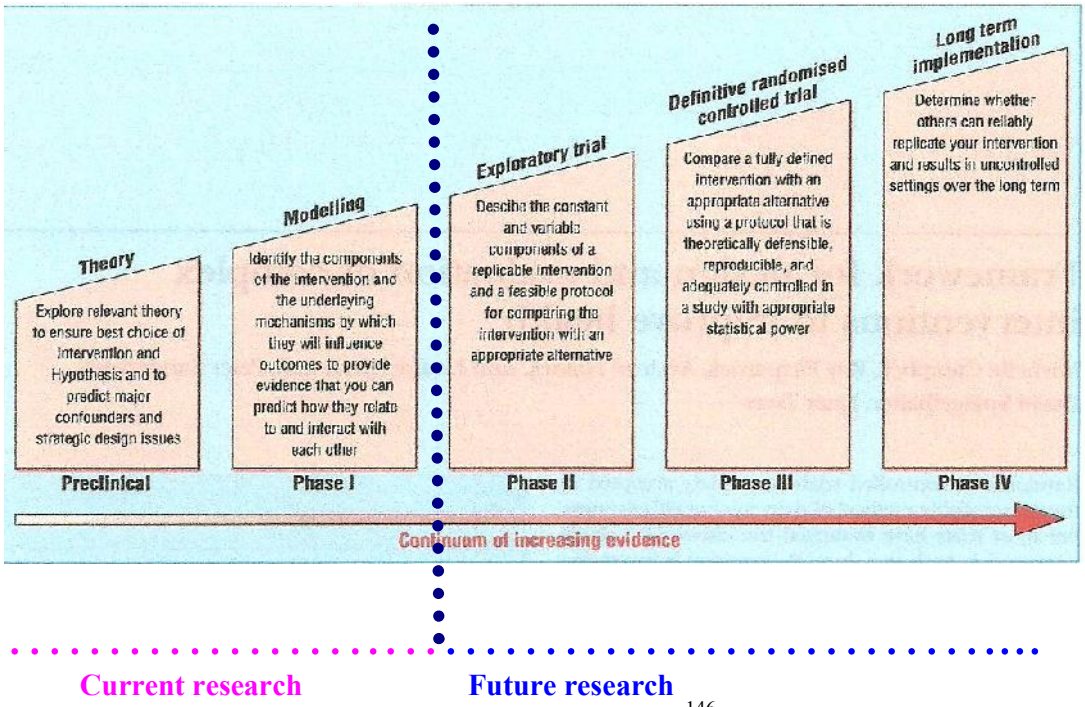
The number of children enrolled in primary schools at the time of starting this study was 33,127 of whom 31, 263 were in Doha district.[152]

Of the 99 governmental primary schools, 88 have students enrolled from the 1st grade. The remainder only enrol students from 3rd grade or above (age 9 or more).[152] The total number of students enrolled in the first grade during 2004/2005, when this study commenced, was 5,177.[152]

2.2.2 Overall design and approach

In this thesis, the development of a childhood obesity prevention programme targeting 6-7 years old children in the state of Qatar is described using the theoretical and modelling phases of the Medical Research Council (MRC) framework for complex interventions (**Figure 2.6**).[146;153]

Figure 2.6 Sequential phases of developing randomized controlled trials of complex interventions [146]



"Adapted from Campbell et al, BMJ 2000;321:694-696"[146]

The Medical Research Council (MRC) proposed a framework to guide identification, development, and evaluation of complex interventions.[153] Complex interventions include a number of independent components that can be applied in a range of settings including the community, schools, and health services.

The framework consists of five phases (Figure 2.6) and distinguishes between several distinct phases, analogous to the phases of development of a drug, ranging from theory (pre-clinical), modelling (phase I), exploratory trial (phase II), definitive randomized controlled trial (phase III), to long-term implementation (phase IV) [146] which examines the implementation of the intervention, practicality and stability of intervention.[138;146] The MRC has recently refined the framework to reflect the response to identified limitations of the frameworks. [154]

Previously interventions targeted at obesity have focused on behavioural programs to increase physical activity and reduce calorie intake. But the growth in the epidemic of obesity in recent years indicates that major changes in environmental factors are responsible at the population level. Interventions must therefore focus on the environment and how behavioural factors interact with the environment. Identifying and modifying the environmental contributors to obesity are likely to have a major impact on obesity prevention.

Swinburn has developed an environmental analysis framework ANGELO (Analysis Grid for Environments Linked to Obesity) which is a conceptual model for understanding the obesogenicity of environments and considered as a practical tool for prioritizing environmental elements for research and intervention. It is based on the ecological model for understanding obesity and has been proposed as appropriate for developing obesity prevention interventions.[95;155]

The ANGELO framework developed to identify and try to quantify the potential impact of environmental factors on the promotion of unhealthy weight gain. The framework includes a needs analysis, and a method for prioritizing components for intervention programs based on relevance and changeability (assessed by stakeholders) and validity (assessed by experts). It consists of five stages which all depend on stakeholder engagement: 1) identifying associated factors to obesity (obesogenicity element), 2) identifying important elements related to diet and physical activity, 3) determining the relevance of each factor, 4) select changeable elements, 5) ranking each factor by combining scores related to each element importance, relevance and changeability. [141;156] The framework has been applied in Australia and New Zealand, and shown to be a useful and effective instrument for needs analysis and problem identification. [141;156]

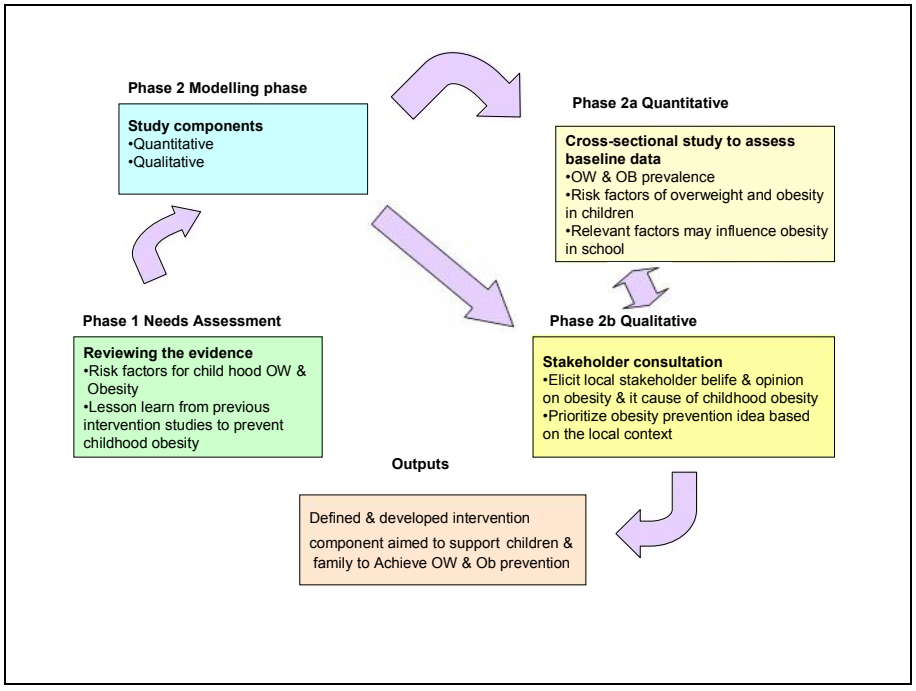
Mixed research methodology is not new. It is a new movement and research paradigm that combines elements from both qualitative and quantitative research methods to answer complex research questions.[157] It has historically been used in the social and behavioural or human sciences, and started with research and methodologists who belived that a combination of qantitative and qualitative view points and methods were usefull to address their research questions.[158]

Strauss and Corbin define grounded theory as "a non mathematical process of interpretation, carried out for the purpose of discovering concepts and relationships in raw data and then organising these into a theoretical explanatory scheme".[159] Glaser and Strasuss (1967) proposed a set of guidelines [159] for data analysis based on grounded theory from which to build explanatory framworks that illuminate

relationships between concepts. This framework is mainly used in qualitative research, but is also applicable to quantitative data.

The study described in this thesis was modelled on the Medical Research Council (MRC) framework for complex interventions, employed cross-sectional study designs and although the study setting was schools, factors both within and outside school were explored and identified. Evidence from the literature (pre-clinical phase) was combined with information obtained from key stakeholders in identifying environmental influences on obesity and in informing the intervention program (phase I) for preventing obesity in children that could be piloted in future (**Figure 2.7**).

Figure 2.7 Study design and component



Phase 1 reviewing the evidence and literature

A variety of methods was used to gather the appropriate information on childhood obesity, determinants of current children's behaviours related to eating and physical activity and potential interventions to prevent obesity in children. These included literature reviews, consulting local public health leads in obesity, and experts working on obesity research. In reviewing the evidence-base, the focus was to identify systematic review articles and guidelines on childhood obesity prevention. The Cochrane, MEDLINE and the national research database and reports were searched.

Phase 2 modelling phase

The study consisted of two distinct parts (quantitative and qualitative components) which are described briefly below:

a) Quantitative: Cross-sectional study using questionnaires to assess baseline levels and risk factors for overweight and obesity in children, and to describe relevant factors that may influence obesity in schools.

b) Qualitative: Focus groups were used to explore stakeholder views on obesity, participants perceptions of the causes of childhood obesity and potential components for a childhood obesity prevention intervention, as well as to allow better understanding of potential barriers and facilitators to behaviour change.

2.2.3 Quantitative methods

2.2.3.1 Sample size determination

A pragmatic approach to the sample size was taken, considering the available time and resources I had for my fieldwork. The sample size for this study was powered on identifying the prevalence of obesity (+/- 5%) among school age children in Qatar, with 95% confidence. The sample size was determined by using the following formula:

$$n = p(1-p)\left(\frac{z}{d}\right)^2$$

Where 'n' is the sample size, 'p' estimated prevalence in the target population, 'z, is the confidence interval and 'd' is the confidence coefficients (margin of error). Given that there are no previous studies of the prevalence of obesity in this age group in Qatar, a conservative estimate of 50% was used.

$$n = 0.5x(1-0.5)x\left(\frac{1.96}{0.05}\right)^2$$

$$n = 384.2$$

The computed sample size was therefore 385 pupils. In order to estimate prevalence in boys and girls separately, so we would need 385 of each sex (making sample size 770). We wished to allow for a 20% non-response, and so we targeted around 1000 children to make sure that sufficient questionnaires collected before summer holiday.

2.2.3.2 Subjects

All children enrolled in the first grade (age 6-7) in 2006/7 in the selected schools were eligible and included in the study.

2.2.3.3 Sampling technique

Sampling frame (districts and schools)

Districts 1 to 3 were selected as the majority of Qatari population are resident in these areas. Districts 4 and 5 are oil industry cities and the population differs from the rest of Qatar with many residents being non- Qatari. Participants were drawn from a random sample of primary schools in these districts.

Since the schools in Qatar are segregated, in each district equal numbers of boys' and girls' school were selected. The researcher generated a computerised random number table, which was used to select the 12 schools from all 78 primary schools from three districts (cluster) using an excel spread sheet. Selection took account of the number of schools in each district (see table 2.7) and attempted to identify school with roughly equal pupil numbers.

As a result, from the largest district (with 45 schools) 6 schools were selected, from the medium district (23 schools) 4 schools, and from the small districts (≤10 schools) 2 schools were selected. Then the population was further partitioned into smaller sub-populations (strata). In this case 3 strata of schools were assigned: small (≤ 35 students), medium (36- 70 students) and large (>70 students).

Table 2.7 Number of children and schools from each district included in study sample

Districts	No. of Schools (Pupils)		Total numbers
	Boys	Girls	
District I (Doha area)	3 (205)	3 (324)	6 (529)
District II (Around Doha area)	2 (155)	2 (172)	4 (327)
District III (Al-khor area)	1 (64)	1 (59)	2 (123)
Total	6 (424)	6 (555)	12 (979)

Sampling individual students

All children in year one (age 6-7 year) in the 12 selected schools (6 boys' and 6 girls' schools) were eligible and invited to participate in the study. Each eligible pupil was assigned a unique number. Selected children had an information sheet (the parent Questionnaire Appendix 4) including a consent form sent to their parents and information sheet filled in by relevant schools nurse (Health information questionnaire Appendix 3).

Of the 979 children invited 586 responses were received for parent questionnaire. The distribution of students in the sample was 43.3% boys and 56.7% girls. The distribution was similar to that mentioned by the ministry of education Annual report [152] which indicate that the reference population for boys and girls were 48.7% and 51.2% respectively.

2.2.3.4 Data collection instruments

Four questionnaires were used for the quantitative component of the research; in addition prompt sheets were developed for the focus groups work. The instruments,

their purpose and how they were developed are described below (a description of the focus group instruments is described later, as outlined in section 2.2.4.3.

2.2.3.4.1 Questionnaire components, development and reliability

Questionnaires were used to obtain school level information on health related policies and the availability and range of food services and individual level data on health, height and weight, and usual dietary intake and physical activity levels in participating children from these schools.

All questionnaires were designed for self completion. Where it possible, previously validated questionnaires were used, sometimes modified to make them more applicable to the Qatar community. **Table 2.8** summarises the source for questionnaires, the modifications, and more detail is discussed below in each section.

Table 2.8 Existing questionnaires that were used or amended for use in this study

Questionnaire	Form of administration	Target group	Languages in which available	Country of development and use	Components and Comments	How instrument used in this study
School food and physical activity survey[141]	Self completion	Primary schools	English	New Zealand	3 sections : **-1st part** - related to school food and physical activity policies, food service, physical education and activity **-2nd part** - related to school food service, and food sales **-3rd part** - related to teachers' personal rating and judgments about the effectiveness of policies at their school	**-1st part:** 7 questions excluded as not relevant to Qatar. 18 questions included with minor changes to wording based on our setting e.g. year of study,(supply with extra added Question from part 3) **-2nd part:** 3 questions excluded as no vending machines in Qatari schools, 9 questions Included with minor changes e.g. food types changed (sausage replaced by pastries, sport drink by Pepsi), or expanded choice of responses ,(supply with extra added Question from part 3) **-3rd part:** excluded but 7 questions chosen as relevant 1 question [rating agreement on nutritional value of schools food] taken and added to part 2 6 questions [3 related to healthy eating policies and 3 related to sport and physical activity policy] taken and added to part 1
IPAQ International Physical Activity Questionnaire	Telephone/ interview and self administered. Short and long versions	15-69 years	Multiple languages (around 22) including Arabic and	Several including Saudi Arabia	**Short version:** Derive scores for duration (minutes) and frequency (days) of walking, moderate intensity and vigorous intensity activity **for the last 7**	**S**hort form used supplemented with 3 questions taken from long version - number of days spent travel in motor vehicle - time spent on one of those days

[160]			English		**days**. In addition one question about time spent sitting on weekdays. [limited as no measure of other sedentary and sleep activity] **Long version:** structured to provide separate domain specific (work, transportation, domestic and gardening, and leisure time) scores for walking, moderate and vigorous intensity activity [long and detailed questionnaire suitable for adult age groups]	travelling in motor vehicle (hours or minute per day) - time spent sitting on a weekend And two additional questions: - time spent sleeping on weekday - time spent sleeping weekend day
NCI Fruit and Vegetable Screener [161]	Self report	adult	English	Applied in 6 international centres	Measures frequency of dietary intake of fruit and vegetable over the last month	Used with following changes: - frequency over last week instead of month - Questions re-ordered to more meaningful groups of foods - Question on white potato consumption removed, as it is not a dietary staple - Question on tomato sauce consumption replaced with pasta consumption - Amount of juice drunk modified to cups instead of ounces to make it easier for responders
NCI Fat Screener [162]	Self report	adult	English	Applied in 6 international centres	Measure of fatty food intake over the last month	Used with following changes: - frequency over last week instead of month - Questions re-ordered to more meaningful groups of foods - Questions asking about pork, sausage or bacon consumption removed - Questions asking about orange juice and fruit removed as it is already included from the fruit and vegetable screener

						- Question on beef or pork hot dogs consumption replaced with 3 question, frequency and amount of eating fish, chicken and meat - Question added about number of time eating fast food, chocolate specify what was eaten, no. of time eating crisps - Question added about drink screener includes sweetened drink and bicarbonate drink frequency and amount

The first two questionnaires were designed to collect school level data and the third and fourth individual level data on individual children in primary schools. The questionnaires were first drafted in English, and then were formally translated into Arabic using an approach based on that recommended by the WHO for the development of cross-cultural measures.[163;164] Each questionnaire was initially translated into Arabic by 2 people; a bilingual researcher (myself) and a medical secretary. To ensure the accuracy of translation the Arabic version of the questionnaire was pilot tested with 3 people with different levels of education from the Qatar community for language accuracy, clarity, ease of comprehension and semantic equivalence. These 3 people came to a general consensus as to whether any amendments were needed to be made to the original translation. Minor changes were made in the wording to clarify the semantics in the Arabic version. Once a translation was deemed to be acceptable then the questionnaires were independently back translated in to English to enhance translation equivalence. The back translated version of the questionnaire version was then compared to the original English version of the questionnaire. All translations were found to be grammatically and semantically equivalent. Translated versions are shown in **appendix 1-4**.

2.2.3.4.1.1 *School level data collection*

Questionnaire 1 (**Appendix 1**) was a 24 item questionnaire addressing school policies related to food and physical activity. This was sent to the school principal at each school and they were asked to complete it. **Questionnaire 2** (**Appendix 2**) was a 10 item questionnaire asking about the availability and price of foods sold in school. This was sent to canteen managers at each school, who were asked to complete it.

Both of these questionnaires were based on a school environments questionnaire developed and used by Carter and Swinburn in New-Zealand primary schools [141]. The original instrument aimed to identify and measure the obesogenic elements of the school environment. However some of the questions were modified to be more suitable to Qatar (see **Table 2.8** for the modifications).

2.2.3.4.1.2 Health information questionnaire

Questionnaire 3 (**Appendix 3**) was used to obtain data on the height, weight, medical history and medication use of all children included in the study. This data is routinely collected at school entry by school nurses (see chapter 2, section 2.1). School nurses were asked to provide this data for each of the participating at the first grade children.

2.2.3.4.1.3 Parents questionnaire formation and development

Questionnaire 4 (the parent questionnaire) (**Appendix 4**) had three parts. The first enquired about socio-demographic characteristics of the parents, family composition and information on the height and weight of all family members. The second part enquired into the dietary habits of the child, and included a food frequency questionnaire related to the study child. The final section was used to obtain parent reported physical activity levels (including type and range of activities) for the study child. This was sent to the parents through schools and they were asked to complete it.

A large number of questionnaires are available and have been used to estimate diet and physical activity levels in children in various parts of the world. However there is no consensus on the best approach.[165] There are also social and cultural issues affecting the validity of a specific instrument for populations other than the one they were developed for.[165;166] Dietary and physical activity questionnaires are unreliable

when completed by children age 6-7 because of the cognitive immaturity and difficulty recalling past events.[166-168] Therefore in this study we used parent reported instruments to assess diet and physical activity levels. For more detail about questionnaire formation and development see (**Table 2.8),** this summarises the source for questionnaires, and more detail is discussed below in each section:

Dietary assessment

There is no ideal and simple method to assess general dietary habit in large populations of children. In Qatar an added difficulty is that estimates of portion size are complicated by several family members eating from the same plate. The main dietary assessment approaches used in large epidemiological studies include:

- Food frequency questionnaires (FFQ) measure usual food intake. The respondent is asked to report the frequency of consumption (and sometimes portion size) of each of a list of foods and drinks, over a specific time period (e.g. over the last week). Although this is considered a practical and economic way to collect information for large numbers of individuals, it has been shown to overestimate intake in children and is not useful for determining individual differences in energy requirement.[169] This instrument has low costs and is easy to administer [165] for population studies, but reliability studies showed overestimated energy intake.[166]

- 24 hour recall estimates actual intake over the previous day, with detailed description of food, and portion size consumed. However it has been shown to underestimate energy intake [166], have high cost, response bias and need highly trained staff for administration.[165]

- Food records are written accounts of actual intake of food and beverage during a specific time period (e.g. 3 or 7 days), but this also tends to underestimate energy intake [166] it covered limited area of nutrition knowledge and were not suitable for use with adolescent sample.[165] In addition studies using a weeks food record may not capture seasonal variation in diet.[166]

- Weighed food records may provide an accurate estimate of energy intake but this technique is not practical in implementation for large populations.[170]

Mainly for pragmatic reasons, for this study the decision was made to use a 22 item food frequency questionnaire (FFQ), completed by the children's main carer (usually mothers), as this was the most practical approach- although it overestimates, we do not expect it to overestimate more in particular groups- so bias was not likely.[166] The National Cancer Institute (NCI) Fat Screener and Fruit and Vegetable Screener were the main source for the FFQ for the dietary intake, adapted to include more food items which are relevant to the diet of Qatari children See **Table 2.8** for more details.[161;162]

Physical activity assessment

Reliable and valid assessment of physical activity is a challenge. Subjective measures (questionnaires) are easy to administer and have low cost compared to relatively more accurate objective measures, such as accelerometry, and are therefore commonly used.[32;167]

Among the available questionnaires, the International Physical Activity Questionnaire (IPAQ) is most widely used[160;171], and its validity and reliability have been tested in

12 countries, including an Arabic version.[172] In addition the IPAQ allows the calculation of energy expenditure in Metabolic Equivalents (MET) and the duration of vigorous, moderate, and walking activity per week. For this study, parents were asked to report on their children's level of physical activity based on the short Arabic version of IPAQ. This was supplemented by a small number of additional questions (see **Table 2.8**).

2.2.3.4.2 Questionnaires administration

All the schools were requested to appoint a co-ordinator to whom all the questionnaires were hand-delivered. The co-ordinator was responsible to send the questionnaires to the school principal, the canteen manager, and the school nurse. In addition, class-room teachers were provided with the parental questionnaire, and were responsible for the distribution and collection of questionnaire from the students over 2 to 4 weeks.

Follow up for the progress of data collection was done on weekly basis. A reminder was sent every two weeks, and additional copies of questionnaires were provided as necessary. To collect the questionnaire 2 to 5 visits were made to each school.

2.2.3.5 Pilot study

A pilot study was carried out before commencing the main study where the field work was assessed. Accordingly changes were made to the study instruments in which some questions were excluded, and the scheduled time for receiving back questionnaires was extended.

For the pilot study two primary schools (1 boys' school and 1 girls' school) and 20 parents not involved in the main study were selected to test the questionnaire design, content, and language at the study sites. The time taken for administering and liaising with the school, as well as the time it took to have the questionnaires returned were noted.

After completing the questionnaires, participants were interviewed by the researcher either in person (for school principals, canteen managers and schools nurses), or by telephone (for parents). They were asked about ease of completion and any questions that were difficult to understand, as well as the time it took to complete the questionnaire. As a result, minor changes (described below) were made to the questionnaires to improve comprehension and ability to respond.

The **school level questionnaire** was initially a single questionnaire sent to the school principals. However, based on their comments, this questionnaire was split into two parts, one to be completed by the principal, and one to be sent for completion to school canteen managers. The questions were also slightly modified, by taking out questions on vending machines (as these are apparently forbidden in school), and some of the food items were changed to reflect what was actually available in a typical school in Qatar, rather than those in the original questionnaire.

The **health information questionnaire,** completed by school nurses was not modified other than the addition of blood pressure measurement, as this is routinely measured at school entry and available in the student health records.

The **parent questionnaire** initially included a 24-hour diary of physical activity and dietary intake, as well as the food frequency questionnaire (FFQ) and IPAQ. However, the diaries were not completed by any of the 20 parents in the pilot study. On the other hand all the other questions were completed well, including the FFQ. Subsequent telephone interview with 19 out of the 20 mothers suggested that they felt the questionnaire was very long and something they had not previously done. The main criticism was around the physical activity questions, as many felt they did not know how much time their child spent on different types of activity because they are either working or someone else helps to look after the child in the home. They all commented that the diet and physical activity diary was too much and they had no time to complete these. One mother commented that during the week of the questionnaire, her child did not eat any fast food, fish, or some other types of food, although normally he would have eaten them frequently and eats fast food once every 2 months.

Slight modifications to the wording of some questions were therefore made to help in understanding them. The time given for returning questionnaires was also extended from one to two weeks, as this was something mothers had commented on. The diet and physical activity diaries were taken out of the main questionnaire, but these were retained and administered to pupils from two of the schools (1 boy and 1 girl school) only, along with the main questionnaire, to be used for validation.

2.2.3.5.1 Validity and reliability of parent questionnaire instrument

Validity - for the FFQ and physical activity questionnaire we planned to validate against the 1 day dietary and physical activity dairy. However, unfortunately even

during the main study this was unsuccessful and none of the diaries were filled out or returned. Therefore it was not possible to undertake this component. Though original questionnaire was validated, however, questionnaires was checked, participants were interviewed by the researcher either in person (for school principals, canteen managers and schools nurses), or by telephone (for parents).

Reliability **-** The initial plan was to conduct a telephone interview with a sample of parents within 2-4 weeks of the questionnaires being returned to repeat the questions and check against the original responses. However, delays in getting official approval to conduct the study, and the longer than expected time for getting questionnaires back prevented this happening to the extent planned. Nevertheless, within 4-8 weeks of receiving questionnaires back, 10% of responders (n=58) were randomly chosen and contacted. Ten questions, five from variables that should remain stable (mothers highest education, family income, child order in the family, child mean meal, and mother opinion about her child weight) and five that may be affected by time, (frequency of eating chicken, fast food, fruit, frequency of practice moderate physical activity, and time child spend sitting on a weekend) (**Appendix 6**) were chosen and the parents were asked these questions on the telephone. The responses were compared to the original response on the written questionnaire.

2.2.3.5.2 Data analysis for the pilot study

Data from all the questionnaires were entered directly onto the SPSS 12 (Statistical Packages for Social Sciences version 12) software programme [173]. Statistical significance was accepted at $p<0.05$. Scores from original and repeated questions were compared.

Cronbach's alpha and the temporal stability measures Spearman rho coefficient was computed to assess the internal consistency for the selected 10 questions computed between the two administrations (test and retest). Inter-class correlation (ICC) was used to determine test-retest reliability at the individual level, stability over time and to assess absolute agreement between scores from the two measures. The Spearman rho coefficient was used to assess test-retest reliability at the group level. Relative validity was not tested as 1 day diaries were not returned.

Table 2.9 Test–retest reliability and mean values for measures for the 10 variables included in the repeat test

Question	Mean scores		Interclass correlation (Spearman's rho)	internal reliability (Cronbach's alpha) [95% CI]
	Original	Re-test		
Mother's education	2.60	2.64	0.95**	0.97 [0.95-0.98]
Order of child in family	3.43	3.62	0.90**	0.90 [0.84-0.94]
Monthly income	3.64	3.81	0.79**	0.89 [0.81-0.93]
Child's main meals	2.91	3.88	0.25**	0.45 [0.06-0.67]
Mother's opinion of child's weight	1.55	1.64	0.66**	0.75 [0.58-0.85]
Dietary Intake				
Chicken	3.52	3.36	0.21	0.20 [0.34-0.52]
Fruit	3.64	3.07	0.33*	0.46 [0.09-0.68]
Fast food	2.07	1.55	0.21	0.48 [0.12-0.69]
Physical Activity				
Days/week moderate PA	5.49	6.50	-0.00	0.07 [0.59-0.45]
Time sitting at weekend	4.19	4.01	0.05	0.42 [0.20-0.72]

**.Correlation is significant at the 0.01 level
*.Correlation is significant at the 0.05 level

The results are shown in (**Table 2.9**). Cronbach's alpha ranged from 0.42 to 0.97 for 8/10 variables [ranged from 0.42 to 0.48 for 4/10 variables (average scale); 0.75 on one variable (adequate scale); 0.89 to 0.97 for 3/10 variables (good scale)]. The

variables dietary intake of chicken and duration of moderate physical activity scores have scored less than 0.4 indicated poor internal consistency. However these two variables provide a measure of 'usual' habits and the questions were asked in different time periods (the time interval 4-8 week). Interclass correlation (ICC) Spearman's rho test shows the reliability range from minimum -0.00 to maximum 0.95 indicated good temporal stability of 4 out of 10 variables, and the reminder 6 variables was un acceptable reliability. Spearman's rho test found no evidence of a difference between means ($P>0.05$) for 4 out of 10 scores during the two time periods. It is therefore expected that correlation would be at best moderate as it is possible to obtain considerably different estimate depending on the time interval taken. The shorter the time gap, the higher the correlation; the longer the time gap, the lower the correlation. In conclusion from the 10 variables, only mother's education level, order of the child in the family, house hold income and opinion on child's weight gave out an acceptable reliability and high correlation coefficient. The result of retest differed considerably from the first test conducted excepts for these 4 variable mentioned above.

2.2.3.6 Anthropometrics measurements

The weight and height measurements for all children are undertaken at PHC centres by trained school nurses, during the pre school entry physical examination which takes place within 4 - 6 weeks between April and May each year. All personnel undertaking measures are trained through the Mother and Child Health Section at PHC as in-service training and this should minimise measure variation. The Seca E.S.M.E. 506 weighing scales are used for all weight measurements, and both height and weight measures are taken according to standardised instrument and prescribed protocols (**Appendix 7**).

2.2.3.7 Ethical issues

The study took into consideration the basic principles of biomedical ethics for the participant individuals and the community. Written informed consent was obtained from all participating school principals, school canteen managers, school nurses, parents (mothers or fathers), and focus groups participants (**Appendix 5**). Written explanation as well as verbal explanation was given to participants where it possible to help them understand the study and how data would be used. Also, they were informed about their rights to withdraw at any time during the study. All information given was treated as confidential. Each questionnaire was coded with a serial number to enable linkage in the analysis. Ethical permission for the study was obtained from the University of Birmingham (UK), and from the Higher Education Ministry of education (State of Qatar). Permission was also obtained from the principals of the twelve schools participating in the project.

2.2.3.8 Data analysis for the main study

The data was processed and analyzed by the Statistical Packages for Social Sciences (SPSS) version 12 software programme [173] using a personal computer between June 2007 and February 2008. Data entry was checked by examining frequency tables. Descriptive analyses were used to describe the prevalence of overweight and obesity, as well as the range of dietary and physical activity levels. Bivariate analyses (chi-squared and t-tests) were used to compare variables. Logistic regression analysis was carried with overweight/ obesity vs. non obese as the outcome to evaluate the effect of different factors on the risk of obesity. All analysis was at individual level, as there were insufficient schools for cluster analysis. Nevertheless, "school" was entered as a variable within the analysis, and adjusted for as a random effect. These are detailed below.

2.2.3.8.1 Baseline data

Information on age (date of birth), sex, nationality, number of siblings, order of the child in the family, number of people living in the same house, and weight and height for all the family members were collected.

2.2.3.8.2 Age

An exact age was calculated by the difference between the date of data collection [weight and height measurements at PHC] and the date of birth.

2.2.3.8.3 Socio-economic status

As there is no equivalent of a social class classification system in Qatar, educational level and family monthly income was used as a proxy of socio-economic status. In

this study, highest attained educational level was categorised as illiterate, primary certificate, preparatory certificate, secondary certificate, University certificate, and post graduate certificate. However, for analysis education level was grouped into low education level (illiterate and primary certificate), medium education level (preparatory and secondary certificate), and high education level (University and post graduate certificate). Occupation was grouped into working and not working. The family monthly income was categorized as <3000 QR, 3000 -5999 QR, 6000 – 11999 QR, 12000 – 24999 QR, and ≥ 25000 QR. However, for most analyses family monthly income was categorised as: low income (<12000 QR), medium income (12000-24999QR), and high income (≥25000QR).

2.2.3.8.4 Body mass index assessments (BMI)

The body mass index (BMI) was calculated using the formula weight (kg) divided by height (m^2). BMI values were categorised into 4 groups (Underweight, Normal weight, at risk of overweight, Overweight) based on cut off values derived from age and sex specific growth charts used by the CDC. (See **Box 2.1**).

Box 2.1 Weight status categories

Weight status category	**Percentile range**
Underweight	Less than 5^{th} percentile
Normal weight	5^{th} percentile to less than the 85^{th} percentile
At risk of overweight	85^{th} to less than 95^{th} percentile
Overweight	Equal to or greater than the 95^{th} percentile

(Weight status categories based on growth chart tables from CDC 2002)

Currently there are no BMI growth charts for the Qatar population. Health and medical authorities recommend the use of the United State Centres for Disease

Control and Prevention (CDC) growth chart, developed by the National Centre for Health Statistics in collaboration the National Centre for Chronic Disease Prevention and Health Promotion 2000. Therefore the analysis will focus on the BMI level based on CDC cut-offs to make it easier to compare with national level data and studies.

However, for comparison, the proportion of children assigned to each of the BMI categories according to three different definitions (CDC, WHO and IOTF) were contrasted. In order to determine agreement among the 3 definitions Cohen's kappa test was applied. Comparison between references (CDC and WHO, and for the CDC and IOTF reference value) were performed for the weight status for the total population by gender.

For some of the analyses in chapter 3 weight status was collapsed into two categories, combining underweight and normal weight (1) and overweight and obese (2). In the analysis of the prevalence of overweight and obesity , the following variable were considered sex, nationality, parents education level, family income level, and school district level.

2.2.3.8.5 Parents' perceptions of their child's weight status

Parents were asked about their child's weight status, which was categorized as underweight, normal weight, and overweight and obesity. In addition they were asked about their beliefs about reasons for their child's overweight and obesity.

2.2.3.8.6 Dietary habit assessments

Information on pattern of feeding during infancy period were collected which was categorised as breastfeeding, formula feeding, and mixed feeding; in addition data on the duration of breast feeding were collected. The parents were asked about the source of food consumption during school time, and home dietary customs (eating from a plate separate from the rest of the family or sharing a single plate with the rest of family).

The dietary intake was estimated based on the FFQ and is presented as food groups rather than trying to calculate calorie intake. In this study the frequency of consumption was categorised as never, 1-2 time per week, 3-4 times per week, 5-6 times per week, and one or more per days. For data presentation purposes, the food items was group as follow: **(I) animal protein** (red meat, chicken, fish, and egg), **(II) dairy product** (milk and cheese), **(III) carbohydrate** (bread, rice, cereal, and pasta), **(IV) fruit and vegetable** (fruit, vegetable and fresh fruit juice), **(V) unhealthy food** (fried potato chips, fast food meals, crisps, sweetened beverage, and confectionery).

2.2.3.8.6.1 Healthy food consumption patterns

The food consumption pattern from the FFQ was compared against current healthy eating recommendations (US dietary food guideline 2005 table 3 (P12) and table A1 (P 51-52)) [174] (**table 2.10**). The results were used to classify individuals into three groups: high, ideal, and low healthy food consumers, based on these criteria (**Box 2.2**).

Scores were assigned according to frequency and amount consumed for each of the following food items: (i) red meat, chicken, fish and egg for animal protein; (ii) milk and cheese for dairy products; (iii) cereal, bread, rice and pasta for carbohydrates; (iv) green salad, mixture of vegetables; and vegetable soup for vegetables, (v) fresh fruit juice; fruit for fruit; (vi) any 5 of (iv) or (v) for "5 portions fruit and vegetables". The cumulative scores for animal protein, dairy product, carbohydrate, vegetable, fruit and vegetable and fruit were then assigned to high, ideal and low food intake (**see box 2.2**).

Box 2.2 Scoring criteria for food consumption

1. **Low food intake:**
   - no consumption OR
   - Some consumption reported but not enough to meet categories 2 or 3.
2. **Ideal food intake:**
   - Consumes recommended frequency and amount according to guideline (**Table 2.10**)
3. **High food intake:**
   - Higher food consumption than the ideal recommended in the guidelines.

Table 2.10 Child Food guideline (US dietary food guideline 2005) recommended daily intakes for children [174]

Food groups	Subgroup	Recommended daily serving	Equivalent amounts
Animal protein	Red meat, chicken, fish, and egg	3-4 ounce per day [2serving/day]	1 ounce equivalent to: - 1 ounce cooked lean meats, poultry and fish. - 1 egg - 1/4 cup cooked dry bean
Dairy product	Milk and cheese	2 cups of milk [2serving/day]	1 cup equivalent to: - 1 cup (250ml) milk or yogurt - 1 ½ ounce cheese (50gm) = 2 slices hard cheese - 2 ounce processed cheese
Carbohydrate	cereal, bread, rice and pasta	4-5 ounce per day [6 serving/day]	1 ounce equivalent to: - 1 slice bread (35 gm) - 1 cup of dried cereal - 1/2 cup of cooked rice, pasta and cereal (30gm)
Vegetable	green salad, mixture of vegetable; vegetable soup and beans	2.5 cups [5 serving] / per day]	1/2 cup equivalent to: - 1/2 cup of cut up raw cooked vegetable - 1 cup (250ml)raw leafy vegetable - 1/2 cup (125ml) vegetable juice
Fruit	fresh fruit juice; fruit	2 cups [4 serving] / per day	1/2 cup equivalent to: - 1/2 cup of fresh, frozen or canned fruit - 1 medium fruit - 1/4 cup dried fruit - 1/2 cup fruit juice

(Taken from US dietary food guideline 2005 table 3 (P12) and table A1 (P 51-52)) [174]

NB. Beans excluded from calculation as it was not clearly stated in the questionnaire whether cooked or dried beans were referred to.

2.2.3.8.6.2 Unhealthy food consumption patterns

In addition, each child was assigned an unhealthy food consumption score, based on the frequency and amount of consumption of the following foods: (i) sweetened and

carbonated drinks for sweetened beverages; (ii) fast food meals, hamburger and chips for fast food; (iii) crisps; (v) sweets, chocolate, and ice-cream for confectionery and were then assigned to high, moderate and low food intake (**see Table 2.11**).

Table 2.11 Scoring criteria for unhealthy food consumption:

Food groups	**Subgroup**	**Scoring criteria for food consumption**
Sweetened beverages	sweetened drinks carbonated drinks	Low intake (0-<1cup) per day Moderate intake (1-<3 cups) per day High intake (3 cups or more) per day
Fast food	fast food meals hamburger , sausage fried potato chips	No intake per week Moderate intake (1-4 times) per week High intake (5 or more) per week
Confectionery	sweets chocolate ice-cream	No intake per week Moderate intake (1-4 times) per week High intake (5 or more) per week
Crisps	Crisps	No intake per week Moderate intake (1-4 packs) per week High intake (5 packs or more) per week

2.2.3.8.7 Physical activity and sedentary behaviours assessments

Parents were asked to report their child's specific types of activity undertaken in the leisure time (walking, moderate intensity activity and vigorous intensity activity); their frequency (measured in days per week) and their duration (time per day).

Responses to the physical activity questions were used to categorise individuals into low, moderate or high levels of activity, according to the International Physical Activity Questionnaire (IPAQ) scoring protocol ([171] www.ipaq.ki.se http://www.ipaq.ki.se/scoring.pdf.) Similarly metabolic energy turnover (MET) minutes per week were calculated, using the scoring protocol formulae ([171] www.ipaq.ki.se http://www.ipaq.ki.se/scoring.pdf (see **Box 2.3**), based on average MET scores for each type of activity.

Box 2.3 Scoring protocol for the short version of IPAQ:

1- Low physical Activity:

- No activity is reported **OR**
- Some activity is reported but not enough to meet categories 2 or 3.

2- Moderate physical Activity:

Either one of the following 3 criteria

- 3 or more days of vigorous activity of at least 20 minutes per day **OR**
- 5 or more days of moderate intensity activity and / or walking of at lest 30 minutes per day **OR**
- 5 or more days of any combination of walking, moderate intensity or vigorous intensity activities achieving a minimum or at least 600 MET-minutes/week.

3- High physical Activity:

Any one of the following 2 criteria

- Vigorous intensity activity on at least 3 days and accumulating at least 1500 MET-minute/week **OR**
- 7 or more days of any combination of walking, moderate or vigorous intensity activity accumulating at least 3000 MET-minutes/week.

Formula for computation of MET-minutes/week:

Walking MET-minutes/week = 3.3 * walking minutes * walking days

Moderate MET-minutes/week = 4.0 * moderate-intensity activity minutes * moderate days

Vigorous MET-minutes/week = 8.0 * vigorous-intensity activity minutes * vigorous-intensity days

Total physical activity MET-minutes/week = sum of Walking + Moderate + Vigorous MET minutes/ week scores.

Responses to the frequency and duration their child habitual weekday and weekend day sedentary [sitting] time (that included time spend watching television, video, use computer for playing game, and writing home work), and time spend sleeping on weekday and weekend. Data were presented as median and interquartile range.

2.2.3.8.8 Obesity risk factors

In order to assess the risk factors for obesity multivariate analyses, using logistic regression was undertaken. The models were used to evaluate the relationship between overweight and obesity vs. not obese as the outcome variable, and backward stepwise regression was undertaken, including variables that have been shown to be important risk factors for obesity in previous studies, or were implicated as potentially important in the previous analyses in this study. Variables that were found to be associated with weight status statistically from the previous analyses (with $p<0.1$) were included in the models. These variables included socio-economic factors, dietary intake, physical activity, sedentary and sleeping duration. The Odd Ratios (OR) together with their 95% Confidence Intervals (CI) were computed for each factor. The likelihood ratio test statistic for the model was significant at the 0.05 level.

Models were built sequentially, substituting variables at each stage, with the final model including all the variables. Model 1 includes gender, nationality, and school districts. These variables were included in all subsequent models. Socio-economic variables were added in model 2. In model 3 child pattern of feeding during infancy was added. For Model 4 dietary factors were included. In Models 5 and 6 children's physical activity level and sedentary and sleeping behaviour were sequentially included. Model 7 was the fully adjusted Model including all the above variables. Back ward stepwise regression analysis was used to eliminate variables until only variables significant at the $P <0.05$ level were left in the final model. The number of people included in the analyses reduced in each model because of limited data available. Substituting school district by “school” as a factor with in the models made no difference to the direction or size of effect.

2.2.3.8.9 Obesity risk

Responses to the parent questionnaires were used to assign children a risk category for obesity. The categorization was based on "The big five" scoring worksheet [175] developed by the American Medical Association Expert Committee on the assessment, prevention, and treatment of obesity. This tool can be used by physicians and families to identify five common behaviours ("The Big Five") that have been considered as causes of obesity. The scoring sheet was slightly modified to accommodate the questions used in this study (**see box 2.4**) in addition to scoring guide to calculate child total score.[175]

Box 2.4 Criteria for high risk of obesity

1-Sweetened beverages:
Sweetened beverages include sweetened fruit juice and punches, regular calorie soft drink, and chocolate or other flavoured milk. One serving of sweetened beverage is 12 oz = 11/2 cup = 375ml.

How many servings of sweetened beverage does your child consume in a typical day? (Round up any half servings to the next whole number of servings.)

1- No serving or less than 1 cup= 0
2- 1 - <2 cups= 5
3- 2 - <3 cups = 12.5
4- 3 cup or more = 20

2- Fast food (excluding sweetened beverages):
Traditional fast food (e.g. burger [with any type of meat], hot dogs, French fries, chicken nuggets, onion rings)

In a typical week, how often does your child eat traditional fast food?

1- One time or less = 0
2- 1-2 times per week = 5
3- 3-4 times per week = 12.5
4- Five or more times = 20

3- Family meals:
Eating dinner while supervised by at least one parents is protective against obesity.

How often does your child eat dinner with at least one parent during typical week?

1- One time or less =20
2- 2-3 times =10
3- 4-5 time = 5
4- 6 or 7 times =0

[All children scored 10 for this question, as it was not covered in the parent questionnaire]

4-Sitting time:

Sitting time defined as the amount of time your child spend watching television, using a computer, playing video games, sitting at a desk, visiting friends, reading, or lying down.

In a typical weekend days, how much total sitting time does your child have?

Less than one hour = 0

1-< 2 hours = 5

2-< 3 hours = 10

3- < 4 hours = 15

More than four hours = 20

5-habitual physical activity:

In a typical week, how many days does your child participate in physical activity (sports to the point of being out of breath) or, walking, riding a bike, etc., for at least 30 minutes total per day?

1- Zero or one day = 20
2- 2-3 days = 10
3- 4-5 days = 5
4- 6 or 7 days = 0

Total score……..

Scoring guide:

To calculate child total score, add up the scores, and then subtract that number from 100

80 to 100 points: Excellent. Child practicing healthy habits helps him to maintain healthy weight

60 to 79 points: Good. Good habits

40 to 60 points: Fair. Child needs to adopt healthy behaviours to maintain or achieve healthy weight

Less than 39 points: Poor. Child is at high risk of becoming obese or remaining obese

2.2.3.8.10 The school environment

Information on schools food service, availability and contents of school food was collected. School food and drinks sales were also collected as an index of foods eaten. Foods and drinks sold through the school food service were classified by the researcher as 'Main Choice' (pastries, sandwiches, pizza, croissant, sausage, hamburger, and French fries), Snacks (fruit, vegetable, cake, donuts, and custard), and Drinks (fresh juice, water, milk, sour milk (laban), and fizzy drink), and they were grouped into more healthy or less healthy foods. In additions, a foods and drink price list was requested from each school's food service, to compare price of healthy and unhealthy choices. Schools were asked whether they had a food policy, and if so, to rate their food policy's effectiveness in promoting healthy eating.

Information on each school's indoor and outdoor facilities for physical activity, and the availability and content of any physical activity policies (including information on the number of physical education/ sport lessons each week) was also collected.

2.2.3.8.11 Classification for assessing school at high risk for obesity

Schools were assessed in terms of their likely propensity for increasing the risk of obesity in their students on the basis of their responses to the study questionnaires (**Box 2.5**).

Box 2.5 Criteria for assessing school at high risk for obesity

1- School policies relating to promoting and supporting healthy eating at schools.

1. No = 0
2. yes, and include what foods are available in the canteen = 5
3. yes, and include the availability of drinking water for student = 5
4. yes, and include teaching food and nutrition in the curriculum = 5
5. yes, and include staff acting as role models for healthy eating = 5

Record total score …….. Out of 20

2- School policies relating to promoting and supporting physical activity at Schools

1. No = 0
2. yes, and include the use of the school ground out of the school hours = 5
3. yes, and include providing access to sport equipments out side of the formal sport pr physical education class = 5
4. yes, and include promoting cycling and walking to school = 5
5. yes, and include encouraging participation in sport or other activity programme (e.g. aerobic) = 5

Record total score …….. Out of 20

3- Were the following items of food or drink usually (usually means most day of the week) available from the school food service

1. Fruit = 5
2. vegetable or salad =5
3. milk , yogurt or sour milk =5
4. water = 5
5. not available = 0

Record total score …….. Out of 20

4- On average, how many physical activity sessions are available a week

1. Nil = 0
2. 1 session per week = 5
3. 2 session per week = 10
4. 3 session per week = 15

Record total score …….. Out of 15

5- Were their indoor and outdoor physical activity facilities

1. school had no indoor facilities = 0
2. school had indoor facilities =5
3. school had out door facilities = 5
4. student could not have access the school out door facilities at any time out side school hours (weekend and holiday) =0
5. student could have access the school out door facilities at any time out side school hours (weekend and holiday) = 5

Record total score …….. Out of 15

6- Do staffs have the opportunity for professional development training regarding the health benefits of nutrition and physical activity

1. no = 0
2. yes = 10

Record total score …….. Out of 10

Scoring guide:

To calculate school total score, add up the scores,

80 to 100 points: Excellent. School practicing healthy habits helps children to maintain healthy weight and healthy habits.

60 to 79 points: Good. Good habits

40 to 60 points: Fair. School needs to adopt healthy behaviours to maintain or achieve healthy weight

Less than 39 points: Poor. Schools is at high risk of promoting students to becoming obese or remaining obese.

2.2.4 Qualitative Methods (Focus Group)

The focus groups were conducted to identify and prioritize appropriate measures and intervention for preventing obesity in Qatar community. The present study was a pragmatic study to address a specific question rather than pure qualitative research, but the procedure is more in line with the grounded theory approach.

Focus groups (FGs) are one of a number of qualitative study techniques which provide an opportunity to explore the opinions of stakeholder and also to provide an opportunity to engage the community in the process of intervention development. Furthermore, participants have the opportunity to discuss opinions and ideas with other stakeholder members and to explore differences and disagreements.

FG processes allow people to explore knowledge, experiences and to express and clarify their opinions better than what is conveyed in an interview.[176] FGs are particularly appropriate for studying sensitive issues and facilitates contribution of a range of community members. Furthermore, they tend to be more productive than interviews as participants are able to generate critical comments and they support each other in sharing common feeling and experiences between group members.

2.2.4.1 Identification of focus group participants

Participants were identified in order to get the full range of opinion from different schools and district areas. We used different identity groups, based on participants preference and to make it more comfortable atmosphere for discussion (some participants like nurses and canteen manager were disagrees to attend mixed identity group even from their own school).

The identity groups (G) taking part in focus group included:

G1- Schools canteen manager

G2- Teachers (science, sport and 'classroom' teachers)

G3- Mothers (mothers with different level of educations and from different schools who were involved in the study (filling in the parents questionnaires) and agree to participate in the focus group)

G4- Schools nurse

G5- Physician (paediatrician, community and family physician) and Local authority (representative from Hamad Medical Corporation, Ministry of Health, Ministry of Education and Super Supreme Council of Family Affairs)

Access to teachers was facilitated by the school principals. For Groups G1, G2 and G4 participants were selected from the individuals who were involved in the study in filling in the relevant questionnaires (questionnaire part (2) school food provision, or part (3) health information or part (4) parents' questionnaires) and who agreed to participate in the focus group discussion.

We were looking for 25—35 participants to enrol in the 5 focus groups (5-7 participants per focus groups). **Table 2.12** shows summary of response rate for the focus group: 51 candidates were invited to participate in the focus groups of whom 36 agreed to participate in the focus group discussions. However only 17 participants actually turned up and attended the focus groups discussion despite many attempts to increase number of participants in focus group including rearrangements for the session date, frequent call and SMS text message for reminding participants about session time.

Table 2.12 Summary of response rate for the focus groups

Groups	No. of participants invited	No. of participants confirm attendance	No. of participants show up at meeting
FG 1	7	6	3
FG 2	9	7	5
FG 3	11	8	3
FG 4	12	7	3
FG 5	12	8	3
Total	51	36	17

The composition of each focus group was between 3-5 participants. Participants were asked to fill in focus groups information sheet along with consent form (**Appendix 9**) to provide some basic information including age, sex, nationality, occupation and number of children they had (if applicable) .

2.2.4.2 Focus Group participants

All 17 participants were females. The majority were from Qatar (n=11), with the remaining from Palestine (n=2), Iran (n=2), Jordon (n=1), and Pakistan (n=1). The age varied from 24 to 41 years. Nine of the participants were mothers and their children number ranging from 2 to 6; and age ranging from 14 months to 20 years of age.

2.2.4.3 Focus group content

The purpose of the focus group work was to explore individual and environmental factors that contribute to the development of obesity in school children. Guidelines for discussions with these stakeholder groups included the following main components (see **Appendix 8** for focus group guide line):

- Explore understanding of obesity, overweight and childhood obesity.
- Explore perceptions of the reasons for increasing childhood obesity.
- What could be done about obesity particularly for Qatari population?
- Group to priorities interventions in terms of:
    - Importance.
    - Changeability.
- Group to identify a final list of 8 intervention components.

2.2.4.4 Focus group structure and process

Participants were briefed about the project through written information and through phone call where their agreement to attend session was obtained earlier before schedule meeting date. Formal written consents were obtained immediately before the beginning of the focus groups session (**Appendix 9**).

Two sessions were conducted for each stakeholder group. Each session lasted for 90 minutes. The two sessions were run in one day for the majority of the focus groups except for the teacher group where two sessions were run one week apart based on the participants preference. For groups that had 2 sessions in same day, a 15 minute break was added between sessions. All the focus group discussions were run in Arabic language except G4 where both Arabic and English (based on participants preference)

were used. The researcher facilitated all focus groups and was accompanied by an assistant (to enable the prioritization exercise to run smoothly). The researcher was introduced to FG participants as a student who would facilitate the focus group discussion as part of her research thesis requirement. All the focus group data were transcribed, reviewed and analysed by the researcher as will be discussed on the coming section.

- **Session 1:** the focus group began by a brief introduction to the research project before moving on to consider the first component and to allow them to explore understanding about obesity, overweight, and reasons for increasing childhood obesity and what could be done about it (see detailed procedure of the focus group in the focus group topic guide **Appendix 8**).

- **Session 2:** the second part of focus group session aimed to validate and refine the list of ideas that have been derived in session one. The researcher introduced further ideas on how we could prevent children obesity based on previous research studies (interventions from literature). Participants were asked to discuss these interventions along with their own suggested ideas, and to prioritize each intervention in terms of its importance (most successful or effective intervention) and its feasibility/ changeability (feasible intervention and most changeable intervention in the context of their local settings and communities). In addition, participants were asked to identify any barriers that would hinder the implementations of the interventions in the Qatar community. At the end of the session and building on the results of the

prioritization exercise, the participants were asked to identify their 'top' 8 interventions to prevent obesity in children.

2.2.4.5 Data analysis and presentation of finding

Focus group discussions were digitally recorded and transcribed verbatim and transcripts were reviewed by the facilitator (researcher). All transcripts were then checked for completeness and accuracy, and any relevant points from researcher's handwritten note (taken during the focus groups) were incorporated as field notes.

The transcripts were read several times and focus group audio recordings listened to repeatedly by the researcher. Focus group data on the beliefs and opinion on the causes of obesity and childhood obesity were analyzed thematically. Data were initially coded in emergent themes, and then common themes across groups were identified for the belief of causes of obesity (Table 2.13).

Table 2.13 Thematic coding framework relating to beliefs on causes of childhood obesity, generated from analysis of the stakeholder focus group data.

Main themes emerge from group discussion	Range of issue discussed by group	No. of group selected influence
Dietary habit	Unhealthy food	5
	Easy access to unhealthy food and food marketing	4
	Portion size	5
	Cooking practice	4
	Child preference	3
	Eating in front TV	4
	Cultural influence	5
Physical activity	Reduce physical activity in general	5
	Culture influence and gender difference	2
	Facilities	2
	Lack of exercise in school	5
	Changing life style	4
	Safety	5
Family	Parents roles	5
	Mother role	5
	Father roles	3
	Lack of awareness, knowledge and responsibility for parents	3
	Other family member (role module)	3
Schools	Reduce physical activity level	5
	School food provision	5
Community	Changing life style	5
	Lack of health awareness	3
	Deficiency of recreation centre and sport club	2
	Traditional believe and culture	5
Medical condition	Disease, genetic and hormonal problem	4
Geographic	Climate	3

A different analytical technique was undertaken to examine the data on intervention ideas and prioritization. Process was coded in a more structural way using a framework developed at the beginning of the analysis (**Table2.14**). Interventions were

identified and those prioritised as important, practical, and those that were prioritized as in the final list were extracted from the transcripts.

This analysis approach was more structure than most qualitative analytical techniques, but it is recognized as appropriate approach for analysis when applied on qualitative research.[177] Focus group processes with participant prioritization has been used successfully elsewhere. [156;178;179]

The responses were collated under the appropriate research questions (basic topic area based on the focus group guide) for ease of coding. An analysis was undertaken to identify major emerging themes based on questions underpinning the research. Once major themes had been identified, sub-thematic categories were identified and coded, permitting cross-group comparisons. In conclusions intervention data from the different FG was collated for the different intervention setting and categories.

Table 2.14 Framework for analysis of the stakeholder focus group data relating to childhood obesity prevention

Setting	Intervention component	Example of intervention suggested by participants	Group ranking			Barrier identified for intervention implementation	Facilitators identified for intervention implementation
			Prioritized as important intervention list	Prioritized as changeable and practical intervention list	Final priority list Top 8 intervention		
Family							
Schools							
Schools food provision							
Community							

2.2.4.6 Validity reliability

To test the validity of the researcher's coding of these, a comparative analysis was undertaken whereby one of the Supervisors analysed one of the focus groups using a transcript that had been translated into English. The themes identified by the Research Student and the supervisor were almost identical with only minor differences. However, it was felt that some of the nuances and meanings were lost with translation from the Arabic to the English. Therefore, decision was made to carry out analysis for all scripts in the Arabic language. However for the purposes of presentation in this thesis, any quotation used will be in the English translation.

2.2.5 Time frame

September 2005 – July 2006:

-Situation analysis for research place.

-Planning and preparing research instrument, translation to Arabic language.

-Applying for the official approval for conducting research at schools setting.

September 2006 – November 2007:

-Pilot study for the research instruments.

-Implementation for the research plan, including environmental analysis and data -collection through questionnaire and focus groups discussion.

-Starting data entry.

December 2007 – September 2010:

-Complete data entry.

-Focus group transcript

-Data analysis; and development of the intervention

-writing up.

2.2.6 Researcher contribution to study components presented in thesis

1. Arrangements and follow up with schools representative for the data collection progress.
2. Collected the medical information from the student's medical files for one school, as this school nurse was not cooperative and delayed in filling in questionnaires.
3. Collected the test retest reliability questionnaire set (phone interview).
4. Data entry of all variables for questionnaire parts one and two. In addition several variable for part 3 and 4.
5. Under took all the analysis presented in chapter 3 cross sectional study.
6. Arrange and facilitate for the focus group session.
7. Transcribed focus group script, and translation from Arabic to English language
8. Under took qualitative (Focus group) data analysis and coding of the stakeholder group.
9. Under took the interventions development process, it is my interpretation of the analysis that is presented in this thesis.
10. I am the sole author of this thesis, with supervisory input from Dr. Peymane and Professor Jayne parry.

3 Obesity prevalence and factors associated with obesity

This chapter summarises the main findings from the parent and school questionnaires. Descriptive analysis is used to describe the prevalence of overweight and obesity, dietary and physical activity habits and other characteristics of the study population. The relationship between weight status and different lifestyle and other individual characteristics, as well as school level characteristics are described. The findings are discussed in the context of the international literature.

3.1 Description of study population

All 12 primary governmental schools invited to take part, responded to the school questionnaires and complete data was also obtained from the respective school nurses (**Table 3.1**). Therefore height and weight data on 979 children (424 boys and 555 girls) were available for analysis. Among these pupils, 586 parent questionnaires (59.9%; 65.0% girls and 53.1% boys) were returned, with the response rate being higher among non-Qataris compared to Qataris (65.9% vs 58.6%), parents of girls compared to boys (65.0% vs 53.1%), and those living in the inner district (I and II) (**Table 3.2**). Overall 16.0% of the eligible study population and 15.4% of those whose parents responded, were in the overweight or obese categories of BMI.

Table 3.1 Number of primary schools and students participating by district.

Districts	No. of Schools	No.(%) of eligible pupils	No.(%) of parent questionnaires returned (responder)
District I (Doha area)	6	529 (54.0)	318 (60.1)
District II (Around Doha area)	4	327 (33.4)	200 (61.2)
District III (Al-khor area)	2	123 (12.6)	68 (55.3)
Total	12	979 (100)	586 (59.9)

Data presented are numbers (percentages).

Table 3.2 Comparison of children whose parents did or did not respond to parent questionnaire

Variable		Number (%)		Number (%) of total eligible population
		Responders	Non responders	
Gender	**Boy**	225 (53.1)	199 (46.9)	424 (43.3)
	Girl	361 (65.0)	194 (35.0%)	555 (56.7)
Nationality	**Qatari**	474 (58.6)	335 (41.4)	809 (82.6)
	Non Qatari	112 (65.9)	58 (34.1)	170 (17.4)
BMI categories	**Underweight**	129 (60.8)	83 (39.2)	212 (21.7)
	Normal	367 (60.1)	244 (39.9)	611 (62.4)
	Overweight	44 (56.4)	34 (43.6)	78 (8)
	Obese	46 (59.0)	32 (41.0)	78 (8)
School district	**District I**	318 (60.1)	211 (39.9)	529 (54.0)
	District II	200 (61.2)	127 (38.8)	327 (33.4)
	District III	68 (55.3)	55 (44.7)	123 (12.6)

Data presented are numbers (percentages).

3.1.1 Characteristics of the study population

The socio-demographic characteristics of the study sample (responders) are shown in (**Table 3.3**), according to background nationality. The majority (82.6%) were Qataris and

compared to the non-Qataris, this group generally had higher family income, higher levels of education and larger household size (**Table 3.3**). The study population consisted of a higher proportion of Qataris compared to the general population (64% vs. 36% according to Ministry of education's annual report) [152].

The mode for the category with the most number within monthly household income of 12,000 -24,999 QR per month respectively (equivalent to £2174.2-4529.5) is lower than the average reported income for that period in Qatari (41.483 QR per month-[180]) generally.

The median household size was 7 persons per family with the median number of children per family being 4. This is similar to the household size for Qatar in general [181]. In general, mothers tended to be better educated than fathers, although the reverse was true for non-Qataris, where a higher proportion of fathers had higher level education. In both populations, the majority of fathers were working [overall n=499 (93.8%)], whereas about half of the mothers worked [overall n=242 (53.8%)]. Again, this is typical of the characteristics of the population in Qatar [181]. The respondents tended to also have higher educational level, and higher family income compared to national surveys [150;181]/ studies [182]. These differences may be because non-Qataris, those with lower education, and lower income were less likely to respond.

Table 3.3 Socio-demographic distribution of the study population

Variable		Qatari (n=809)*	Non Qatari (n=170)*	Total	P-value For difference in total population
Gender	**Boy** **Girl**	352 (43.5) 457 (56.5)	72 (42.4) 98 (57.6)	424(43.3) 555(56.7)	0.80
Monthly Family income(Qatari Riyal)	**< 3000 QR** **3000 – 5999 QR** **6000 – 11999 QR** **12000 – 24999 QR** **≥25000 QR**	7 (1.5) 39 (8.4) 146 (31.3) 188 (40.3) 87 (18.6)	14 (12.7) 44 (40.0) 34 (30.9) 17 (15.5) 1 (0.9)	21 (3.6) 83 (14.2) 180 (31.2) 205 (35.5) 88 (15.0)	<0.01
House hold size (no. of family members)	**Low(1-6)** **Medium(7-12)** **High (>12)**	180 (38.5) 248 (53.1) 39 (8.4)	59 (53.6) 44 (40.0) 7 (6.4)	239(41.4) 292 (50.6) 46 (8.0)	<0.01
Number of children in family	**Low (1-3)** **Medium (4-7)** **High (>7)**	127 (26.8) 313 (66.2) 33 (7.0)	36 (32.7) 66 (60.0) 8 (7.3)	163(28.0) 379(65.0) 41(7.0)	0.34
Mother's educational level	**Low (Illiterate and Primary Certificate)** **Medium (Preparatory and Secondary Certificate)** **High (University and Post graduate)**	38 (8.0) 165 (34.9) 270 (57.1)	14 (12.6) 40 (36.0) 57 (51.4)	52 (8.9) 205 (35.1) 327 (56.0)	0.14
Father's educational level	**Low (Illiterate and Primary Certificate)** **Medium (Preparatory and Secondary Certificate)** **High (University and Post graduate)**	42 (8.9) 223 (47.1) 208 (44.0)	8 (7.2) 34 (30.6) 69 (62.2)	50(8.6) 257 (44.0) 277 (47.4)	<0.01
Mother's occupation	**Working** **Not working**	205 (56.5) 158 (43.5)	37 (42.5) 50 (57.5)	242 (53.8) 208(46.2)	0.02
Father's occupation	**Working** **Not working**	396 (92.5) 32 (7.5)	103 (99.0) 1 (1.0)	499 (93.8) 33 (6.2)	0.01

Data presented are numbers (percentages).
**No= total number response to the question.*

3.2 Prevalence of obesity in the study population

As discussed in chapter 2, obesity levels were calculated from measures of height and weight undertaken by school nurses, using the most recent CDC guidelines for BMI cut-offs. This definition is what is used for most of the rest of this chapter. However, for comparison, the proportion of children in each of the BMI categories according to three different definitions (CDC, WHO and IOTF) are shown in (**Table 3.4**). Although the proportion of children classified as overweight or obese combined was similar but not identical for all three definitions (16.0%, 17.1% and 14.7% respectively), the proportion classified as obese differed more (8.0%, 11.2% and 6.5%) and the proportion classified as underweight differed markedly (21.7%, 16.3% and 29.4% respectively) according to the definition used. In each case, the CDC definition resulted in estimates that were in-between the WHO and IOTF definitions. The comparison of the three references showed no differences in weight status classification between boys and girls.

The differences between CDC and WHO estimates were significant for overweight and obesity. The WHO overestimates the overall prevalence of overweight and obesity ($p<0.01$) and overestimates were similar between boys and girls. Prevalence of overweight and obesity by CDC and WHO criteria, showed very good and strong agreement (Cohen's kappa=0.956, $p<0.01$) (**Table 3.5**).

Concerning the CDC and IOTF comparison, IOTF reference underestimates overweight and obesity prevalence ($p<0.01$), and this is more marked in boys compared to girls. However, the CDC and IOTF criteria have a strong agreement (Cohen's kappa=0.953, $p<0.01$) (**Table 3.5**).

Table 3.4 Number (%) of children in each BMI category based on CDC, WHO, and IOTF reference equations.

BMI category	CDC	WHO	IOTF
Underweight	212 (21.7)	160 (16.3)	288 (29.4)
Normal	611 (62.4)	651 (66.5)	547 (55.9)
Overweight	78 (8)	58 (5.6)	80 (8.2)
Obese	78 (8)	110 (11.2)	64 (6.5)
Total	979 (100)	979 (100)	979 (100)

Data presented are numbers (percentages).

Table 3.5 Agreement between weight status categories according to the CDC and the WHO references and the IOTF references.

BMI categories	Weight status according to CDC definition		
	Non obese	**Overweight or obese**	**P-value for trend**
Weight status according to WHO definition*			
Non obese	811 (98.5)	0 (0)	<0.01
Overweight or obese	12 (1.5)	156 (100)	
Weight status according to IOTF definition¥			
Non obese	823 (100)	12 (7.7)	<0.01
Overweight or obese	0 (0)	144 (92.3)	

*****Cohen's Kappa measure of agreement Value 0.956 ($p<0.01$)
¥Cohen's Kappa measure of agreement Value 0.953 ($p<0.01$)

The prevalence of obesity and overweight among girls and boys, and for Qataris and non-Qataris are shown in (**Table 3.6**). Overall 156 (16%) children were either overweight or obese (15.5 % girls and 16.5% boys), being slightly more prevalent among Qataris compared to non-Qataris (16.3 % versus 14.1%, p=0.76), and those living in the capital city district. Prevalence reduced progressively by increasing distance from the central district (P for trend=0.013). Underweight was also common, with around one fifth being classed in this category, more common in boys (23.1% compared to 20.5% in girls) and Qataris (22.1% compared to 19.4% in non-Qataris) and those living in school district II (around Doha district) 25.7% (n=84). The differences in underweight prevalence were not statistically significant by nationality or sex. The observed differences between school districts were statistically significant (P=0.013) with under weight.

3.2.1 Socio-economic status and weight status

The relationship between weight status and parental education and income was examined (see **Table 3.6**). There was a non-significant trend for increasing overweight and obesity with increasing maternal education, but there was no relationship between father's education or household income and obesity. Household size was significantly related to overweight, with a lower prevalence of overweight with increasing household size.

Table 3.6 Socio- economic distribution of the study population and weight status

Socioeconomic factors	Weight status					
	Underweight	Normal	Overweight	Obese	Overweight or obese	P-value for trend
Gender						
• **Boys**	98 (23.1)	256 (60.4)	33 (7.8)	37 (8.7)	70 (44.9)	0.72
• **Girls**	114 (20.5)	355 (64.0)	45 (8.1)	41 (7.4)	86 (55.1)	
Nationality						
• **Qatari**	179 (22.1)	498 (61.6)	64 (7.9)	68 (8.4)	132 (84.6)	0.56
• **Non - Qatari**	33 (19.4)	113 (66.5)	14 (8.2)	10 (5.9)	24 (15.4)	
School district						
• **District I**	104 (19.7)	327 (61.8)	46 (8.7)	52 (9.8)	98 (62.8)	<0.01
• **District III**	84 (25.7)	197 (60.2)	26 (8.0)	20 (6.1)	46 (29.5)	
• **District III**	24 (19.5)	87 (70.7)	6 (4.9)	6 (4.9)	12 (7.7)	
Mother's educational level						
• **Low**	13 (25.0)	34 (65.4)	2 (3.8)	3 (5.8)	5 (5.6)	0.13
• **Medium**	44 (21.5)	132 (64.4)	13 (6.3)	16 (7.8)	29 (32.2)	
• **High**	72 (22.0)	199 (60.9)	29 (8.9)	27 (8.32)	56 (62.2)	
Father's educational level						
• **Low**	18 (30.0)	28 (56.0)	1 (2.0)	3 (6.0)	4 (4.4)	0.72
• **Medium**	49 (19.1)	163 (27.9)	22 (8.6)	23 (8.9)	45 (50.0)	
• **High**	61 (22.0)	175 (63.2)	21 (7.6)	20 (7.2)	41 (45.6)	
Family monthly income						
• **Low**	61 (21.5)	181 (63.7)	20 (7.0)	22 (7.7)	42 (47.2)	0.84
• **Medium**	48 (23.4)	123 (60.0)	16 (7.8)	18 (8.8)	34 (38.2)	
• **High**	19 (21.6)	56 (63.6)	7 (8.0)	6 (6.8)	13 (14.6)	
House hold seize						
• **Low 1-6 children)**	62 (48.8)	133 (36.7)	21 (48.8)	23 (51.1)	44 (50.0)	0.05

• **Medium (7-12 children))**	54 (42.5)	198 (54.7)	21 (48.8)	19 (42.2)	40 (45.5)	
• **High (> 12 children)**	11 (8.7)	31 (8.6)	1 (2.3)	3 (6.7)	4 (4.5)	
Number of children						
• **Low (1-3 children)**	43 (33.3)	94 (25.8)	8 (18.6)	18 (39.1)	26 (29.2)	0.48
• **Medium (4-7 children)**	79 (61.2)	241 (66.0)	32 (74.4)	27 (58.7)	59 (66.3)	
• **High (> 7 children)**	7 (5.4)	30 (8.2)	3 (7.0)	1 (2.2)	4 (4.5)	

***P-values are based on Chi-squared test for difference between categories.*

Data presented are numbers (percentages).

Table 3.7 Relationship between socio-demographic characteristics and risk of overweight and obesity in children, based on logistic regression analysis

Variable	Crude Unadjusted OR (95% CI)			Model I Adjusted * OR (95% CI)			Model II Adjusted ¥ OR (95% CI)	
Sex								
Boys	1.00 (Reference)			1.00 (Reference)			1.00 (Reference)	
Girls	0.93(0.66-1.31)	0.67		0.88 (0.62-1.25)	0.48		0.96 (0.59-1.57)	0.88
Nationality								
Qatari	1.00 (Reference)			1.00 (Reference)			1.00 (Reference)	
Non-Qatari	0.843 (0.53-1.35)	0.48		0.87 (0.54-1.39)	0.56		0.81 (0.44- 1.49)	0.50
School district								
District III	1.00 (Reference)			1.00 (Reference)			1.00 (Reference)	
District II	1.51 (0.77-2.97)	0.23		1.52 (0.77-2.97)	0.22		1.30 (0.53-3.21)	0.57
District I	2.10 (1.11-3.97)	0.02		2.12 (1.12-4.02)	0.02		1.93 (0.83-4.52)	0.13
Mother's educational level								
High	1.00 (Reference)			-			1.00 (Reference)	
Medium	0.80 (0.49-1.30)	0.36		-			0.90 (0.55-1.49)	0.69

Low	0.51 (0.20-1.35)	0.18		-			0.75 (0.27-2.10)	0.59
House hold size								
High	1.00 (Reference)			-			1.00 (Reference)	
Medium	1.67 (0.57-4.90)	0.35		-			1.49 (0.50-4.46)	0.49
Low	2.37 (0.81-6.95)	0.12		-			2.03 (0.67-6.16)	0.21

- ***Model 1:*** *adjusted for sex, nationality, and school district; 979 (100%) included in analysis. (Our model about sample size)*
- ¥ ***Model 2:*** *Adjusted model 1 and additionally socioeconomic factors (mother's educational level, father's educational level, mother occupation, house hold size, and number of children in family, monthly family income) included in analysis.*

In a multivariate model to examine these socio-demographic factors, in **model I** only school district remained as statistically significant predictor of obesity after adjusting for sex and nationality (**Table 3.7**) Compared to those in district III, there was an increasing likelihood of obesity with increasing proximity to the capital city (district I) (OR=2.10; 95% CI 1.11-3.97 compared to district III). While in **model II** after adjustment of all the socio-demographic variables, all were not related to weight status in the fully adjusted model and resulted in loss of significance of the prevalence ratio of school district level, mother education and house hold seize.

3.2.2 Parents' perceptions of their child's weight status

When parents were asked about their child's weight status, over three quarters (76.4%) believed that their child was of normal weight, compared to 62.7% being in that category according to BMI (**Table 3.8**). Both underweight and overweight were underestimated by parents, with 15.7% and 7.9% believing their children to be in these categories respectively, compared to 21.9% and 15.5% respectively according to BMI.

Table 3.8 Comparison of parent-perceived and actual (based on BMI) weight status of children

Weight status	Number (%)		P-value for difference between perceived and actual
	Perceived weight status according to parent	Weight status according to BMI	
Underweight	91 (15.7)	127 (21.9)	<0.01
Normal	444 (76.4)	364 (62.7)	
Overweight and Obese	46 (7.9)	90 (15.5)	
Total	581 (100)	581 (100)	

393 did not respond to parent questionnaire, and of responders, 5 were missing for this question

***P-values are based on Chi-squared test for difference between categories.*
Data presented are numbers (percentages).

When children's weight status according to BMI was compared with parental reported weight status (**Table 3.9**), overweight was more likely to be correctly recognized compared to underweight. Rarely did parents of overweight children classify their child as underweight (3.3%), and only one parent (0.8%) reported their underweight child as overweight. Nevertheless almost two thirds of parents of overweight children did not correctly identify their child's weight status.

Parents who correctly classified their child as overweight and underweight were most likely Qatari, living in District II, and those who had higher socioeconomic status (higher education attained of the mother and higher family income). In contrast, overweight girls were more likely to be correctly recognized compared to boys (37.9% vs 31.3%), while for the underweight was the reverse.

Table 3.9 Children's weight status according to BMI compared with perceived weight status according to parent.

Perceived weight status according to parent	Weight status according to BMI		
	Underweight	**Normal**	**Overweight and Obese**
Underweight	36 (28.3)	52 (14.3)	3 (3.3)
Normal	90 (70.9)	299 (82.1)	55 (61.1)
Overweight and Obese	1 (0.8)	13 (3.6)	32 (35.6)
Total	127 (100)	364 (100)	90 (100)

Data presented are numbers (percentages).

Out of 46 parents who perceived their child as overweight, 39 provided reasons for this. Unhealthy eating habits were cited by the majority of parents (32/39), and under half (n=16) attributed the reasons to reduced or absence of physical activity. Just under one third (n= 12) believed that hereditary or genetic factors were responsible, and one mother reported that she believed tonsillectomy was the cause for her child's obesity.

3.3 Dietary habits and intake among study population

This section presents data on breast feeding practice during infancy, food consumption during school time, home dietary customs, and dietary habits of the study children, as reported by parents. The dietary intake was estimated based on responses to the food frequency questionnaire and is presented as food groups rather than trying to calculate calorie intake, as explained in the methods section. The dietary factors were compared with the child's weight status.

3.3.1 Breast feeding

Around one in five children in this study had been breastfed exclusively 20.1% (n=117) among them 101 (96.2%) were breastfed exclusively for at least 6 months, whilst two thirds (n=396, 67.9%) had received mixed feeding pattern (breast-fed and formula fed) during the infancy period (**Table 3.10**). Exclusive breastfeeding was more frequent among non-Qataris compared to Qataris (36.0% vs 16.3%), among children of mothers with lower educational level (p=<0.01), lower family monthly income (P=0.002) and non working mothers (p<0.01). There was no difference in breastfeeding practice neither by child's sex nor by father's educational.

Compared with non obese children, fewer overweight and obese children were breast fed exclusively (20.3% vs 18.9%) and the likelihood of overweight was greatest for those who only had formula feeding during infancy, though these differences were not statistically significant.

Adjusting for the other socio-demographic factors and school district, the likelihood of overweight was higher among children who were only formula fed compared to those who had mixed feeding (adjusted OR 2.04 (95% CI 1.00-4.15) (**Table 3.11**).

Table 3.10 Number (%) of infant feeding patterns by socio-demographic characteristics and weight status distribution.

Socio-demographic factors	Number (%) Feeding pattern in infancy			
	Breast feeding	**Formula feeding**	**Mixed feeding**	**P-value for trend**
Gender				
• **Boys**	49 (22.0)	23 (10.3)	151 (67.7)	0.62
• **Girls**	68 (18.9)	47 (13.1)	245 (68.1)	
Nationality				
• **Qatari**	77 (16.3)	51 (10.8)	344 (72.9)	<0.01
• **Non - Qatari**	40 (36.0)	19 (17.1)	52 (46.8)	
School district				
• **District I**	62 (19.6)	40 (12.7)	214 (67.7)	0.90
• **District II**	42 (21.1)	23 (11.6)	134 (67.3)	
• **District III**	13 (19.1)	7 (10.3)	48 (70.6)	
Mother's educational level				
• **Low**	24 (46.2)	7 (13.5)	21 (40.4)	<0.01
• **Medium**	39 (19.1)	23 (11.3)	142 (69.6)	
• **High**	53 (16.3)	40 (12.3)	233 (71.5)	
Father's educational level				
• **Low**	14 (28.6)	4 (8.2)	31 (63.3)	0.20
• **Medium**	53 (20.6)	30 (11.7)	174 (67.7)	
• **High**	49 (17.8)	36 (13.0)	191 (69.2)	
Family monthly income				
• **Low**	76 (26.8)	31 (10.9)	177 (62.3)	<0.01
• **Medium**	25 (12.3)	29 (14.2)	150 (73.5)	
• **High**	14 (16.1)	9 (10.3)	64 (73.6)	
Mother occupation				
• **Not working**	57 (27.4)	26 (12.5)	125 (60.1)	<0.01
• **working**	32 (13.2)	30 (12.4)	180 (74.4)	
Weight status				
• **None obese**	100 (20.3)	54 (11.0)	339 (68.8)	0.66
• **Overweight and obese**	17 (18.9)	16 (17.8)	57 (63.3)	

*****P-values are based on Chi-squared test for difference between categories.*

Data presented are numbers (percentages).

Table 3.11 Associated between likelihood of overweight and obesity in children by feeding patterns during infancy

Variable	Unadjusted OR (95% CI)		Adjusted * OR (95% CI) and P value for trends	
Feeding pattern				
Mixed feeding	1.00 (Reference)		1.00 (Reference)	
Formula feeding	1.76 (0.94-3.29)	0.07	2.04 (1.00-4.15)	0.05
Breast feeding	1.01 (0.56-1.82)	0.97	1.202 (0.60-2.42)	0.61

Model 3 *adjusted for sex, nationality, and school district and additionally socioeconomic factors (mother's educational level, father's educational level, working status of mother, and, monthly family income*) and feeding patterns *included in analysis.*

3.3.2 Food consumption during school time

Although children in Qatar usually do not consume any main meals during the school day and go home at lunch times, the majority of children (91.7%) were reported to eat some snacks in school. Half (50.6%) buy some snacks from the schools canteen (slightly more commonly in girls (51.3%), the Qatari population (53.2%), and normal weight children (54.3%)), whilst one third (33.5%) consume food prepared at home. This was significantly more common in the non-Qatari population (47.7%).

3.3.3 Home dietary custom

Almost half (43.3%) of the study children were reported to eat their main meal from a shared plate with the rest of the family, rather than eating in their own separate plate. Generally, eating at separate plates was more common for girls than boys (61.5% and 49.1% respectively, $P<0.01$), but did not differ significantly by nationality or weight status.

3.3.4 Dietary intake based on FFQ

To determine the dietary behaviours risk factors of children, as described in section (**2.2.3.8.6.**) in chapter 2, data from the FFQ was used to summarise the children's dietary habits. Food items from the FFQ were combined into 4 categories: animal protein, dairy products, carbohydrate and fruit and vegetables and further classified into amount of "healthy" intake for each category (low, ideal or higher than recommended) based on the US dietary food guidelines for children. The amount of "unhealthy" food items consumed (amount of sweetened beverages, fast foods, confectionery and crisps) is also described. A description of dietary intake is summarised in tables 3.12 and 3.13 blow.

Table 3.12 Amount of food consumed against healthy dietary recommendations for each food group, by gender and weight status

Amount consumed against recommend ations	Gender			Weight status			Total
	Girls	Boys	P-value	Non obese	Overweight or obese	P-value	
Animal protein							
Low	149(77.6)	94 (73.4)		202(76.5)	41(73.2)		243(75.9)
Ideal	19 (9.9)	15 (11.7)	0.42	25(9.5)	9(16.1)	1.00	34 (10.6)
High	24 (12.5)	19 (14.8)		37(14.0)	6(10.7)		43 (13.4)
Dairy product							
Low	272(77.6)	142 (65.1)		346(71.9)	68(78.2)		414 (72.9)
Ideal	30 (8.6)	36 (16.5)	<0.01	59(12.3)	7(8.0)	0.34	66 (11.6)
High	48 (13.7)	40 (18.3)		76(15.8)	12(13.8)		88 (15.5)
Carbohydrate							
Low	220 (62.9)	116 (53.5)		285(59.5)	51(58.0)		336 (59.3)
Ideal	66 (18.9)	38 (17.5)	<0.01	92(19.2)	12(13.6)	0.37	104 (18.3)
High	64 (18.3)	63 (29.0)		102(21.3)	25(28.4)		127 (22.4)
Fruits and vegetables							
Low	310 (88.8)	174 (81.3)		408(85.5)	76(88.4)		484 (86.0)
Ideal	9 (2.6)	9 (4.2)	0.01	17(3.6)	1(1.2)	0.66	18 (3.2)
High	30(8.6)	31 (14.5)		52(10.9)	9(10.5)		61 (10.8)

P-values are based on Chi-squared test for difference between categories.
Data presented are numbers (percentages).

Low food intake: no consumption OR some consumption reported but not enough to meet categories for ideal or high food intake.
Ideal food intake: Consumes recommended frequency and amount according to guideline table
High food intake: Higher food consumption than the ideal recommended in the guidelines.
*(See recommended daily serving for food groups based on US child food guideline (**Table 2.10**) method chapter **2**).*

Table 3.13 Amount of unhealthy foods consumed by children in Qatar, based on parental report, by gender and weight status

Food consumption	Gender			Weight status			Total
	Girls	Boys	P-value	Non obese	Overweight or obese	P-value	
*** Sweetened beverages**							
Low	234 (67)	117(54.2)		304 (63.5)	47 (54.7)		351 (62.1)
Moderate	66(18.9)	47 (21.8)	<0.01	96 (20.0)	17 (19.8)	0.05	113 (20.0)
High	49 (14.0)	52 (24.1)		79 (14.0)	22 (25.6)		101 (17.7)
† Crisps							
NO intake	40 (11.4)	20 (9.2)		50 (10.4)	10 (11.5)		60 (10.6)
Moderate	201(57.4)	105 (48.2)	0.01	258 (53.6)	48 (55.2)	0.61	306 (53.9)
High	109 (31.1)	93 (42.7)		173 (36.0))	29 (33.3)		202 (35.6)
‡ Fast food							
NO intake	82 (25.4)	55 (29.3)		114(26.6)	23(28.0)		137 (26.8)
Moderate	231 (71.5)	124 (66)	0.64	298(69.5)	57(69.5)	0.62	355 (69.5)
High	10 (3.1)	9 (4.8)		17(4.0)	2(2.4)		19 (3.7)
‡ Confectionery							
NO intake	11 (4.0)	6 (3.7)		14 (3.8)	3 (4.1)		17 (3.9)
Moderate	136 (49.1)	71 (44.1)	0.33	171 (47.0)	36 (48.6)	0.77	207 (47.3)
High	130 (46.9)	84 (52.2)		179 (49.2)	35 (47.3)		214 (48.9)

P-values are based on Chi-squared test for difference between categories.

Data presented are numbers (percentages).

**Sweetened beverages: Low intake (0-<1cup) per day, Moderate intake (1-<3 cups) per day, High intake (3 cups or more) per day*
‡ Fast food and confectionery: No intake per week, Moderate intake (1-4 times) per week, High intake (5 or more) per week
† Crisps: No intake per week, Moderate intake (1-4 packs) per week, High intake (5 packs or more) per week

3.3.4.1. Description of dietary food intake by categories

Animal protein

The most commonly reported source of animal protein intake on a daily basis was chicken (15.5%), followed by red meat (5%), and then fish 21 (3.7%). Only 1 (0.2%) child was reported to eat no meat during the data collection week (**Table 10.1, Appendix 10**).

Dairy products

Around one third of children drink milk on a daily basis (35.8%), this is more common in boys than girls (43.2% vs. 31.2%), and among the Qatari compared to non-Qatari children (37.3% vs. 29.4%). Similarly one third of children eat cheese (33.7%) daily, more commonly in boys than girls (38.2% vs. 30.9%). Only 2 children (0.3%) did not consume any dairy product during the data collection week.

Carbohydrate

Over half the children consumed bread or rice on a daily basis (60.2% and 50.1% respectively). Other sources of carbohydrates were cereals (15.5%) and pasta (5.3%). In general bread was consumed on a daily basis, more commonly in boys than girls (63.6% vs. 58.1%), and non-Qataris compared to Qataris (71.6% vs. 57.5%). On the other hand, rice was more commonly consumed daily by girls than boys (51.6% compared to 24.8%), and Qatari compared to non-Qatari children (55.2% vs. 28.4%). Less than one percent of

the study population did not eat any bread and rice during the data collection week, while one fifth (21.3%) did not eat cereal and 17.8% ate no pasta.

Fruit and vegetables

Fruit was consumed more commonly than vegetables. Around one third of the study population (34.8%) reported eating fruit on a daily basis compared to a quarter (24.9%) who reported eating vegetables daily. Only 3.5% reported eating no fruit during the data collection week, while one fifth of children (21.2%) reported eating no vegetables. Overall daily fruit and vegetable consumption was similar by sex and nationality. While Qataris are more likely to never eat vegetables compared to non-Qataris (22.4% vs. 15.7%), non-Qataris are more likely to never drink fresh fruit juice (30.6% vs. 12.9%).

3.3.4.2. Healthy food consumption patterns

Most children had lower than the recommended healthy intake for almost all food groups (**Table 4.12**). Only 14.0% (n=79) had adequate or higher than recommended levels of Fruit and Vegetable intake, higher for boys than girls (18.7% and 11.2% respectively, P=0.01).

Animal protein intake was similar in all groups, but otherwise boys generally consumed significantly higher amounts of other food types compared to girls. There was no significant difference in amounts of foods consumed by nationality or weight status.

3.3.4.3. Pattern of unhealthy foods consumption among children

All children (100%) were reported to have consumed at least one of the unhealthy food types over the past week. For most food types, the frequency of intake was up to 2 times per week except for confectionery and sweetened drinks, where more than a third of children were reported to consume these once or more per day (**Table 10.2, Appendix 10**). Three quarters of children ate fast food meals at least once a week and 90% eat fried chips at least weekly. About half ate confectionery at least 5 days a week, whereas only a quarter eat crisps that frequency. Overall boys eat unhealthy foods more frequently than girls. However the frequencies of consumption were similar for Qatari and non-Qatari children.

Boys were more likely than girls to consume high levels of sweetened drinks and crisps (24.1% vs 14.0% and 42.7% vs 31.1% respectively, P<0.01 for both) (**Table 3.13**). Compared to non-Qatari, Qatari children were more likely to consume high levels of sweetened drinks (19.5% vs 11.1%, p=0.10); but there were no significant differences in unhealthy dietary habits by nationality.

A quarter (25.6%) of overweight or obese children were reported to consume higher levels of sweetened drinks, compared to only 14.0% of non-obese children (P=0.05). otherwise unhealthy dietary habits were not significantly different by weight status.

3.3.4.4. Socio-economic status and dietary habits

The relationship between dietary habits and parental education and income was examined (**Table 10.3 Appendix 10**). Generally, the higher the educational attainment of the mother, the less likely the child was to consume the minimum recommended healthy levels for all food groups (although the trend was only statistically significant for dairy products and fruits and vegetables). Thus for example, whilst 26% of children whose mothers had lower educational levels consumed the minimum recommended amounts of fruit and vegetables, only 15% and 11.7% respectively of those who had mothers with medium or high educational attainment consumed this level fruit and vegetables (p value for trend = 0.01). On the other hand, children of more educated mothers tended also to be less likely to consume high levels of unhealthy foods, except for confectionary (although most trends were non-significant). A similar pattern was seen in relation to fathers' educational level and parental income, though the trends were mainly non significant. No significant difference in child dietary patterns was seen between working and non working mothers (**Table 10.4, Appendix 10**).

After adjustment for other factors, no statistically significant trends were observed for any sociodemographic or dietary factor and overweight and obesity. Obesity was more common among children with lower intake of animal protein (OR 3.78, 95%CI 1.05-13.58 for ideal vs high intake), and less common among those with higher intake of carbohydrate (OR 0.37, 95% CI 0.13-1.03 for ideal vs high intake) (**Table 3.14**). The OR for the relationship between sweetened beverage intake and obesity was similar in both models, although no longer statistically significant in the adjusted model.

Table 3.14 Relationship between overweight and obesity in children and socioeconomic and dietary factors, based on logistic regression analysis

Variable	Crude Unadjusted OR (95% CI)			Model IV Adjusted ¥ OR (95% CI)	
Sex					
Boys	1.00 (Reference)			1.00 (Reference)	
Girls	0.93(0.66-1.31)	0.67		1.14 (0.60-2.19)	P=0.69
Nationality					
Qatari	1.00 (Reference)			1.00 (Reference)	
Non-Qatari	0.843 (0.53-1.35)	0.48		0.75 (0.30-1.87)	P=0.54
School district					
District III	1.00 (Reference)			1.00 (Reference)	
District II	1.51 (0.77-2.97)	0.23		2.69 (0.81-8.90)	P=0.12
District I	2.10 (1.11-3.97)	0.02		2.65 (0.77-9.14)	P=0.10
Mother's educational level					
High	1.00 (Reference)			1.00 (Reference)	
Medium	0.80 (0.49-1.30)	0.36		0.66 (0.30-1.45)	P=0.30
Low	0.51 (0.20-1.35)	0.18		1.03 (0.27-3.90)	P=0.96
Father's educational level					
High	1.00 (Reference)			1.00 (Reference)	
Medium	1.22 (0.77-1.94)	0.39		1.14 (0.55-2.35)	P=0.0.73
Low	0.50 (0.17-1.46)	0.21		0.23 (0.02-2.15)	P=0.20
House hold size					
High	1.00 (Reference)			1.00 (Reference)	
Medium	1.67 (0.57-4.90)	0.35		1.73 (0.34-8.74)	P=0.50

Low	2.37 (0.81-6.95)	0.12		2.78 (0.54-14.31)	P=0.22
Monthly family income					
High	1.00 (Reference)			1.00 (Reference)	
Medium	1.15 (0.57-2.30)	0.69		0.97 (0.37-2.50)	P=0.94
Low	1.00 (0.51-1.96)	0.99		1.06 (0.36-3.10)	P=0.91
Carbohydrate					
high intake	1.00 (Reference)			1.00 (Reference)	
Ideal intake	0.53 (0.25-1.12)	0.09		0.37 (0.13-1.03)	P=0.05
Low intake	0.73 (0.430-1.24)	0.24		0.65 (0.31-1.33)	P=0.24
Animal protein					
high intake	1.00 (Reference)			1.00 (Reference)	
Ideal intake	2.22 (0.70-7.02)	0.17		3.78 (1.05-13.58)	P=0.04
Low intake	1.25 (0.50-3.16)	0.63		1.42 (0.53-3.78)	P=0.49
Sweetened beverage					
High intake	1.00 (Reference)			1.00 (Reference)	
Moderate intake	0.64 (0.32-.28)	0.20		1.01 (0.39-2.61)	P=0.98
Low intake	0.55 (0.32-0.97)	0.04		0.58 (0.25-1.35)	P=0.21

¥ ***Model 4:*** *Adjusted OR for each factors in the model for sex, nationality, school district, socioeconomic factors (mother's educational level, father's educational level, house hold size, and monthly family income) and dietary factors (carbohydrate, animal protein and sweetened beverage).*

3.4 Physical activity and inactivity levels among children in Qatar

This section summarises data on parent reported physical activity habits of the study population, based on responses to the International Physical Activity Questionnaire. Responses were coded according to the IPAQ scoring protocol (see section **2.2.4.7.** in chapter 2), to derive categories of physical activity level (low, moderate or vigorous). Daily duration of sedentary behaviour (sitting and sleeping) was also estimated. The relationship between levels of physical activity and weight status is then described.

3.4.1 Description of physical activity levels among children

Among 586 parent questionnaires returned 373 were included, with the 48.7% response rate (54.7% girls and 41.1% boys) being higher among non-Qataris compared to Qataris (54.0% vs 47.7%), and 213 were lost 208 were excluded because of incomplete response (46 4.7% no responses, and 162 14.0% do not know), and 5 outliers were excluded.

Overall, only 25.6% (n=102) of children (31.3% boys and 22.1% of girls) were reported to undertake minimum recommended levels of physical activity (at least 60 minutes of moderate to vigorous physical activity on 5 or more days per week).

Almost half (n=175; 47%) of the study population with valid response were classified as inactive (low activity). Inactivity was significantly more common among girls than boys (54.7% and 33.8% respectively, $P<0.01$). Around 22% (n=83) and 31% (n=115) were classified as moderately active and highly active respectively (Table **3.15**). Activity levels were not related to nationality.

Table 3.15 Number (%) of physical activity levels among children in Qatar, based on parental report, by gender, nationality and weight status

Physical activity level	Gender Number (%)			Weight status Number (%)			Total Number (%)
	Girls	Boys	p-value	Non obese	Over weight or obese	p-value	
Low *	128 (54.7)	47 (33.8)	<0.01	140 (45.0)	35 (56.5)	0.15	175 (46.9)
Moderate‡	49 (20.9)	34 (24.5)		72 (23.2)	11 (17.7)		83 (22.3)
High †	57 (24.4)	58 (41.7)		99 (31.8)	16 (25.8)		115 (30.8)
Total	234 (100)	139 (100)		311 (100)	62 (100)		373 (100)

P-values for trend.
Data presented are numbers (percentages).

**Not meeting criteria for moderate and high physical activity.*

*‡ Either one of the following 3 criteria: (1) 3 or more days of vigorous activity of at least 20 minutes per day **OR** (2)5 or more days of moderate intensity activity and / or walking of at lest 30 minutes per day **OR** (3)5 or more days of any combination of walking, moderate intensity or vigorous intensity activities achieving a minimum or at least 600 MET-minutes/week.*

*† Any one of the following 2 criteria: (1) Vigorous intensity activity on at least 3 days and accumulating at least 1500 MET-minute/week **OR** (2) 7 or more days of any combination of walking, moderate or vigorous intensity activity accumulating at least 3000 MET-minutes/week.*

There was a significant relationship between increasing educational level of fathers, and greater active levels (P=0.02) (**Table 3.16**). Mothers' educational level and family income were unrelated to activity levels. There was also a trend for increasing physical activity levels with increasing distance from the capital, though this was of borderline statistical significance (P=0.08).

Adjusting for other factors, higher levels of physical activity were more common among girls (OR 0.43, 95% CI 0.27-0.69 compared to boys), and those with lower paternal educational levels (OR 0.25, 95% CI 0.10-0.62 compared to higher paternal educational levels) (**Table 3.17**) and resulted in loss of borderline significance
of school district level (p=0.08).

Overweight and obese children were more likely to be inactive and less likely to undertake moderate to high levels of physical activity compared to non-obese children (56.5% vs 45.0% for inactivity), although the differences were not statistically significant (P=0.15).

Table 3.16 Relationship between children's physical activity levels and parent's education level and family income.

Physical activity level	Mother's educational level Number (%) of				Father's educational level Number (%) of				Family monthly income Number (%) of			
	Low	Medium	High	p-value	Low	Medium	High	p-value	Low	Medium	High	p-value
Low	16 (48.5)	55 (44.0)	104 (48.4)	0.68	21 (65.6)	77 (48.4)	76 (42.0)	0.02	80 (44.7)	68 (48.9)	24 (48.0)	0.53
Moderate and High	17 (51.5)	70 (56.0)	111 (51.6)		11 (34.4)	82 (51.6)	105 (58.0)		99 (55.3)	71 (51.1)	26 (52.0)	
Total	33 (100)	125 (100)	215 (100)		32 (100)	159 (100)	181 (100)		179 (100)	139 (100)	50 (100)	

P-values are based on Chi-squared test for difference between categories.

Data presented are numbers (percentages).

Table 3.17 Factors associated with children's physical activity level

Variable	Physical activity level			Unadjusted OR (95% CI)		Adjusted * OR (95% CI) and P value for trends	
	Low level	Moderate to high	P-value				
Sex							
Boys	47 (33.8)	92 (66.2)	<0.01	1.00 (Reference)		1.00 (Reference)	
Girls	128 (54.7)	106 (45.3)		0.42 (0.27-0.65)	<0.01	0.43 (0.27-0.69)	<0.01
School district							
District III	16 (39.0)	25 (61.0)	0.08	1.00 (Reference)		1.00 (Reference)	
District II	54 (41.9)	75 (58.2)		0.89 (0. 43-1.82)	0.75	0.97 (0.45-2.09)	0.93
District I	105 (51.7)	98 (48.3)		0.597 (0.30-1.18)	0.14	0.69 (0.33-1.42)	0.31
Father's educational level							
High	76 (42.0)	105 (58.0)	0.02	1.00 (Reference)		1.00 (Reference)	
Medium	77 (48.4)	82 (51.6)		0.77 (0.50-1.18)	0.23	0.66 (0.40-1.10)	0.11
Low	21 (65.6)	11 (34.4)		0.38 (0.17-0.83)	0.05	0.25 (0.10-0.62)	<0.01

Data expressed as number (percentages), unadjusted and adjusted logistic regression variable for the children's moderate to high physical activity level.

***Model 5** adjusted for sex, nationality, school district, father's and mother's educational level and family monthly income.*

3.4.2 Patterns of sedentary activity and sleep duration, and relationship with weight status

Among 586 parent questionnaires that were returned, 217 had complete data on sedentary activity time. Overall 41.1% of the children who were overweight and obese and 36.4% of the non obese were included in this analysis. Complete data on sleep duration was available for 348 children (61.1% of overweight or obese and 59.0% of non obese).

The length of time (hours/day) spent in sedentary activities and sleeping are shown in Table (**3.18**). Overall children were reported to spend more time doing sedentary activity on weekdays compared to weekend days (median and interquartile range 5 (2-8) and 3 (1.5-5) hour/day respectively). Sleep duration was reported to be longer at weekend compared to weekdays (median and IQR 10 (8-10.1) and 9 (8-10) hour/day respectively). There was no significant relationship (P=0.41) between duration of sedentary activities and weight status. Overweight and obese children tended to have shorter sleep duration compared to non-obese children, but the differences were not statistically significant (P=0.61). **Table 3.18** Adjustment for other factors did not alter these relationships.

Table 3.18 Relationship between children's weight status and average sedentary behaviour (sitting and sleeping)

Sedentary behaviour variable	Weight status n (%)				Unadjusted OR (95% CI)		Adjusted * OR (95% CI) and P value for trends	
	Non obese	Overweight and obese	Total	P=value	OR (95% CI)	P=value	OR (95% CI)	P=value
Seated duration								
≥4 h/day	105 (58.3)	18 (48.6)	123(56.7)		1.00 (Reference)		1.00 (Reference)	
2-<4 h/day	40 (22.2)	11 (29.7)	51(23.5)	0.41	1.61 (0.70-3.69)	0.27	1.65 (0.65-4.18)	0.29
<2 h/day	35 (19.4)	8 (21.6)	43(19.8)		1.33 (0.53-3.33)	0.54	1.06 (0.34-3.35)	0.92
Sleep duration								
≥11 h/day	18 (6.1)	3 (5.5)	21 (6.0)		1.00 (Reference)		1.00 (Reference)	
9-<11 h/day	137 (46.8)	24 (43.6)	161 (46.3)	0.61	1.05 (0.29-3.85)	0.94	1.10 (0.20-5.98)	0.91
<9 h/day	138 (47.1)	28 (50.9)	166 (47.7)		1.22 (0.34-4.41)	0.76	1.07 (0.20-5.58)	0.94

Data expressed as median and IQR (IQR, interquartile range) and unadjusted and adjusted logistic regression variable for the overweight and obese children's and sedentary and sleeping behaviour.
***Model 6** adjusted for sex, nationality, and school district*

3.5 Factors associated with overweight and obesity in children

In this section, the previous analyses are combined to examine which socioeconomic, dietary and physical activity variables had the strongest influence on overweight and obesity in children. All variables that were associated with weight status ($p<0.15$) were sequentially added to the multivariate models. **Table 3.19** shows the final model, comparing OR obtained from crude and the fully adjusted model for overweight and obesity in children according to socioeconomic, dietary and physical activity factors. After adjusting for all variables only lower monthly family income (OR 11.34 (95% CI 0.94-136.00) and lower carbohydrate intake level (OR 0.24 (95% CI (0.06-0.94) remained as significant predictors of overweight and obesity. Lower physical activity levels (OR 3.23 (95%CI 0.88-11.90) for overweight and obese vs non obese) and lower intake of sweetened beverages (OR 0.24 (95%CI 0.05-1.18) for overweight and obese vs non obese) were non significant (P=0.07 and P=0.08 respectively). The child's sex, nationality, school district, paternal educational level, mother's working status, house hold size, activity and sleep duration, and feeding pattern during infancy were not related to weight status in the fully adjusted model.

Table 3.19 Odds ratio (95%CI) for overweight and obesity in children according to socioeconomic, dietary and physical activity factors, based on logistic regression analysis

Variable	Unadjusted OR (95% CI) and P value		Adjusted * OR (95% CI) and P value for overweight and obesity	
Sex				
Boys	1.00 (Reference)		1.00 (Reference)	
Girls	0.93 (0.66-1.31)	0.67	1.14 (0.37-3.51)	0.82
Nationality				
Qatari	1.00 (Reference)		1.00 (Reference)	
Non-Qatari	0.843 (0.53-1.35)	0.48	0.47 (0.10-2.14)	0.33
School district				
District III	1.00 (Reference)		1.00 (Reference)	
District II	1.514 (0.77-2.97)	0.23	2.75 (0.39-19.31)	0.31
District I	2.103 (1.11-3.97)	0.02	2.30 (0.34-15.45)	0.39
Mother's educational level				
High	1.00 (Reference)		1.00 (Reference)	
Medium	0.80 (0.49-1.30)	0.36	0.46 (0.14-1.89)	0.28
Low	0.51 (0.20-1.35)	0.18	1.04 (0.13-8.04)	0.97
Working status of mother				
Working	1.00 (Reference)		1.00 (Reference)	
Not working	0.83 (0.50-1.38)	0.48	1.03 (0.22-4.77)	0.96
Father's educational level				
High	1.00 (Reference)		1.00 (Reference)	
Medium	1.22 (0.77-1.94)	0.39	1.31 (0.38-4.49)	0. 67
Low	0.50	0.21	0.00	0. 99

	(0.17-1.46)		0.00	
Monthly family income				
High	1.00 (Reference)		1.00 (Reference)	
Medium	1.15 (0.57-2.30)	0.69	2.72 (0.25-29.09)	0.41
Low	1.00 (0.51-1.96)	0.99	11.34 (0.94-136.00)	0.05
House hold size				
High	1.00 (Reference)		1.00 (Reference)	
Medium	1.67 (0.57-4.90)	0.35	1.03 (0.11-9.52)	0.98
Low	2.37 (0.81-6.95	0.12	3.49 (0.36-33.85)	0.28
Physical activity level				
High	1.00 (Reference)		1.00 (Reference)	
Moderate	0.94 (0.41-2.16)	0.89	0. 19 (0.03-1.25)	0.08
Low	1.55 (0.81-2.95)	0.18	3.23 (0.88-11.90)	0.07
Dietary habits				
Sweetened beverage				
High intake	1.00 (Reference)		1.00 (Reference)	
Moderate intake	0.64 (0.32-1.28)	0.20	0.24 (0.05-1.18)	0.08
Low intake	0.55 (0.32-0.97)	0.04	0.34 (0.09-1.33)	0.12
Carbohydrate				
high intake	1.00 (Reference)		1.00 (Reference)	
Ideal intake	0.53 (0.25-1.12)	0.09	0.41 (0.09-1.92)	0.26
Low intake	0.730 (0.43-1.24)	0.24	0.24 (0.06-0.94)	0.04
Pattern of feeding				
Mixed feeding	1.00 (Reference)		1.00 (Reference)	
Formula feeding	1.76 (0.94-3.29)	0.07	1.87 (0.45-7.66)	0.39
Breast feeding	1.01 (0.56-1.82)	0.97	1.77 (0.46-6.79)	0.41
Duration of sedentary activities				

≥4 h/day	1.00 (Reference)		1.00 (Reference)	
2-<4 h/day	1.61 (0.70-3.69)	0.27	1.66 (0.45-6.14)	0.44
<2 h/day	1.33 (0.53-3.33)	0.54	0.86 (0.16-4.61)	0.86
Sleep duration				
≥11 h/day	1.00 (Reference)		1.00 (Reference)	
9-<11 h/day	1.05 (0.29-3.85)	0.94	2.23 (0.09-50.55)	0.61
<9 h/day	1.22 (0.34-4.41)	0.76	2.78 (0.12-62.45)	0.52

Model 7: *variable in model 1 (sex, nationality, and school district) and model 2 (parents educational level, family monthly income, and working status of mothers, in addition to house hold size), pattern of feeding during infancy, dietary habit (carbohydrate and sweetened beverage), physical activity level, seated and sleep duration.*

3.6 Obesity risk, based on scores from "The big five" test scoring worksheet

Overall 60.0% (n=114) of children ranked either excellent or good scores (11.1% and 48.9% respectively) for the "the big five" test, suggesting they had low risk of obesity. On the other hand 7.9% (n=15) and 32.1% (n=61) of children obtained poor and fair scores respectively in (**Table 3.20**) suggesting these children were at high risk of becoming obese.

There was no sex difference in obesity risk scores, and risk scores were not significantly different by nationality nor school district. Children who were overweight or obese were more likely to have fair/poor scores (at risk of obesity), compared to normal weight children (52.6% and 36.8% respectively). However, the difference was statistically non significance (P=0.09).

Table 3.20 Risk of obesity based on score from "the big five" scoring worksheet [175], according to sex, nationality, weight status and school district

Score rank	Gender			Weight status			Total
	Girls	Boys	p-value	Non obese	Over weight or obese	p-value	
low risk†	65 (59.6)	49 (60.5)	0.51	96 (63.2)	18 (47.4)	0.09	114 (60.0)
High risk‡	44 (40.4)	32 (39.5)		56 (36.8)	20 (52.6)		76 (40.0)
Total	109 (100)	81 (100)		152 (100)	38 (100)		190 (100)

P-values are based on Chi-squared test for difference between categories.
Data presented are numbers (percentages).
†Low risk =Excellent and good score
‡High risk = Fair and poor score
(See criteria for high risk of obesity (Box 2.4) method chapter 2)

3.7 The Schools environment

This section presents the characteristics of school environment, including the school food service, number of physical education sessions, schools health policies, and staff professional development. The school characteristics are compared to children's weight status.

3.7.1 School food service

All of the twelve schools provided a food service on a daily basis, though in none of them was food prepared on the premises. Seven (58.3%) of the schools open their canteens only during break times, while the remainder have an open canteen service throughout the school day. The majority of schools (n=9) have their food service run by external

food companies and the rest by the school canteen manager and in 4 schools the service is used for income generation. All the schools had water fountains or drinking taps, though the number of these varied from 4-10.

3.7.1.1. Types of food available in schools

All the schools provided a list of the food items available in their canteens, and the price for each item (**See table 3.21**). The most common food items for sale were pizza and pastries (91.7%), and sandwiches (83.3%). All schools sold water but other drinks available included sugar sweetened drinks (91.7%) and milk (including flavoured milk) (58%). Less commonly available food included French fries, vegetables, custard and yoghurt (8.3%). No school had a vending machine and none sold crisps, carbonated drinks, ice-cream, or chocolate.

Table 3.21 Food items available for sale in school canteens with mean unit price (QAR) and 95% Confidence Interval

Food items		Number (%) of schools selling item	Mean Price (QAR)(95 % CI)
Main Choice	**Pizza**	11 (91.7)	1.78 (1.78-1.93)
	Pastries	11 (91.7)	1.36 (1.32-1.40)
	Sandwiches/filled rolls	10 (83.3)	2.73 (2.65-2.81)
	Croissant	3 (25)	2.99 (2.91-3.08)
	Hamburger	3 (25)	3.28 (3.22- 3.33)
	Sausage	2 (16.7)	1.49 (1.41-1.58)
	French fries/hot chips	1 (8.3)	2.00 (-)
Snacks	**Cake**	4 (33.3)	1.56 (1.49-1.63)
	Biscuit	5 (41.7)	1.00 (-)
	Doughnuts	3 (25)	2.00 (-)
	Custard/cream caramel	1 (8.3)	1.00 (-)

	Fresh fruit	4 (33.3)	2.47 (2.28-2.64)
	Vegetable/salad	1 (8.3)	1.00 (-)
Drink	**100% fresh fruit juice**	3 (25)	2.68 (2.46-2.91)
	sugar drink/juice	11 (91.7)	1.14 (1.12-1.16)
	Milk (including flavoured milk)	7 (58.3)	1.40 (1.35-1.45)
	Water	12 (100)	1.00 (-)
	Laban/Yoghurt	1 (8.3)	1.00 (-)

3.7.2 Schools Physical activity service

All of the twelve schools had indoor and outdoor facilities for physical activity which were available on a daily basis during school day. In 3 of the schools the outdoor facility was open to students any time outside of the school hours, and in 8 schools the out door facilities were utilized by external clubs for sports.

The number of physical activity education sessions offered to children ranged between 1 and 3 sessions per week, and tended to decrease for older pupils (**Table 3.22**).

Table 3.22 Number of physical education session per week offered in school by grade

No. sessions/ week	No. (%) of schools offering this number of sessions					
	Grade 1	**Grade 2**	**Grade 3**	**Grade 4**	**Grade 5**	**Grade 6**
1	2 (16.7)	2 (16.7)	2 (16.7)	5 (41.7)	6 (50.0)	6 (50.0)
2	9 (75.0)	9 (75.0)	9 (75.0)	7 (58.3)	6 (50.0)	6 (50.0)
3	1 (8.3)	1 (8.3)	1 (8.3)	- (0.0)	-(0.0)	-(0.0)
Total	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)

3.7.3 Schools policies

Only 7 (58.3%) schools reported having a food policy and 6 (50%) a physical activity policy. None of the schools provided a copy of their policies, but item responded whether or not their policies covered particular areas (**Table 3.23 and 3.24**).

3.7.3.1. Food and nutrition policies

Most policies covered types of foods provided by food service and the availability of drinking water for students. The inclusion of food and nutrition in curricular content (n=5) the importance of staff acting as role models for healthy eating (n=4) and type and content of foods served at school events (n=4) were also often covered.

Table 3.23 Content of school food and nutrition policies (n=7)

Content of policies	Number of schools
Types of foods provided in the food service	6
The availability of drinking water for students	6
Class teaching programme related to food and nutrition in the curriculum	5
Staff acting as role models for healthy eating	4
Food served at school events	4
Vending machines at school	3
The use of Foods for fundraising	3

3.7.3.2. Sport and physical activity policies

All the schools that had a policy covered the use of school grounds outside school hours and the provision of access to sport equipment outside formal lessons. Only one included a statement about encouraging walking and cycling to schools.

Table 3.24 statement included in school sport and physical activity policies (n=6)

Content of policies	Number of schools
The use of school grounds "out of school hours"	6
Providing access to sports equipment outside of formal sport or P.E.	6
Encouraging participation in sports or other active programs	4
Promoting cycling and/or walking to school	1

3.7.3.3. Relationship between availability of school policy and children's diets, physical activity and weight status

There was no relationship between availability of school food and nutrition policies and children's healthy or unhealthy food consumption patterns. However there was a relationship between school food and nutrition policies and weight status. Among schools with a policy, the prevalence of obesity was lower (13.6%) compared to those without a policy (19.0%, p=0.02 for difference between proportions). However, this difference persisted after adjustment for child's sex, school district and socioeconomic factors (p=0.04).

In contrast, children in schools with physical activity policy were more likely to have higher levels of lower physical activity compared to those in schools with no policy (54.3% vs 41.2%), though the association was non significance (p=0.07). This association was no longer present after adjusting for child's sex, school district, socioeconomic factors and physical activity level. The availability of school physical activity policy was unrelated to children's weight status.

3.7.4 School staff professional development

In almost all schools (n=11) staff had participated in professional development training, of which, 10 had included nutrition and physical activity as part of the content. There were no relationship between such training among staff and weight status in children.

3.8 School classification for risk of obesity

A summary score for assessing school at high risk for obesity was derived to classify schools according to how obesogenic their environment is (see box 2.5, chapter 2). Generally, none of the schools ranked excellent scores for the school obesity risk classification, while 6 schools had a good score (4 for girls and 2 for boys schools); and one and 5 schools ranked fair and poor respectively.

Generally Boys schools tended to have lower scores, suggesting a more obesogenic environment compared to girls schools (P<0.01). Schools located away from the capital (district III) tended to have lower risk score for obesity compared to other schools. All the schools located in district III ranked "good" compared to half the schools (n=3) of district I schools, and quarter the school (n=1) of district II schools.

Comparison of individual overweight and obesity levels with school obesity risk classification shows that although the associations were non significant there was a trend for high rate of overweight/ obesity in schools with poor and fair risk scores (P=0.52). This pattern persisted after adjusting for child's sex, nationality and school district.

In conclusion, findings suggest that Qatar has a double burden of both over- and under-nutrition. Whilst there was a high prevalence of overweight and obesity 16%, (15.5 % girls and 16.5% boys); underweight was also prevalent 21.7% (20.5% girls and 23.1% boys). Prevalence of obesity reduces progressively by increasing distance from the central district (capital cities) p=0.01.

When comparing the prevalence of overweight or obesity (combined) according to the 3 definitions (WHO, CDC and IOTF) the estimates were similar but not identical (17.1%, 16.0%, and 14.7% respectively). Compared to the CDC, the use of the WHO criteria overestimates while the IOTF criteria underestimates prevalence, especially in boys. The prevalence of overweight and obesity by CDC and WHO criteria, showed very good/ strong agreement (Cohen's kappa=0.95, p<0.01); and similarly when the prevalence from CDC was compared to the IOTF criteria (Cohen's kappa=0.95, p<0.01).

Most children had lower than the recommended healthy intake for all food groups, generally boys consumed significantly higher amounts of dairy products, carbohydrates and fruit and vegetables. All children were reported to have consumed at least one of the

unhealthy food types over the past week. Again boys eat unhealthy foods more frequently than girls.

Generally, there were no differences between obese and non obese children in relation to dietary patterns, except for sweetened beverages which were more frequently consumed by overweight or obese compared to non-overweight children (P=0.04).

Inactivity was common in almost half of the study population, overall inactivity was higher in girls than boys (p<0.01). Overweight and obese children were more likely to be inactive and less likely to undertake moderate to high levels of physical activity, although the differences were not statistically significant (p=0.15). Similarly there was no significant relationship between sedentary activity and sleep duration and weight status, although obese children tend to sleep less.

The strongest influence on overweight and obesity in children were lower monthly family income, and lower carbohydrate intake levels.

School environment evaluation suggested that schools with food and nutrition policy, had lower prevalence of obesity (13.6%) compared to those without a policy (19.0%, p=0.02 for difference between proportions). The availability of school physical activity policy and professional development training among school staff was unrelated to children's weight status. Generally, girls' schools and schools located away from the capital had lower obesity risk.

3.9 Discussion

3.9.1 The burden of overweight and obesity

Although this study focused on overweight and obesity, the findings suggest that Qatar has a double burden of both over- and under-nutrition. Whilst there was a high prevalence of overweight and obesity (16%) underweight was also prevalent (21.7%). This combined nutrition problem is common in other developing countries [66], including the six GCC countries [15]. It has also been previously described among children aged 6-12 years [18;19] and adolescents aged 12-17 years [68] in the state of Qatar (see studies summary **Table 1.2** chapter 1). Underweight prevalence is lower in adolescents (7.2%) [68], and higher in the younger age groups (37.6%) with higher prevalence among boys than girls (54.8% vs. 23.1% girls).[18] The estimated prevalence of underweight in this study (21.1%) was similar between boys and girls (23.1% vs. 20.5% respectively). The prevalence estimates are sensitive to the reference equations and BMI cut offs used, and these differ in different studies. Nevertheless, whichever definition is used, a substantial proportion of children in this study were both in the overweight and underweight categories. Given the focus of this study, the remainder of the discussion will concentrate on overweight and obesity.

A study by Alkhalaf and colleagues conducted in 2004 also examined obesity prevalence among school children in Qatar. This study was based on 38070 students aged 6-12 attending 9 primary governmental schools, and defined obesity according to the sex and age specific BMI percentiles based on the CDC growth charts. The observed prevalence of overweight and obesity (11.6% and 14.7% respectively) was higher than that found in

this study (8% and 8%). Also unlike this study, they found a sex difference in obesity prevalence, with a slightly higher rate in girls compared to boys, (28.5% and 24.1% respectively), but similarly to our study, there was no difference in prevalence between Qatari (26.4%) and non-Qatari (26.2%) populations.[19] The observed differences are likely to be due to the wider age range included in that study; with inclusion of children aged up to 12 years. The study did not compare obesity prevalence between schools, districts or socio-economic factors.

Another national cross-sectional study conducted in 2002 by Qotba and AL-Isa used CDC BMI cut offs to assess obesity prevalence among 271 grade one children in Qatar. The reported prevalence in that study was lower than ours (6.3% and 3.7% for overweight and obesity respectively). They also reported a sex difference, with higher rates among girls compared to boys (14.2% vs. 4.8%).[18] However that study was based on a limited sample, and again made no comparisons by other socioeconomic factors.

When compared with the other GCC countries, a national household screening programme in different provinces of Saudi Arabia was conducted to determine the prevalence of overweight and obesity among children. The study included 12701 children (6281 boys and 6420 girls) with ages ranging from 1 to 18 years. They reported overweight and obesity in all provinces of Saudi Arabia although prevalence varied by district. The overall prevalence of overweight was 10.7% and 12.7% and that of obesity 5.98% and 6.7% in boys and girls respectively. In general, girls had higher prevalence of both overweight and obesity compared with boys.[13]

Sorkhou and his colleagues conducted a survey in Kuwait to determine the prevalence of overweight and obesity among Kuwaiti children (age 5-13 years). They found very high rates of obesity (19.9%) which was higher in girls than boys and with increasing age group (36.6% in those over the age of 10 compared with 9.1% in the younger age group).[12]

The above and other studies used different sampling methods, age groups and definitions. Overall prevalence ranges from 3.7% to 17.2%. Some of the studies from other GCC countries report that obesity prevalence is higher in girls [12;13;58;71] and others, in boys.[15] Generally overweight increases with age and later studies reported generally higher prevalence (see studies summary **Table 1.2** chapter 1). In this study the estimated prevalence of overweight and obesity is lower than that reported in Saudi Arabia (15.8% and 11.7% respectively in 6 - 18 years olds in 1994) [14], and Kuwait (obesity prevalence 19.9% in 5 - 13 years olds in 2002).[12] The prevalence is comparable to those reported in UAE (obesity prevalence was 7.9% for children aged 6-16 years in 2000).[11] The countries differences in overweight and obesity could be explained by a number of factors including different sampling methods, age groups and definitions, in addition to differences in socioeconomic status, cultural environment, and changes in lifestyle, such as preferences of food, dietary habits and physical activity habits.

3.9.2 Overweight and obesity prevalence in Qatar: comparison of three definitions CDC, WHO, and IOTF

Comparative analysis of the 3 definitions showed that the prevalence of overweight and obesity vary according to the reference set used. Flegal et al (2001) [183] compared the prevalence of overweight and obesity in US children with three sets of BMI reference values (CDC, IOTF, and a value developed by Must which was derived from National Health and Nutrition Examination Survey (NHANES I)). Each reference equation resulted in different estimates, being higher with the Must reference value compared to CDC, and lowest with IOTF. For boys the prevalence for overweight was lower with IOTF than with other reference sets while the rates for girls were more similar. Reilly et al (2000) [53] compared the sensitivity and specificity of the UK 1990 BMI reference values and the IOTF references in 7 year old children, against body fat measures estimated by bioelectrical impedance as the reference standard, the sensitivity of the UK 1990 reference was moderately high (88%) while the IOTF reference had low sensitivity which differed significantly between the sexes (boys 46% and girls 72%). The authors concluded that obesity prevalence will be underestimated when using IOTF reference and the underestimate would be more marked in boys than girls. Our results also suggested IOTF underestimates obesity relative to the CDC reference charts, and that boys were more likely to be affected.

Ramirez et al (2006) [61] compared the prevalence of overweight and obesity in children in northwest Mexico based on three sets of BMI reference values (WHO, CDC, and, IOTF). The pattern was similar to that found in our study, with prevalence estimates being higher (39%) using WHO followed by the CDC (20%) and IOTF (17%) definitions. Similar

patterns were reported by Kain et al [59] in a study of 6 year old Chilean children and Zimmermann et al [37] in 6-12 years old Swiss children. Thus several studies have shown that the CDC compared to IOTF reference value, leads to underestimation of obesity prevalence, which is more marked in boys than girls.[37;53;59;183]

As seen repeatedly, the various definitions do not give the same result as they were generated by using different data sets and approaches to set cut-offs. The WHO reference is based on the 1997 NCHS/WHO growth reference merged with data from the WHO Child Growth Standards (0-5 yrs) which used arbitrary statistical cut-off points at the 85th and 95th centiles. The CDC reference is based on the 1997 NCHS/CDC references based on the BMI distribution of representative samples of the US population, in order to avoid the influence of increasing obesity prevalence that has occurred among US children. Nevertheless, data on weight of children over 6 years of age from the last survey (NHANES III) were excluded.[54] This makes the CDC reference sets suitable for use in countries which have not yet faced the fully blown obesity epidemic. On the other hand, the IOTF reference use data from 6 countries (not including any Middle Eastern or African countries) and are based on BMI centile curves that passed through the adult cut-off points of 25. Cole et al (2000) [8] recommended use of IOTF for international comparisons.

Unfortunately, there is no gold standard to define obesity in children. In the absence of local age specific BMI references for children's and adolescents in Qatar, other GCC countries or most developing countries, other reference population data need to be used.

Standardised growth reference charts of BMI for Qatari children are not available. Thus the WHO growth charts are the most appropriate references for classifying children to a range of weight categories to be used in Qatar population and other GCC countries. These reference values were based on cross sectional data collected from six countries including Oman (one of the GCC countries). Qatar Health Authority is in the process of changing use of the CDC growth charts towards the WHO growth chart as the standard for children in Qatar. However, for epidemiological studies BMI level analysis based on CDC cut-offs will be needed, to make it easier to compare with our current national level data and previous studies.

3.9.3 Risk factors for obesity

3.9.3.1. Socio-economic status and weight status

Other studies from developed countries show that childhood obesity is most frequent in lower socioeconomic status groups [47;72] and those who are living in rural areas. [64;104] In contrast most studies from the developing countries show that childhood obesity is higher in upper socioeconomic status groups [22;64;72] and who are living in urban areas.[64] This reflects the nutrition transition, and different stages of the obesity epidemic, with developing countries being at an earlier stage. In this study, in the fully adjusted model, obesity was more common among children whose families had the lowest level of income compared to those with high family income. Yet obesity was more common in the urban capital city area.

As shown in other studies from developing countries, we found a higher prevalence of overweight in children from small house hold size and among those living in the capital city district. Consistently with another study conducted in Kuwait, parent's education and occupation were not found to be associated with childhood obesity.[184]

3.9.3.2. Dietary habits and intake among children in Qatar

3.9.3.2.1. Breastfeeding and childhood obesity

Previous studies have found a higher prevalence of mixed feeding pattern (breast fed and formula fed) in Qatar.[181;185] Breast feeding children was negatively associated with mother's educational level and monthly income. This finding was also observed in the present study. Al-Kayyali and Al-Tawil conducted a study in the neonatal outpatient clinic of the women's hospital in Qatar 340 women were randomly selected to evaluate breast feeding practices. They found that 32% of children were exclusively breast-fed, 55% had mixed feeding pattern (breast fed and formula fed) and 13% were formula fed.[185] A similar pattern was observed in a study by Al-Jaber and colleagues conducted in 1998. Exclusive breastfeeding was negatively correlated with mother's level of education (decrease with increasing mother education) and monthly family income.[181]

In meta-analysis concluded by Arenz and colleagues breast feeding was found to be associated with a small but consistent protective effect against obesity risk in children.[186] Other studies have also found that breast feeding is a protective factor against overweight.[187;188] A cross sectional study conducted in 12 communities in Beijing based on 4654 children aged 1-35 months; found that formula feeding and early introduction of semisolid food were significantly more common among overweight than normal weight

children and there were lower rates of exclusive breast-feeding in overweight children.[188] Armstrong and colleagues found a similar pattern in 32200 Scottish children at age 39-42 months in 1998 and 1999, and the effects remained after adjustment for the potentially confounding effects of socioeconomic status, birth weight and sex.[187]

Another study conducted in the US in 1997 among adolescents (aged 9-14 yrs) with 8186 girls and 7155 boys also indicate lower prevalence of overweight in those who were predominantly breastfed in the first 6 months of life. The reduction of risk was approximately 22% and the protective effect increased with increasing duration of breast feeding.[189] Similar findings were reported in 9357 children age 5-6 yrs from a cress sectional study in Bavaria (southern Germany). [190] So breast feeding may prevent later overweight. This effect is more likely to be related to the composition of breast milk than lifestyle factors associated with breast feeding.

In our study the prevalence of overweight and obesity was higher in formula fed children compared to those who had some breast feeding. Public health strategies to encourage continuous promotion of breast feeding could help halt the rising trend of obesity.

3.9.3.2.2. Dietary habits among children in Qatar

Most countries in Asia, Latin America, Northern Africa, and the Middle East have experienced a shift in dietary patterns and related disease patterns over the last few decades. Dietary change includes a large increase in the consumption of fat, added sugar in the diet, and marked increase in animal food products, with a fall in total cereal and

fiber intake [65;67;191], which suggests shift from traditional foods and transition to the higher fat Western diet patterns.

Our finding suggested that there were no differences between obese and non obese children in relation to dietary patterns, except for sweetened beverages which were more frequently consumed by overweight and obese compared to non-overweight children. Our results are comparable with the results of Danielzik [104] that showed no differences in dietary habits between overweight and non obese children. Another study conducted by Janssen et al. found no consistent patterns for the relationship between fruit, vegetable, and soft drink intake with overweight.[65]

3.9.3.2.3. Sweetened beverage consumption is related to obesity

Although the cause of obesity is likely to be multifactorial, our finding suggested that sugar sweetened drink consumption could be an important contributory factor. These findings are similar to many previous studies which found that carbonated drink consumption was associated with higher risk of obesity.[90] A randomized controlled trial showed that an intervention targeted at reducing carbonated drinks in school children was associated with reduced obesity [117] further indicating that this is a causal link.

Public health strategies should discourage consumption of sugar sweetened drinks, and initiate efforts to promote the consumption of other beverages such as water, low fat milk and fresh fruit juice. School policies should also follow this.

3.9.3.3. Physical activity and inactivity level among children in Qatar

Physical activity patterns of children have changed as a result of an increase in time spent in sedentary pursuits and decreased opportunities for physical activity in schools and communities.[65;192] Janssen et al. found that the likelihood of being overweight was significantly lower with greater physical activity levels in studies from 29 out of the 33 countries (88%). Similarly they observed higher rates of overweight with increasing television viewing time in 22 out of 34 countries (65%).[65] The relationship between increased TV viewing and obesity has also been reported in other studies.[192]

Physical activity related factors associated with childhood obesity development in most other studies, including inactivity [65;193] and sedentary activity [193] were not associated with obesity in our study, although there was a borderline significant association between higher risk of obesity and low levels of activity in the fully adjusted model. This weak association was also seen in a study by Moussa et al. [184] but in both studies, is likely to be related to the subjective nature of physical activity recording and inaccuracy in data ascertainment.

Nevertheless, we found high levels of inactivity among children, which is similar to findings from other studies internationally. [65;193]The average time spent on sedentary activities (median and IQR 4.86 (2.28-6.93) hour/day) were far more than that for exercise (median and IQR 1 (0-2.58) hour/day).

Our data support the hypothesis that sleep duration is inversely associated with obesity in children, although the effect was of borderline statistical significance. Almost all studies show that short sleep duration is associated with obesity.[193-195] Bayer and colleagues used nationally representative data from 7766 German children from 3-10 years of age. They found that sleep duration is associated with higher body fat mass resulting in higher BMI, and there is no significant age dependency of the effect.[195] Another study conducted in Turkey with 5358 children aged 6-17 years and a study conducted in Hong Kong with 6-7 years old children shows similar findings.[193]

In this study the average time spent sleeping was around 9 hours (median and IQR 9 (8-9.86) hour/day).

3.9.4 School environment and obesity

In this study of a representative sample of Qatar primary schools, we found that the school food environment was conductive to healthy food choices for the children at those schools and that this was reflected in the high sales of relatively healthy foods from the school food services. Pastries, pizza, sandwiches, and water were the most available food items. Whilst many unhealthy food items (crisps, carbonated drinks and chocolate) were not usually available for sale at school food services, sugar sweetened drinks were common.

The results presented in this study highlight the importance of promotion of healthy food and nutrition policy and food choices in schools. Carter and Swinburn found that the food environment in New Zealand primary schools was 'obesogenic', and they suggested an urgent need to promote improved school food policies.[141] Previous studies have found associations between the food school environment (e.g. number of vending machines, availability of unhealthy food choice in canteen and availability of school food policies) and students eating behaviour.[144;196;197]

3.9.5 Strength and weakness

3.9.5.1. Strengths

Obesity is a growing problem worldwide, most studies on obesity prevalence and its causes have been conducted in western populations. Although there have been few previous studies to examine the prevalence of childhood obesity in Qatar, this is the first large study which targeted young school children to examine both prevalence, and some of the risk factors for obesity in a random sample of children in Qatar, and the BMI was assessed objectively using standardised protocol and was calculated from measured rather than reported heights and weights. The sample was selected to include children from different districts, making it more representative and allowing some comparisons between districts. The study confirmed some of the known risk factors for obesity demonstrated in other international studies, which supports its validity.

3.9.5.2. Limitations and difficulties encountered during data collection

Although this study makes an important contribution, there are several potential limitations that deserve to be mentioned. Firstly, the weight and height measures were obtained from routine service data for pre-school entry medical examinations, and were not undertaken under research conditions. Therefore different personnel in different health centres were involved in undertaking measurements and instruments were not standardized. Nevertheless all the nurses undertaking measurements were trained according to specified protocols and height and weight measures were available for 100% of the population. However, we do not anticipate that these limitations resulted in large or systematic errors in data collection.

Secondly, although researcher planned to validate the FFQ and physical activity questionnaire against a 1 day diet and physical activity diary, unfortunately neither in the pilot stage nor during the main study, were any of the diaries filled out or returned. Mothers commented that the diet and physical activity dairy was time-consuming and they did not have time to complete these or they are not used to this type of question or activity.

Thirdly, since food consumption was assessed using FFQ (past 7 days) and Physical activity and sedentary activity was assessed using IPAQ, all variables were self- reported and misreporting may have influenced or diluted our results. Some questions were poorly completed and not included in the final analysis. For example weight and height measures for parents and other siblings were not reported. The physical activity

frequency and duration, and sedentary activity times were also not complete and missed out or incompletely returned by some of participants. Nevertheless, the measures do give some valid signals which are consistent with the literature, which provides some validity to our findings.

Despite the above limitations, the present study has made an important start in investigating overweight among children in Qatar and can form the basis for the development of appropriate obesity prevention interventions for the local population.

Chapter 4

This chapter presents the qualitative results of this research. To begin with, I will briefly outline the demographic characteristics of the focus group participants. I will then report the results related to the participants understanding of overweight and obesity, the participants perceptions on what causes overweight and obesity in school children in Qatar, the perceived main modifiable contributing environmental factors and the identified facilitators and barriers for implementing interventions. The findings are discussed in the context of the international literature.

4 Result Qualitative component

In total 17 participants were involved in 5 focus groups, all of them female. The majority of participants were from Qatar (11 participants), the remainder being Palestinian (n=2) Iranian (n=2), Jordanian (n=1), and Pakistani (n=1). Their age varied from 24 to 41 years; nine were mothers with between 2 to 6 children; and the children's ages ranged from 14 months to 20 years.

The findings presented in this section came from the two parts focus groups, with five identity groups as follows: School Canteen Managers (1), Teachers (2), Mothers (3), School Nurses (4), Physicians and Local Government representatives (5) (representatives from Hamad Medical Corporation, Ministry of Health, Ministry of Education and Super Supreme Council of Family Affairs).

Participants were encouraged to discuss their understanding and beliefs of overweight and obesity and their perceptions on what causes overweight and obesity in school children in Qatar. Participants were then encouraged to identify how we could prevent

childhood obesity, specifically what could be done about obesity particularly with children aged 6 to 7 in the Qatar population. Participants were then asked to prioritize appropriate measures and ideas in term of importance, changeability and feasibility for implementation in Qatar. Subsequently, they were asked what they felt were the eight most practical and changeable intervention influences overall on obesity prevention.

Different ideas and components were discussed and prioritized across the groups. Some were more frequently discussed than others; the common settings were family, school and community.

4.1 Concepts of overweight, obesity and obesity in children

At the beginning of each focus group, participants explored the concepts of overweight, obesity, and obesity in children.

4.1.1 Perception of over weight and obesity

A consistent message across all the groups was that overweight and obesity were not distinguishable in Arabic. The concept was usually related to abnormal weight gain and body image (appearance).

Box 4.1 Quotes for perception of over weight and obesity

For me overweight and obesity in Arabic terminology are considered one thing, but as an English terminology there is a difference, when I said overweight differs from obesity. P2 FG5

****

Honestly overweight is similar to obesity. P5 FG2

****

Overweight and obesity all are the same things. P2…all considered as one [frame]. P1 FG1

****

Both overlap with each other because both of them are related to increase in size. P2 FG3

All groups talked about abnormal weight gain compared to height; for example, a Nurse participant defined overweight and obesity as *"increasing in body weight according to the height"*. The Mothers' group defined obesity as "weight gain above normal limits" and they spoke about obesity as weight gain which inhibits the child's ability to function (move).

Only the 'medical ' participants used BMI terminology. In general both groups correctly understood the BMI term and defined it correctly for adults. However for the definition for children, nurses did not discuss the issue in detail but noted that "*it is different between boys and girls*", while in the physician group the discussion demonstrated their understanding of the difference between the adult and children definition (the interpretation of BMI for children is based on age and sex specific percentile).

Box 4.2 Quotes for perception of over weight and obesity definition

Example of definition:

Overweight and obesity in general also can be calculated by the BMI of the person, and they calculate the BMI according to their present weight and height, and if the BMI is more than the accepted amount then they call it as obesity. P1FG4

****

Physical condition defined by BMI more than. 25 P1 FG4

****

An increase in BMI above the normal limits. P1 FG 5

****

Increasing body fat comparing between height and weight. P2 FG 1

****

Increase weight compared to height. P3 FG2

****

Weight gain above the normal limits which leads to difficulty of movement. P1 FG3

****

Obesity or overweight is "increasing in body weight according to the height".P3 FG4

****

Overweight is increased weight above the normal limitsP1 FG1.

****

It is imbalance of taken in and taken out of calories. P1 FG4

In addition the Canteen Manager, Nurses and Mothers conceptualized it in relation to appearance and referred to children who look big and have wide shoulder, bone thickness, and accumulation of fat.

Box 4.3 Quotes for perception of over weight and obesity definition

It is increasing in body fat collected in certain area of the body. P1 FG4.

****

Also it can be defined as an accumulation of the extra fat in muscles in specific different parts of the body, like, abdomen, back, and the sides etc. P3 FG4.

****

Increasing in the size over the limit. P1 FG3.

****

Increase fat percentage over the body. P2 FG1.

4.1.2 Perceptions of whom is affected by overweight and obesity and why it is problem

4.1.2.1. Who is affected by overweight and obesity

Participants believed that overweight and obesity is a common problem in Qatar, involving every age group including children, youth and adults. They were aware of the increasing obesity visible in the Qatar community, for example one of the Teachers noted that number of obese children is more now compared to previously, when obesity was rarely seen in children. The Teacher focus group noted that obesity affected *'females more than males'* and this is most likely related to female inactivity (the social culture influences in Qatar mean that males engage in the public sphere more frequently than females do). Participant 5 from the Teacher group expressed her own experience with obesity as a result of inactivity *"after my graduation from the university and before I joined my work, I gained 15 kg all that because I was sitting all the time and eating food from restaurants"*.

Box 4.4 Quotes for who is affected by overweight and obesity

The majority of the Qatar community is suffering from this problem, especially females. It has become a problem that every body is trying to solve. Everywhere, everybody talks about diet. P5 FG2

****

Obesity is seen not only in children also found in youth. P3 FG5

****

When we were young rarely we saw obese children. P1 FG2

4.1.2.2. Perceived consequence of obesity and why it is problem

Future complications of obesity and child self esteem were perceived as important consequences of obesity in children. The Canteen Manager and Teacher focus groups discussed weight in relation to poor self esteem in children. In addition, they mentioned future complications of obesity like diabetes mellitus and hypertension.

Box 4.5 Quotes for perceived consequence of obesity and why it is problem

Children with overweight will be disappointed with them self and will not play with friends. P1 FG1

****

Obese children had a difficulty in movement...and usually feel embarrassed to run in front of other children at the physical activity education session. P1 FG2

****

Children will not be going to street to play with peers because other children tease the obese one…even they do not understand obesity and why. P3 FG1

****

Any one who had obesity mostly will have a disease if not at young age will have it when become older may get diabetes, or other disease. P1 FG1

****

Dangerous in future of being obese like hypertension, diabetes or other problem that can affect them in future. P1 FG4

4.1.2.3. Perceived size of problem

Participants were aware of the size of the obesity problem, and it was seen as a common problem not only in Qatar but as an international problem seen in the developing and developed countries too.

Box 4.6 Quotes for perceived size of problem

Obesity increased not only in Qatar but everywhere P2, it is an International phenomenon. P3 FG5

****

What is going in our community is similar to what happened in other community, European communities but we are at the start point for the transformation. P1 FG5

****

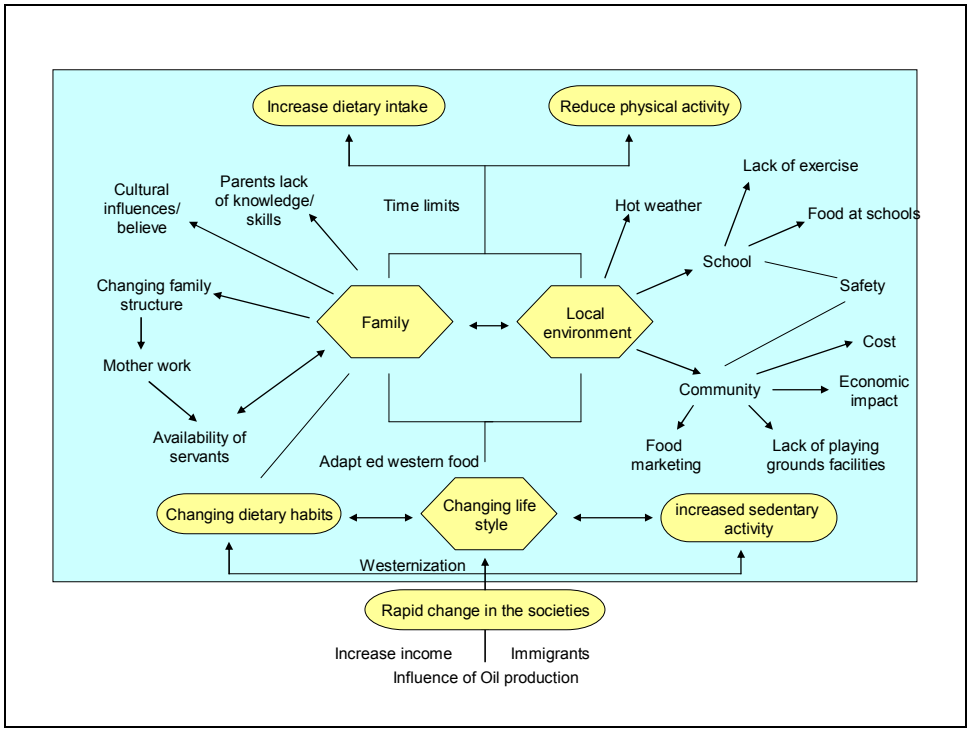
Obesity is present in other communities considered to have greater health awareness like USA. P2 FG5

When participants explored the concepts of overweight, obesity, and obesity in children there was a limited discussion about body image (appearance), weight gain, and BMI with more focus on perceived causes of overweight and obesity. This is now discussed.

4.2 Perceived causes of increased obesity in school children in Qatar

The overall themes that emerged across all the focus groups are summarized in (**Figure 4.1**). The overarching messages that emerged were consistent across the focus groups, and were related to changes that happened in Qatar society as an influence of oil production.

Figure 4.1 Perceived causes of increased obesity in school children in Qatar



Now I am going to talk about culture in the state of Qatar and changes happening in the community as a consequence of oil production (a summary of what was presented in the introduction chapter 1), then I will discuss the perceived causes of increasing obesity in children in Qatar from the participants point of view.

After oil discovery in 1940, the state of Qatar passed through rapid phases of socioeconomic development as described in chapter 1. Briefly, this was characterized by a remarkable increase in national as well as family income which led to changes in the society as follows: a change in the family structure from an extended family towards nuclear family, an increase in the number of working mothers, increasing dependence on domestic helpers (servants) to look after children and to cook for the family, a change in food consumption patterns with consumption of 'western' food in addition to other foods

associated with economic immigrants. All these changes are associated with changes in life styles that have an influence on dietary habits and physical activity.

Family structure changed from the extended family living in large houses to nuclear family living in family compounds with separate houses or living in the same neighbourhood area. At that time the situation was considered safe to allow children to play in the neighbourhood area without adult supervision as every body knew each other and it was rare to see strangers in the area. However, the situation changed as the family structure shifted to a more nuclear unit living in separate houses and mostly away from the family house. As a result, children's play shifted to inside the house with children not allowed to play outside in neighbourhood areas without supervision.

Mothers' roles were considered very important as she looked after the family, cooked meals and looked after her children with assistance and advice from the grandmothers. But with increasing numbers of women continuing their education and/or going to work, initially grandmothers became responsible for looking after children during the mother's absence. Later on, families became dependant on domestic helpers and servants. The father's role remains important as he is considered the head of the house and controls food choice at home as well as having financial responsibility.

Before the oil discovery food patterns were simple and depended on dates, milk, rice, bread, and fish. After the oil discovery, there was a change in dietary habits characterized by excessive and more diverse food intake. The introduction of western types of food,

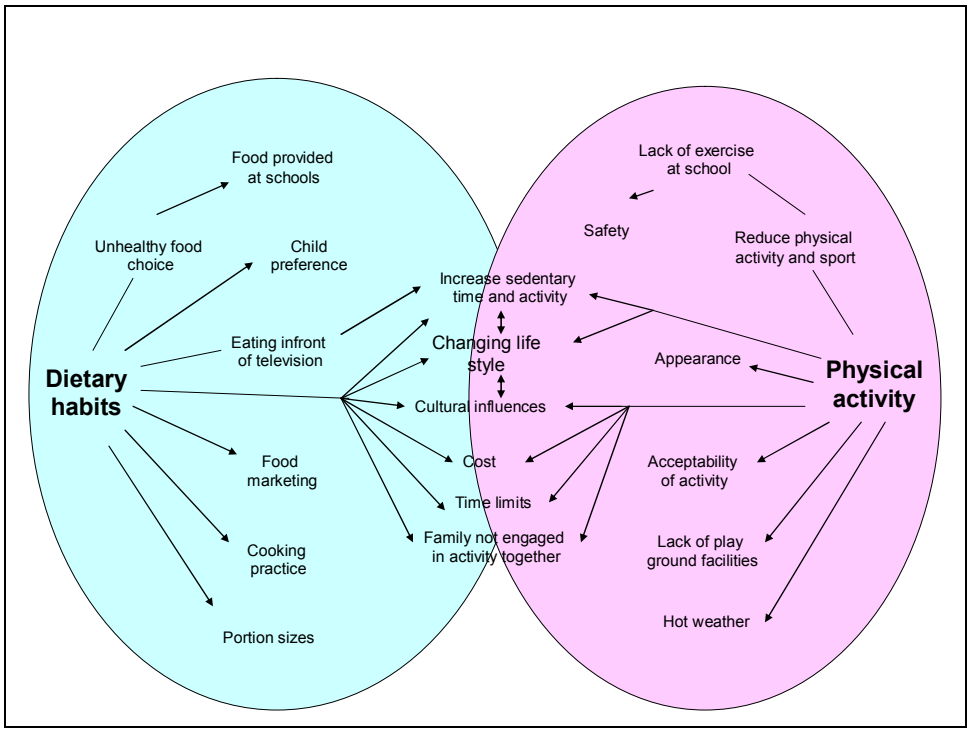
processed fast food and new food habits introduced by immigrants also contributed (see the Introduction section **1.5.1 and 1.9.1**, chapter 1).

Traditionally the main meal is eaten at lunchtime, with lighter meals at breakfast and dinner (see introduction). Families in Qatar used to eat all meals together, served in a traditional way. Nowadays families do not always engage in eating meals together as before.

Now I am going to discuss the participants perceptions about potential causes of childhood obesity in Qatar.

The perceived causes were related to 'dietary habit' or 'physical activity' or both (**Figure 4.2**). Three main themes emerged relating to these two factors which are summarized as, local environmental factors, family, and changes in life style influence.

Figure 4.2 Perceived causes of increased obesity in school children in Qatar related to dietary and physical activity habit



4.2.1 Local environment factors

The local environment, including geographic climate, community and school influence plays an important role in encouraging children to adopt healthy behaviours regarding healthy eating and physical activity habits.

The local environment has an important role in encouraging children to be physically active; however hot weather, unsafe roads for walking or cycling, and a lack of playgrounds were cited as important factors discouraging children from being physically active. In addition, food marketing, cost, and the types of food provided at school, were thought to play important roles in discouraging children from developing healthy eating habits.

4.2.1.1. Geographic climate

Participants from Physician and Government Representatives, Canteen Manager and Nurses focus groups recognized '*hot weather'* as an important factor discouraging children from being physically active; and this was seen as a leading factor to obesity.

Box 4.7 Quotes for the effect of climate

What I mean hot weather not encourage people to do sport in our communityP3 FG4

****

Of course environmental factor had an important role especially weather here not helpful to do any activity P1 FG5

4.2.1.2. What is available in community influence

4.2.1.2.1. Lack of recreation centre

'Lack of playing grounds' was identified as an important factor that discouraged children from being physically active. Canteen Manager and Physician and Government representatives reported that very few leisure facilities were available and expressed the need for a greater number of facilities, for example recreation centres, clubs and even the number of parks.

Box 4.8 Quotes for the effect of lack of playing grounds

In addition to unavailability of recreation centres that encourage people to attend on daily basis, even if it is available in very small number and not near houses or living areas because what we have are few parks and not available every where. P1 FG5

4.2.1.2.2. Acceptability of activity

Canteen Manager and Physician and Governmental focus groups were the only groups that mentioned *'acceptability of activity'* in Qatar community, for example no suitable places for girls to practice physical activity in the open area, and the need to have places suitable for families to supervise children while playing.

Box 4.9 Quotes for acceptability of activity

Clubs are available in our countries but not all of us can go there to practice physical activity because of our concerns to our religious and cultures. P1 FG5

****

Regarding open playing area it should be place suitable for children and family all together so parents can observe their kids while they are playing and it should be suitable for different age level. P1 FG5

4.2.1.2.3. Safety issue

'Safety' was one of the recognized concerns for the participants from Canteen Manager and Physician and Government representative focus groups for children playing in open area or in a club with a lack of supervision.

Box 4.10 Quotes for safety concerned

One of the important points is child age, the differences of age in the playing grounds. some of the families do not like their kids to play outside because of their fears. P3 FG 1

Unsafe roads for walking or cycling were recognized by all of the focus groups participants as an important factor discouraging children from being physically active. Parents become reluctant to allow their children to walk to school or to play outside unsupervised because of the road safety and changes happened in the community as it is considered unsafe.

4.2.1.2.4. Food marketing

Participants recognized that the local environment could discourage children's healthy eating habits. For example, commercial advertising for unhealthy foods, increased numbers of fast food outlets and unhealthy food options in the community in general and particularly near children's playing spaces. In addition participants noted the availability of unhealthy food choices in school canteens and even the supplying of fast food meals during school trips.

All the focus groups except the Nurse focus group recognized the influence of commercial advertising through television and newspapers for fast food. In addition they noted the promotion of fast food by the giving away of free toys with meals which encourage children to choose fast food meals. Participants also commented on the availability of the fast food outlets near children's playing ground spaces.

Box 4.11 Quotes for the effect of food marketing

You can see advertisement every where in news paper , television*, and fast food utility themselves…like Kentucky offering free gift with each meal for children that encourage children to chose fast food every time.P2 FG3*

****

Here in Qatar you will find that any playing places for children are accompanied by fast food restaurants. P1 FG5

4.2.1.2.5. Cost of food and activity

Financial ability to provide healthy options for children, such as *'cost of food and exercise facilities'* were recognized by the focus group participants as an important factor that discourages healthy behaviour and habits for children.

Participants from all the focus groups except the Nurses group describe that *'cheap price*' for fast food meals encourage people to buy these meals as every one can afford it in comparison with the *'healthy meal price'*. Participants from the Canteen Manager and Physician and Governmental Representative group also acknowledged that families may not be able to afford the cost of their child joining clubs especially if they have more than one child.

Box 4.12 Quotes for the effect of cost of food and exercise facilities

Example of food cost:

You will find the fast food meals cheaper than home meals or healthy meals. And with [inflation] and expensive life now a days I can pay 10 Riyals for child meals and juice but not to pay 200-300 riyals for healthy and complete meal I can not afford it.P1 FG5

****

Example of leisure activity cost:

There is an important point family financial level may not allow family to join these clubs for swimming or playing. P3 FG 1

4.2.1.3. School influence and role

4.2.1.3.1. Physical activity at school

Participants reported that changes in school routines were resulting in children getting minimal physical activity while they are at school. For example, all focus groups recognized factors related to *'reducing physical activity at schools'*, changes in school activities so that not all schools practiced morning exercise at the start of the school day compared to previous years. Participants also noted students were prevented from running or playing at break time outdoors, and indoor activity rooms were kept locked most of the time outside sport lessons. These restrictions were done as a protection measure because school staffs were concerned about children's safety and possible injuries.

An interesting issue was raised by the Teacher focus groups about families' refusal for their children to play at school physical activity lessons. Teachers mentioned that '*one mother seemed to not want her daughter to do physical activity*'; the reason was postulated to be related to the child's refusal to play, especially if she is obese, either because of tiredness or embarrassment when practicing physical activity in front of the other students. Teachers were aware that self esteem and body image affected student's participation in physical education sessions.

Box 4.13 Quotes about reduced physical activity at school

Reduced physical activities especially at school become less than before. In our time physical activity was vital but now situation differs, physical activity movement at the start of school days stopped now or rarely done. Sport activity becomes limited on the indoor physical activity. P2 FG5

****

Now no sport in our schools not like before when we were young, now they reduced sport time and locking sport room fearing from children injury in case they fell down. In our days we were playing, running and moved more even our faces were pinkish. P3 FG 1

****

Children not practicing physical activity at school because mother send a letter stating that not to ask her daughter to play at physical activity session at school, even she did not have a medical problem. P5 FG2

4.2.1.3.2. Time and staff issue

Participants from the Teacher and Mother focus groups reported that the school curriculum had limited time for physical activity education lessons; in addition there are no unified guidelines for physical activity education at schools, so it depends on staff experience and interest. The Teacher group noted that some of the physical activity teachers just sit and give directions to the students verbally, and sometimes the teachers just ask the students to play by themselves. Another issue was related to the school curriculum's tight schedule and that some of the physical activity lessons were being replaced by maths or science lessons (although physical education sessions comprise just 1-2 sessions per week).

Box 4.14 Quotes refer to time and staff issue

School curriculum long, and had tight schedule, time just enough to be compliant with curriculum requirement. P2 FG3

****

Physical activity education had no guideline or curriculum - still it is under development. P5 FG2

****

At school we should have extra physical activity *education session but the problem is we do not get enough support or approval, some time the situation is the sport teacher sit all the time and not engage in sport activity with children. P3 FG2*

4.2.1.3.3. Food at school

Participants talked about *'school food provision'* and unhealthy food choices offered in school canteens. All focus groups recognized that regardless of policy directing schools to supply healthy food, meals were still unhealthy and often contained high fat and energy items; such as pizza, and doughnuts. Even with all the restrictions preventing children from bringing unhealthy food from home (for example crisps, chocolate, and carbonated drinks), canteens still occasionally included unhealthy choices. Mother and Teacher focus groups noted that fast food meals were supplied during school trips; when a mother disagreed with this, the teacher defended that choice as it was a more affordable way to have a complete meal for children that cost only 10 Riyal.

Box 4.15 Quotes related to food at school

School when organizing trips collect money to buy fast food meals for children, like that day they took my son to Land Mark Shopping centre for playing or to the zoo.

They buy for them from Kentucky. And they are not encouraging children to eat healthy food; kids do not eat fruit. P2 FG3

4.2.2 Family influence and roles

One of the commonest themes emerging across all of the groups was the importance of the family as a leading cause of obesity in children.

When considering *'family influence'*, all the focus groups identified parents as playing a significant role in influencing child obesity. The strongest emphasis was given to the parenting skills, mothers working, fathers' roles and the influence of other family members.

4.2.2.1. Parenting skill

Participants from all the focus groups recognized the important of *'role models'* for healthy behaviours, for example sharing food, amount, portion size and types of food consumed at home. Although it appeared more difficult for both parents to be healthy due to increased availability of fast food in the community, participants felt that discipline has to come from the parents and that they had to be more controlled for themselves and their children.

Box 4.16 Quotes about parenting skill

Example of parents as poor role model by teacher:

Family members are a role model by eating sweets and drinking Pepsi in front of the

children. Even our own food choice, sometimes we eat these things. I prevent my children then my child sees me eating this thing and asks how come you eat that? P1 FG2

****

When the father, mother and all the people around him all are obese, so child will not have the incentive to change his food habits. P3 FG2

****

Example of food custom at family level by nurse:

It's also because of the way they are sharing their food, and kids have a reason that, because my mom is fat, I am fat It's because all of them they are eating. The kids will eat too, they eat the same food, .if they have some high calorie food on their table, all are eating the same. Not only because of hereditary factors, It's also because of sharing the same food. P2 FG4

In addition the Teacher group felt that *'parents lack skills'* to know how to tackle the obesity problem.

Box 4.17 Quotes about parent's lack of skills

Example of parents lack of skill to tackle obesity problem:

Families are not engaged in sport activities together; or discuss how to solve problems from an early stage if they find that their child is obese, what can be done? P3 FG2

Parents were also considered to instil unhealthy dietary behaviour in their children unintentionally through other unrelated factors. For example food may be used to express affection for their children; participant 3 from the Nurse focus group mentioned that

parents try to show their love for their children by giving them lots of pocket money, which they then spend on extra food. Another issue was giving children unhealthy food as incentives, for example rewarding children with food or sweets reinforced unhealthy eating habits.

Box 4.18 Quotes about parent's unhealthy behaviour

Example of parent unhealthy behaviour:

I notice that some of the mothers give more money to their kids, he does not know what is the right or wrong especially for the age 6-7 years so he will buy more. Some children I found have 50 or 100 riyal, may be she says to kids buy by 5 riyals but the children will buy more and more as they can't control, who will control him. There was a child who bought a lot of sandwiches and he was suffering from overweight, this is very important problem some of the mothers they are thinking that it is about spoiling their children and caring of their children but actually she harms her children by giving a lot of money and make them to eat more and more and that is unhealthy and this is wrong. P3 FG4

****

Example of using unhealthy food habits as incentive:

If the children are angry the parents give ice-cream…..don't cry mama my love do not cry I will give you chocolate I will give you ice-cream .They will not promise them apple or juice. P2 FG4

The Teachers and Mothers groups identified that *'families are not engaged in activities or eating meals together'* as in the past. This was considered one of the reasons why children did not know what to eat and their dependence on fast food choices.

Box 4.19 Quotes about families not being engaged in activities together

Example of families not engaged in activities or eating meals together:

Nowadays families are not joined all together during meal times except in the weekend. P2 FG3

****

Children are not eating their meal or lunch with the family. Any time they feel hungry we will bring plate to the kids, and they do not sit with the family at the table and do not see what their family eats. Their meals usually differ mostly hot dog, fast food meal, chicken nugget, or andomy (noodles). P3 FG2

All focus groups participants except those in the Mothers group recognized *'lack of parent control'* could discourage children's healthy eating habits; participants identified that busy parents use food as a distraction to occupy their children so allowing them some free time. Junk food is used as a means to make parenting easier- for example, by keeping the children quiet (see the first 2 quotes in the **Box 4.20** below). In addition participants noted influences outside the home, for example when children visit friends' or other family members' homes and where they may be allowed to eat unhealthy foods (see the 3rd quote in the **Box 4.20** below).

Some parents lacked ability to effectively discipline their children and as a result, often ended up giving their children whatever they demanded. So the parenting skill greatly affected the children's nutrition because the mothers were unable to set limits in their children's diets.

Box 4.20 Quotes about lack of parent control

Parents give children whatever they want just to get rid of them - especially when parents have just returned from work. P4 FG2

****

Mothers feel happy and relieved when she sees her children eating in front of the television and not causing a headache for her. And usually we give food to keep them silent, or even by giving them game boy station (computer or electronic game) to play with. All that leads to obesity. P1 FG2

****

Example of parent lack of control:

I feel that the problem is the mother and father had an important role but they can not control their children, because children communicate with others and they may eat any thing in the absence of their parents for example when visiting friends, neighbours or relatives. They lose control some times. P5 FG2

****

Some of children are greedy for food. Even if they take their meals whenever they see others eating they would like to eat with them even if they are not hungry.. it becomes as a habit. P2 FG2

4.2.2.2. Lack of health awareness and knowledge

All groups except the Mothers group identified '*lack of health awareness and knowledge'* as an important factor leading to obesity of children.

Box 4.21 Quotes about lack of health awareness and knowledge

Unavailability of health awareness in general, mothers basically, but all the family members are responsible. P3 FG 5

****

Lack of awareness and reduced activity are related to whole family and not only children.. We are the leading cause to make children inactive or dependant on the domestic helpers even to carry school bag. By raising our children in that way wrong message passes from parent to children. P3 FG 5

****

Obesity problem is related to the mother or family. At the beginning they force the children to eat, and then it will become a habit for the children. P3 FG5

You are right. Families encourage children to eat and eat, and all the food is unhealthy - that leads to obesity. P2 FG5

There was an argument made by one of the Physicians that the obesity problem is not an indicator of a lack of awareness and knowledge in Qatar, as the problem is also present in highly educated and developed countries.

Box 4.22 Quotes from physician focus group

P1: Obesity of children reflects community lack of awareness for health problem and complications related to obesity.

P2: no I do not think so, as obesity is present in other communities considered to have greater health awareness like USA, it could be due to changes happening in lifestyle and culture but not lack of awareness.

P3: yes obesity occurs in the highly educated communities, but our lifestyle lack of activity is not for children only but also for the entire family members. We introduced bad habits and taught our children to become dependant on others. all that wrong behaviour we practice ourselves as a family, father, mother, and the children will follow us so the problem is lack of awareness. FG5

When considering '*wrong beliefs'*, all groups except the Mother group mentioned this factor. Participants explained that mothers wrongly believed that the weight problems of their child would disappear when they grew up. There was also a misperception that *'fat*' babies are healthier than *'thin*' babies. Also there is an emphasis on children eating enough when they are younger, and sometimes children are forced to eat more than they need initially which results in this over-eating becoming a habit. Participants acknowledged that some parents failed to recognize their child's weight problem and many mothers who had overweight children did not recognize their children were overweight. Participants felt that this was one of the obstacles for mothers in seeking medical advice or attending educational activities.

Box 4.23 Quotes about wrong beliefs

Family, and mothers more specifically, think and believe their child is not eating well and looking thin. P1 FG1

My niece had normal weight but her mother usually insisted that she had not eaten well so she gave her extra amount of food until she became fat. P3 FG1

****

Some of the mothers feel if her child is over weight that is a good thing and saying [thanks god]my child looks healthy. P2 FG2

****

In our community we like children to be fat so to look more beautiful. P2 FG1

****

Lack of recognition for the problem from the family or for the child; rarely find family thinking about their children as obese,, they believe obesity is for adults only even if they are seeing their child is obese. P2 FG2.

****

Some of the people had believed that the obesity of their children will disappear when they become older by it self. P3 FG2

4.2.2.3. Working mother

'*Parent's lack of time'*, and '*mothers working outside the home'* more specifically was recognized by participants as having a major impact on families developing healthy habits.

The Mother's role was seen as an important factor by all of the groups. The strongest emphasis was given to working mothers and ignorance of her role and responsibility toward her children. For example, dependence on servants who take charge of cooking family meals and caring for children when the mother is at work. When mothers are working, the family does not eat meals together as it once used to do (see earlier discussion: parental skills, section **4.2.2.1)**

Box 4.24 Quotes about problem with working mother

Example of dependence on servants and their influence:

Basic thing now is that the mother ignores her role in looking after her kids in all circumstances. And she depends on unsuitable people to prepare food for her children. P3 FG5

****

Parents depend on domestic helpers to feed their children all the time. P1 FG2

****

One of my sons his weight is now around 40 kg, he is 7 years old my other son 12 years old and his weight only 27 kg; all that because of the domestic helpers effect- she was giving him rice and yogurt in large quantity and not giving meat or chicken, directly supplying him with a bottle of milk…I did not recognize this problem until the summer holiday when I started my leave and stayed at home. All that lead to stomach widening and he became greedy for food. P2 FG3

****

Availability of servants is very big problem, it is not only when mothers are working- but the problem is if she depends on them to look after her kids for everything. P3 FG4

4.2.2.4. Father roles

Some of the groups mainly the Mothers, Canteen Manager and Teacher groups, identified '*father roles'* to be important as fathers control the choice of food in the household.

Box 4.25 Quotes about father roles

Meal choice depends only on fathers' preferences, so that leads to the disappearance of certain types of food. If the fathers are not the kind of person that say "I like that" and "do not like that" the mother will cook or chose all kinds of healthy food choice of course that include plenty of vegetables, and the children will eat in a similar way to his family at home. But if the father was the kind of person who says "I do not like that or this" , so certain type of meals or foods are repeatedly cooked twice or three time per week then children will get used to that habit and will continue in that manner even when grown up. P3 FG1

Another example was fathers' preferences for certain types of unhealthy foods and habits for example fast foods, and carbonated drinks, in addition to inactivity and increasing sedentary behaviour.

Box 4.26 Quotes about importance of the father roles

Honestly even if the mother would like to change, the father is not helping in following the changes. Children are seeing their father coming from work eating his lunch, directly going to sleep. When he wakes up he will sit in front of the television all the time. P1 FG3
Even he is the one who likes to bring food from restaurants- especially junk food type. P2 FG3

4.2.2.5. Other family member influence and roles

Most of the groups including Teacher, Canteens Manager and Mother groups, felt that other relatives like aunts and uncles had an important role in children's dietary intake as role models, especially when supplying unhealthy food like fast food meals, and sweets. Interestingly none of the groups discussed the loss of grandmothers' roles or influence as a result of the shift to a more nuclear family.

Box 4.27 Quotes about other family members' influence

My sister usually distributes sweets for the children when visiting my family house, when I ask her not to do that she replies " it is only once per week". P1 FG3

4.2.3 Changes in the life style

The lifestyle changes in Qatar community, aggravated by '*westernization*' and *'modernization'*, have a great influence on physical activity and eating habits, which subsequently contribute to increasing the risk of obesity. Multiple factors play an important role in changes in lifestyle, for example the availability of junk food or fast food outlets in the community; increased access to cars; increased availability of computer games, children not playing outside, changes in family structure and women's roles, for example going out to work and reliance on unsupervised servants to look after the family.

All groups discussed issues related to the changes in lifestyle**,** with the strongest emphasis given to factors related to '*adopting western food habits'* and changing food customs

such as shifting to fast food for children more specifically. Although fresh meals are cooked it was mentioned that fast food may be nevertheless served to children based on their preference. The teachers group had the idea that *'availability of sweet and chocolate at home on a regular basis*' made children used to eating this instead of healthy choices like vegetables and fruit.

Box 4.28 Quotes about changes in lifestyle

Example for adapting to western food:

Foods served in our community being unhealthy started from the fast food restaurants or unhealthy choices when buying grocery for house needs, especially with presence of children. P2 G3

****

Sweets and cakes have become available permanently at home. Every time child opens the drawer to take whatever they like. P1 FG2

****

Even at school sweets have become to be supplied as incentives. P1 FG2

****

Example for increased dependence on computer games rather than active play*:*

All of us agree on the reduced activity and shifting to electronic play instead of moving or active play, even playgrounds for children concentrate on the electronic play, stay in one place and the machines move up and down. so no benefit I remember when I was young my father took us for trips to the sea or the desert we spent all our time running and playing but now no movement. P2 FG5

4.2.3.1. Increase sedentary activity

In addition cultural change towards the westernisation of Qatar and the increase in income brought with it increased access to cars and reduced physical activity and

'*increased sedentary activity'*, for example increasing time spent watching television, playing by computer games or the internet, and eating meals in front of the television.

Box 4.29 Quotes about increased sedentary activity

Example for increased sedentary activity:

Obesity in children has increased nowadays, we can say, because they have reduced their movements compared to before. At home they are not playing like before, because of the need for servants to be available and around to observe them. P5 FG2

In Doha they are using the new technologies, they are using video games, watch television, computer, and mobiles. And all the time they are sitting in front of that, they are eating when they are with such things, compared to other countries I noticed this more in Doha. P2 FG4

****

Reduced physical activity for children results from changing character of playing- from movement, running and jumping, shift to computer game and watching television for long hours. P1 FG2

****

Example of cultural changes and reduced physical activity:

Reduced physical activity at family level like they don't have any physical activities, like they go in cars, they don't walk, not much sports not as a routine habit, even the small distance, they use car…even while parking they don't go to their cars, they tell their drivers to come to pick them up from in front of the door not to walk to the car. P2 FG4

4.2.3.2. Cultural dietary habits

When considering **cultural dietary habits** the most common themes emerging across groups related to adopting unhealthy food habits as was discussed earlier under parental skill; in addition to changes in dietary habit in Qatar and the Arabian Gulf countries. Changes in the food consumption pattern and habits were previously discussed (chapter 1). An interesting idea was raised by one of the participants from the Canteen Manager focus group, who saw a link between increasing appetite due to habitual eating custom by hand instead of eating by spoon. This may be explained by the difficulty of measuring the actual amounts of food intake for each member of the family, since families often eat together from the same plate.

Box 4.30 Quotes about cultural dietary habits

Our traditional food, most of the time, is rich and high in calories and fat. P5 FG2

****

There is nature of food and amount of food and there is increase in appetite for food especially for the people eating by hand and not by spoon. P3 FG1

In all the focus groups, the participants' responses demonstrated their understanding of the complexity and variety of causes relating to increases in overweight and obesity prevalence; and recognized the range of behavioural factors influencing increasing obesity rates in children in the Qatar community.

4.3 Perceived intervention factors that could influence obesity and overweight in Qatar community

Participants were aware of the range of causes of obesity and believed that it is important to address dietary habit and physical activities from an early age. They made a variety of suggestions about ideas, solutions and interventions that would contribute to obesity prevention.

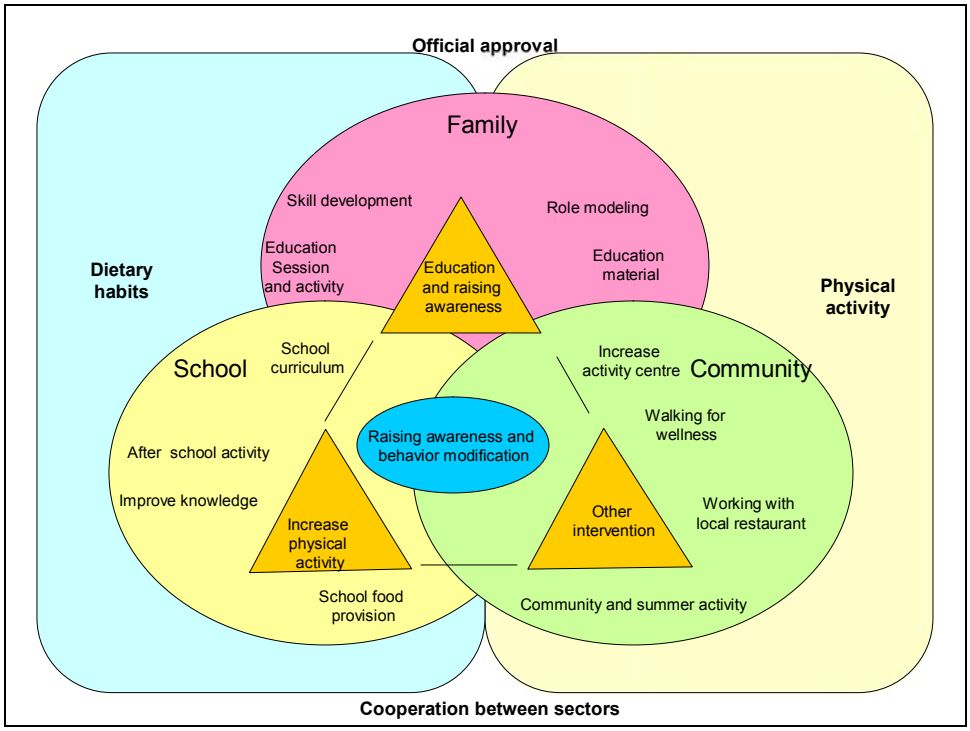
The overall themes that emerged across all the focus groups are summarized in (**Figure 4.3**). The overarching messages that emerged were consistent across the focus groups and were related to raising awareness to promote behaviour modification.

The perceived interventions were related to 'dietary habit' or 'physical activity' or both. Three main themes emerged related to these two factors which are summarized as, 'education and raising awareness', 'increasing physical activity', and ‘other activities’.

Focus group participants identified family, school and community settings play an important role in preventing obesity and encouraging healthy lifestyle behaviour. Below are the main ideas and suggestions that were discussed:

In the following sections, I am going to discuss interventions based on the emerging themes based on intervention sittings.

Figure 4.3 Perceived intervention factors that influence obesity in school children in Qatar



4.3.1 School based intervention

Schools were viewed as playing an important role in educating children, parents and other family members to maintain healthy habits and behaviours. School was discussed by all focus groups as an important setting for intervention implementation (**Table 4.1**) especially since children spend most of their time in school during the day. In addition, the school's role was perceived to be to educate children about dietary habit and nutrition, provide physical activity, and promote healthy behaviour for children who may pass education to parents and other family members. Participants felt that schools can

work with parents through parent meetings, and to encourage their behaviour modification in terms of providing healthy dietary and physical activity habits for all family members.

Box 4.31 Quotes about importance roles of school in education

Children learn and accept knowledge from school more than they learn and accept from their mothers. P 1FG3

****

First of all let's start from school; you have to arrange for meetings to talk about obesity in general and how we can control it; and to invite obese children and their mothers to attend meetings. P3 FG4

Table 4.1 Perception of Interventions implemented through school setting

Aim	Target group	Example of intervention

Change curriculum to increase physical activity	Government	Advise review of education policy to:
		• Increase amount of time in curriculum for exercise
		  o Increase number of physical activity education sessions
		  o Add 30 minutes of sports on daily basis
		  o Increase school break time
		• Provide fitness-based education and non-competitive physical activity education.

Directly increase exercise	Children	Offer greater range of activities (e.g. dance) • Add structured 10 minute bouts of physical activity to classroom • Organize physical activity or sport programme at class and at breaks • Organizing field trip activities (e.g. farm, spire (sport centre), clubs, or camping trip) Add value to existing activity for after school and summer activity programmes: • Offer range of physical activity organized through school liaison with clubs.
Education and raising awareness	Children	Education and raising awareness of healthy diet and physical activity through • School curriculum (e.g. nutrition and general health education) • School activity (e.g. field trip to farm, and hospital) • Education material (e.g. poster, newsletters).
Behaviour modification	Children and family	Promote healthy behaviour at schools and environmental change: • Class room sessions on goal setting and self monitoring • Parental monitoring of sedentary activities. • Class room discussion about diet, and activity diaries and self monitoring

		• School report cards to inform parents about their child weight • Organizing competition and rewards for maintaining healthy food and physical activity habit, and maintaining healthy weight
Improve knowledge	School staff (teacher, nurse, and canteen manager)	Offer professional development: • Provide training so that teachers are able and confident to teach physical activity to children • Knowledge update about nutrition and physical activity. • Teacher education for being a good role models (e.g. promote more walking and choice of healthy food)
Improve school food provision	School staff (canteen manager and school nurse) and food provider or supplier	• Offering healthier food choices in school canteen and at school trips. • Modifying school canteen food contents o Increase availability of fruit, vegetable, yogurt, milk, and water. o Supply healthy sandwiches. o Stop selling sweets, carbonated drinks and replace sweetened drinks with milk or fresh juice. o Reduce price of fruits, vegetables and other healthy food sold at canteen. • evaluate school (written) policy to limit availability of unhealthy foods and drinks

4.3.1.1. Education through school curriculum

Participants from all the focus groups suggested the importance of introducing dietary and physical education through school education sessions as '*food composition*', '*healthy diet*' and '*physical activity habits*'. Participants were aware of the limits of what could be implemented and achieved through school activities, and felt that teachers had a full

curriculum to get through. Any new initiatives and activities must fit within this framework and be able to seek official approval from Higher Education Council and Ministry of Education.

Participants suggestions organize education session and activity for children to include "education on healthy diet" and "cooking demonstration"; Nurses participants suggested supplying healthy meals to demonstrate and encourage children to eat healthy meals (see quotes below).

Box 4.32 Quotes about education activity for children

Making funny lectures for children on the importance of breakfast meals and give them gifts or healthy meals to encourage them to eat healthy option. P3 FG4

****

To teach students about healthy meals and foods, in addition to organizing cooking demonstration on the best way to prepare healthy food. P1 FG3

****

Example quoted from the Physician and Government representative group to conclude education intervention and setting:

We can use educational activity and media tools to initiate the awareness toward the family and community in general to prevent obesity problem. Also we can involve the school too by using education curriculum to initiate children awareness, in addition to add extra activity at the parents meetings at school level. P3 FG5

Education through school activity was identified such as '*story*', '*song*', '*role play*', '*words in the morning school activity*'(see first 4 quotes in the box below), or even '*scientific experiment related to bad effects of unhealthy choices such as Pepsi*' (see 5th

quotes). Participant 3 from the Teacher group suggested interesting ideas about choosing one theme for all the subject activities or home work during one month, for example, nutrition or healthy diet (see the 6th quotes in the (**Box 4.33)** below).

Box 4.33 Quotes about range of education activities through school setting

With simple words to start the school day, or education could be done through role play. P3.FG1

****

We can increase awareness by sending messages through role play, play on stage or by any means; the most important thing is to send this message about the obesity problem we have so we can prevent it. P3 FG5

****

Education about benefits of fruits and vegetables can be done through homework which can be supportive to these ideas. P4 and P3 FG2

****

I think we can educate children by songs and stories and to chose simple scientific experiment to prove to them the bad effects of an unhealthy behaviour.P3 FG2

****

Yesterday I showed my students the reaction between Pepsi and meat. After that all the students said they will practice it at home; One of the students said I will tell my father not to drink Pepsi again. The reaction would be more effective if accompanied by practice and if there is a nice way to convince students especially age 6-7 years. P2 FG2

****

I have an idea which we can implement through the curriculum and to concentrate on health awareness. We can choose one theme for example about obesity, nutrition and healthy food or benefits of fruits and vegetables. We can choose one topic per month which will run around the same time. We can use it as paragraph of a story or a homework and that can be implemented in all the subjects - Arabic, Science and Islamic lessons. P3 FG 2

The Teacher group suggested using competition in class for the best student who maintains healthy weight, healthy diet and physical activity habits using a whole class approach trying to avoid drawing attention to over-weight or obese students and teachers' involvement in this activity. This activity needs cooperation and involvement of the family, so parents will record what their child eats and physical activity at home (record on form organized by school, which should be simple, straightforward tick list to make it easy for parents). Teacher and School Nurse will measure weight of all students once per month then discuss the results and progress with all students. By the end of the year, students who maintain a healthy diet and habits will receive a reward and certificate. Teacher participants felt that we can implement this if we get official approval, to include the activity in the time schedule and to add a score for it to ensure parent and student participation. However, they raised a concern that it may cause embarrassment for some of the students, especially obese ones, to discuss their condition in front of others.

Another example suggested using school report cards to inform parents about their child's weight, Participants felt that this idea depends on the school nurse if she is interested in the weight measurement and school administrator if they are keen and interested to send weight report cards to parents.

The Teacher, Canteen manager and Nurse focus groups described the importance of teaching children '*how to differentiate between the bad and good habits'* and '*how to*

make a decision'. In addition they felt it is important to help the children set goals and to learn self monitoring with parent's support and encouragement.

Box 4.34 Quote about goal setting

Training children how to differentiate between right and wrong so we can prepare them to make their decisions on nutrition and even lifestyle. P2.FG2

Generally all the groups felt that education through school curriculum is important and practical and all of the focus groups included this intervention in their final list.

4.3.1.2. Written education material and resources

The most common suggested method for information dissemination was through printed materials such as 'newsletters', 'pamphlets', 'fliers', 'leaflets' or even through media tools such as 'newspapers and magazines' that are being distributed through schools, health facilities and in community. Some of the participants suggested that it is useful to use posters and bulletin boards at school rather than providing education in written format as they felt that the majority of people will not be interested in reading. Interestingly, participant 3 from the Canteen Manager focus group encouraged education material distribution as it is a useful method for education dissemination to children and parents (see 2nd quotes in the box below).

Box 4.35 Quotes about education material

Distribution of newsletters is not effective as nobody is interested in reading especially at children's level and may throw it away. P1 FG3

****

Education material is very useful for my children. When they read any thing, they discuss the information with us at home.P3 FG1

Although education materials were felt to play an important role in raising awareness and disseminate information, it was relatively less popular in prioritization in the final list. School Nurse and Physician and Local Authority were the only group that prioritized educational material aimed at school level including staff, children, and family in their final list. That could be because participants felt that nobody will be interested in reading.

4.3.1.3. School Staff professional development

Focus group participants recognized the importance of training, professional development and knowledge update for teachers and school nurses. Interestingly, only the Teacher group did not mention this issue.

Box 4.36 Quotes from Nurse focus group

Better to give education to children, teachers and nurses and update them with the latest research and information. P2 FG4

Participants from all the focus groups discussed the importance of educating people for being good role models for the healthy lifestyle for example - eating healthy meals and practicing physical activities. There was contradiction across the group as to who will be the best role model - parents, other family members, teachers, and or friends. Canteen Manager and Mother focus groups believed that teachers had a significant role in changing children's behaviour and they felt that 'children listen to teachers more than listening to parents'. In addition a Canteen manager mentioned that '*what ever her children learn or hear from a teacher will be accepted and will be implemented directly'*. However all the participants identified parents as playing the most important role in influencing and encouraging their children's behaviours in relation to eating and physical activity habits. However one of the Teacher participants believed that mothers will not accept any ideas suggested by schools or teachers. Participants 1 from the Nurse focus group believed "*friends play an important role model"* more than family did (see 2nd quotes in the below box).

Box 4.37 Quotes about promoting positive role models

To be positive models. This is every where teacher, mum, family member, friend every body can be involved. The best model I think will be at home- parents will be the best model for the children, of course there is the friend, the teacher and every body else can be a model. But first they will learn from some body in the family from the parents. P2. FG4

****

In this age they will learn more from friends, follow more friends rather than the family. For example if her friend prefers to eat chocolate she prefers to do that rather than follow her mother's say. P1 FG4

****

Children learn and accept knowledge from school more than they learn and accept from their mothers. P 1FG3

****

Parent education for being good role models for their children from healthy meals and physical activity prospective. And also teachers considered being good role model too. P3 FG5.

But for food habits family will be more important as role models. P2 FG5

4.3.1.4. Increase physical activity intervention

Participants from all the focus groups discussed the importance of increasing physical activity intervention; they thought that physical activities at school level were too limited inside but rather more outside the school. They suggested altering physical education provision within the school curriculum to non competitive activities during on structured and non-structured times. This was very popular and commonly prioritized; all but Nurse Group included this in their final list.

Better utilization of existing sports area and allowing more access to indoor physical activity facilities during break time were also mentioned. This was relatively popular considering three out of five groups prioritized it in the final list including Teacher, Mother, Physician and Local Government Representatives.

Participants believed that schools should increase physical activity provision and increase the number of physical activity education sessions offered to students on a daily basis instead of just a few per week and to incorporate these sessions into the basic lessons. One of the teachers suggested '*adding 30 minute of sport on a daily basis'* and "*adding*

10 minute bouts of physical activity in the classroom" (See the first 2 quotes in the box below). In addition participants suggested increasing school break times to give children the chance to play (See the 3rd quotes in the box below).

Box 4.38 Quotes about increasing physical activity education sessions

Increase the number of physical education classes to be run on a daily basis instead of 2 sessions per week P 3 FG2

****

Add short period of physical activity like exercise to class time and to be under taken during break times. P3 FG2

****

Thirty minutes break time is not enough to play; 50 to 55 minute time for class session becomes long and student feels bored so the idea is to increase the time for breaks and to add extra break time in between class. P3 FG1

In addition they suggested expanding the variety of choices available and to provide fitness-based physical education lessons rather than competitive ones. Such as provide a wider range of physical education (e.g. *dance, drama, swimming, and aerobics*), although some of the participants felt that dancing is not a cultural norm and therefore not acceptable to Qatar community. Another example was physical activity organized through school and liaison with sport club, i.e., swimming.

Canteen Manager, Teacher, and Mother groups suggested the importance of organizing field trips for learning knowledge and physical activity such as '*farm trips*', '*hospital*

visits', '*spire*' (sport centre), '*club or even organizing camping trips*'. Canteen Manager and Mother focus groups included field trip activities in their final list.

Box 4.39 Quotes from Teacher focus group

Organizing field trips include farm visits to learn how vegetables are grown in addition to physical activity benefits. P5 FG2

Participants identified the importance of initiating national policy related to increased physical activity at school level, and review education policy to increase amount of time in curriculum for exercise. There was a lot of discussion around these across the focus groups. However this activity was not popular in the final priority lists, Teacher group was the only one that included it in their final list. And they suggested the need to *'Establish united education standards for all schools for physical activity education curriculum'*. In order to do this, official approval from the Higher Education council and from the Ministry of Education would be needed.

4.3.1.5. Encourage walking for wellness

Participants from the Canteen Manager, Mother, Physician and Local government representative agreed that walking to school is an important idea but not feasible because of child safety, local environment (hot climate) and road safety. This was relatively

popular in the discussion but was not prioritized in the final list because of the barriers mentioned.

4.3.1.6. School food provisions

There were numerous discussions relating to school food provision across the focus groups. All the focus groups discussed the importance of improving access and provision to healthy food in school canteen. Participants were aware about the changes going on towards healthier food choice in the school canteens (where unhealthy food choice were not allowed to be sold at school canteen or even students allowed to bring from home such as bicarbonate drinks, chocolate and crisps and offering healthier food choice like fruit and vegetable) and the limitations on what can be implemented and achieved. They had a range of suggestions for improving dietary habits and implementing healthy eating at school and suggestions concentrated on the canteen and food supply at school trips.

Participants discussed school canteens at length. They believed that school canteens should only sell healthy food choices. Some of the participants believed that children have the right to make their own choice of food. Gradual change in the healthy food choice in canteens to be accepted by children was recognized. However participants were highly consistent in their belief that healthy food is too expensive compared to unhealthy food. They suggested that healthy food should be more affordable. Although some of the participants felt children's choice of unhealthy food is not related to price but to preference and choice (see below quotes).

Box 4.40 Quotes about school food provision

I'll give you an example – if doughnut sells at 2 riyals while salad sells at 5 riyals in the primary schools, the children will say if I buy 2 doughnuts for 4 riyals, I will still have an extra 1 riyal left better than buying salad. P1 FG 5

****

I feel that canteen price is not an important issue because children will buy doughnut as he/she likes it and not because salad is expensive. Even if they offer salad free of charge they will not eat it. P2 FG5

****

Last year the school canteen tried selling fruit at school canteen because they expected that children will buy and eat fruits but unfortunately no body bought them. P2 FG 3

****

I say reduce the price or it should be free for vegetables and fruits to encourage students to eat these types of food. P3FG4

Some participants believed that shifting to health food by canteen is '*an easy task'* while another participant held a different view as *'modification of school canteen content is not an easy task as when it was implemented previously, they found it difficult*'.

This was popular intervention and commonly prioritized by all groups except Nurses groups. Some of the practical examples were given and summarised at (**Table 4.1**), many suggestions related to offering healthier food choices sold in school canteen or even offered for students at school trips. For example, School could look to control food

choice sold in school canteen and force the external food service company or supplier to choose healthy food "*like grilled hamburger instead of fried*" and "*reduced fat, salt and sugar content*". Other examples were to increase availability of fruit, vegetable, yogurt, milk, and water; and another to stop selling sweet, carbonated drink and replace sweetened drinks with milk or fresh juice.

Box 4.41 Quotes from Teacher group

School canteen should have supervision and follow up on types of food offered to students at school level and on trips organized through school. P2 FG 2

4.3.2 Family based intervention

Participants identified parents and family members as playing the most important role in encouraging their children to maintain healthy behaviour and lifestyle that relates to nutrition, dietary and physical activity habits. Parents were considered the key for changing children's behaviour as children depend on, and learn from their parents until the time they start communicating with the external world (by the time they join the school) (**Table 4.2**).

Table 4.2 Perception of Intervention implemented through family setting

Aim	Target group	Example of intervention
Raising awareness and skill development	Parents and Family	Education sessions about: • Nutrition, healthy food, and promotion of healthy eating habits for family and children (e.g. reduced calorie intake, fatty food, and fast food) • Health information (e.g. obesity problem, causes, and solutions) • Promote importance of increase physical activity as routine on daily basis (e.g. walking, climbing stairs and cycling) • Promote importance of reducing sedentary behaviour (e.g. reduced television viewing and video game); and • promote importance of being a good role model
Behaviour modification	Parents and Family	Promote healthy behaviours in family and home environmental change: • Encourage and support whole family to modify their behaviour and promote healthy eating and physical activity habit all together. • Life style modification and reduced sedentary behaviours • Parental monitoring of sedentary activities. • Promote importance of family participation through school and community events and activities together
Dissemination of Education material	Family	Education materials aimed at families (e.g. flyers, newsletters) • Advice on healthy diet, nutrition and importance of increased exercise and reduced sedentary behaviour • Healthy tips healthy eating habits (e.g. no rewards by sweet and candy, reduce availability of sweet and crisps at home level and replace it by offering fruit and vegetable).
Encourage walking for wellness	Children and Family	• Walking to schools • Walking to the mosque to pray • Walking along the Corniche area

4.3.2.1. Education and raising awareness

One of the most common themes emerging across all of the focus group discussions was education and raising awareness. Participants from all the focus groups identified education as an important intervention and considered this key to changing children's behaviour. This could be done through education sessions and activity for the whole family including children, parents particularly for mothers, and other family members (see 1st quote in the **Box 4.42** below). Participants from the School Nurse, Teachers group, Physicians and Government representatives also suggested domestic helpers be educated on healthy eating options and behaviours – although this was not without potential difficulties (see 2nd quote below).

Box 4.42 Quotes from Nurse focus group

Example of target people for education:
Raising awareness should be given to all people, parents and to those who look after children. P1 FG4

****

Example of importance of domestic helper education about healthy eating habits:
Regardless of what we do at home for follow up, observation for the domestic helper work, still they may insist to do whatever is in their mind. P3 FG5

Participants believed that any changes in behaviour regarding dietary or physical activity habits should be addressed during early childhood years and before joining the primary school. Like the Nurses, the Teachers group suggested that mother education on '*healthy diet*', '*nutrition*' and '*breast feeding*' should be started from the time of pregnancy and to

be included at the antenatal session and well baby clinic session. Teacher participants believed the family should be involved in early management for obesity and before reaching puberty.

Box 4.43 Quotes about timing for education intervention

Example of timing of education from the time of pregnancy:
Actually we should start from pregnancy time, we should tell the pregnant lady to change her diet, eating habits and eat healthy food because whatever she eats will affect her baby.P2 FG4

****

Example of early involvement and management for obesity problem:
If the families are not involved in early problem solving for their child's obesity and leave the problem until reaching puberty, it will become difficult to treat- should be starting management at an earlier age. P3FG2.

4.3.2.1.1 Education session and activity

Participants recognized the importance of education sessions and activities with involvement of parents, to facilitate behaviour change related to diet and physical activity. In general, participants believed that it is difficult to engage parents and other family members in attending education sessions and activities. And they identified that the most effective way of educating parents and other family members would be through parent meetings at school - one to one discussion or through workshops rather than formal educational lectures or even reading education materials. Three out of five focus groups prioritized it in their final list (Mothers, Canteen Manager and Nurse Groups).

Box 4.44 Quotes about education through parent meetings at school

First of all let's start from school by having meetings with the obese children and invite the mothers to attend and talk about obesity in general and ways to control it. P3 FG4

****

Increase family awareness on food that contributes to obesity which can be done through school meeting with parents. P2 FG2

The most common content and components of the education session that emerged were about providing nutrition awareness, healthy diet, healthy eating habits, and healthy lifestyle. Examples suggested by participants for education session contents are summarised in **(Table 4.2)**. In general participants suggestion varied from the importance of education on '*healthy breakfast*', '*healthy meals in general*', and '*importance of reduce sweet intake*'.

Participants highlighted the importance of Mothers education to include – '*Importance of her consideration for the meals her child ate at school, home and outside home*', '*Importance of reduced fat added to food*' and '*Restricting and quantifying food amount eaten by their children*' see 3rd quotes in the box below.

Box 4.45 Quotes for education about healthy meals

Example about healthy eating habits:

Provide education on the importance of eating healthy meals and snacks and most importantly, do not leave children hungry especially when going out for shopping to avoid eating fast food meals. P2 FG4

****

Organizing children's meals and to concentrate on healthy choices. This should be done everywhere at home and at schools time. P3 FG2

****

Example about education tips for mothers;

Mother's role is very important in supervising and looking after her children's food at home and at school. In addition to directing her children to differentiate between healthy and unhealthy foods and encouraging her children to educate their friend and encouraging them about healthy food option.P2 FG 1

Nurse's participants acknowledged the importance of gradually changing food components toward a healthy choice, and the need to have plenty of choices.

Box 4.46 Quotes from Nurse group

You have to change the diet gradually for example, we need to have many kinds of healthy food and not just concentrate on one type because kids become bored very fast. Gradual change will prepare children to get ready, and encourage them to choose the healthy food. P3 FG4

Another example was related to behaviour modification and home environmental change, for example encouraging and supporting whole families to modify their behaviour and

promote healthy eating habits such as "*reduce calorie intake*", and "*reduce fat food*". Participants also discussed the effects and frequency of eating fast food at home and suggested parents limit the amount or frequency of buying fast food meals (1-2 times per week).

Box 4.47 Quotes about reducing frequency of eating fast food

family should try to avoid or at least reduce fast food meals for their children P3 FG2

****

If children request fast food meal, we can supply it only once a week, when you go out but not always .P2 FG4

An interesting suggestion was related to encouraging parents to sit with children and eat together so children see what their parents eat.

Box 4.48 Quotes for education about parenting skills

To do good diet management, you should eat the same things as your children, don't give them only salads and you eat majbus (common traditional dish in Qatar) or pasta. All families should change their dietary habits and eat the same food. P2 FG4

4.3.2.1.2 Written educational material

As was discussed earlier in the written education material in school setting (see section **4.3.**) participants concentrate and highlight specifics and important education messages for family to include '*Promote no reward by food, sweet or candies'*, '*increase availability of fruits and vegetables on the table*', and '*reduce availability of sweet and crisps'*. School Nurse, Teacher, Physician and Local Authority groups more specifically suggested the potential support that could come from educational material aimed at the family and prioritized it in their final list.

4.3.2.1.3 Reduce sedentary behaviour

There was a suggestion to reduce sedentary activity such as decrease television and video game time viewing and increase physical activity, i.e. playing outside with friends in the neighbouring areas.

Participants from all the focus groups except Canteen Manager group suggested that reducing sedentary time is an important idea that may promote increased physical activity among children through encourage practicing physical activity as routine on a daily basis and not only the competitive ones such as walking, climbing stairs, cycling and joining sport club. In addition participants discussed the value of having activities and playing areas in their home where children will be encouraged to play with brothers, sisters, and parents. This was relatively popular as practical intervention for the participating groups Teacher, Mother, and Nurse and was prioritized in their final list.

Box 4.49 Quotes about encourage reducing children sedentary time and behaviour

Encourage children to move, practice physical activity and play or ride the bicycle; also we may initiate playing in group suitable to family and friends. P1 FG3

****

Watch what they are doing. Do not allow them to sit infront of a computer or television set for a long time. We need to encourage them to go out for other activities. P2 FG4

****

We should exchange daily electronic play by engaging them to have fun in open spaces especially during school days. When they finish their assignments we should take them to the Corniche to play. I am happy when they go to the mosque to pray and then meet our neighbour children and see them play with their bicycle. P2 FG3

4.3.3 Community based intervention

The community was viewed as an important setting for obesity prevention; (**Table 4.3**) showed participants perception of interventions implemented through community.

Table 4.3 Perception of Interventions implemented through community setting

Aim	Target group	Example of intervention
Improve knowledge	Family and all community member	Offer education session : • Nutrition, diet and healthy eating habits • General health information about obesity and complication • Parenting skills • Encourage increase physical activity.
Health promotion and raising awareness	Family and all community members	• Media promotion through (television programme, news paper and magazine) • Dissemination of education material (e.g. fliers, newsletters)
Increase Physical activity	Children and family	Add value to existing activity at community and summer activity programmes • Offer activity encourage participation of the whole families • Offer fun sport in the community instead of the competitive nature of sports
Increase Physical activity	Government	Increase the number of clubs or recreation centre to practice physical activity
Encourage walking to schools	Government	• Develop school travel plan • Improve school neighbourhoods safety
Encourage walking for wellness	Children and Family	• Walking to schools • Walking to the mosque to pray • Walking along the Corniche area
Work with local restaurants to offers healthy menu options	local restaurants	Offering healthy menu options • Add stamp or logo for the healthy choice in the menu. • Add total calories and nutrient content beside each meal in the menu.

4.3.3.1. Education session and activity implemented through community facility

Community education was viewed as an important issue to facilitate behaviour modification and make changes in the community, particularly targeting extended family

and other community members. The Nurse focus group had the idea that '*Raising awareness should be given to all people, parents and to those who look after children'*.

Participants from Teachers, Mothers and Nurses focus groups recognize the importance of providing education sessions and activities (one-to-one discussion or workshop) at community facilities such as shopping malls, local health provider including Primary Health Care Centres and hospitals. This was relatively less popular as only the Teacher and Nurse focus groups prioritised it in their final list, as participants believed that it is difficult to engage community members and families in attending education sessions or activities and they would simply not be interested in attending.

4.3.3.2. Media promotion

Generally, media involvement in education and promotion for healthy behaviour was discussed by all the focus groups except the Nurse group. The most common suggestion was to use television programmes (as it is viewed by lots of people), to demonstrate healthy cooking skills. This was something participants felt is clearly needed for mothers specifically as nowadays, they lack expertise in cooking skills compared to previous generations.

Teacher participants suggested '*Organizing with media sector to explore and discuss obesity problem in a unique way on television programme and to talk about healthy diet and how to solve obesity problem'* as they believed media tools are important methods to increase public awareness about obesity, expected future complications, solutions, best

management and prevention measures. The Mother group was the only group that prioritized education through television programme in their final list.

Participants also had suggestions on changes at the national level; they suggested controlling fast food advertising and television advertising for unhealthy options.

4.3.3.3. Written education materials

As was discussed earlier in the written education material in school setting and family setting, although education materials were felt to play an important role in raising awareness and disseminate information, it was relatively less popular in prioritization in the final list. School Nurse, and Physician and Local Authority groups more specifically suggested the potential support that could come from educational material aimed at the community and prioritized it in their final list.

4.3.3.4. Improve local facilities and programmes

4.3.3.4.1 Encourage walking for wellness

A number of participants suggested develop school travel plan and improve school neighbourhoods' safety. This was relatively popular in the discussion but was not prioritized in the final list because of the barriers mentioned.

Participants also suggested walking along the Corniche (a pedestrianised area near the sea which is often used by joggers or for family outings), or walking to the mosque to pray as effective ways to increase physical activity levels for children and for family.

4.3.3.4.2 Improve and extend existing after school and holiday children's activity programmes (run through schools and community facilities)

A number of one-day (e.g. weekend day), week-long or longer duration (e.g. summer camp) leisure programmes are available for children in Qatar. These are organized and run by schools, private groups, within shopping malls, or community organizations, which include sport activity, arts and others activity. In addition to physical activities organized through school and liaison with clubs and spire centre (sport facilities located in the sport city complex in Doha city). A number of participants suggested that these programmes could be either extended to involve activities for the whole family, or improved to make them more suitable for encouraging physical activity among children and made more opportunities for fun sport in the community instead of the competitive nature of sports.

Another suggestion was to improve safety by increasing the number of supervisors for children, improve the organization, type of activities (e.g. to suite a wider age group) and timing of the session. This was discussed a lot but did not get prioritized by many groups because of the safety concerns which ranged between unavailability of adequate supervision and varied requirements for different aged children. It was noted however that some of the mother participants had concerns that children would not be interested to attend summer activities as they would like to have rest time after school work and the family may travel during summer holidays. Canteen Manager and Nurse groups were the only ones that prioritized this initiative in their final list.

Box 4.50 Quotes from Mother group

Summer activities may not be feasible as families may travel during summer holidays therefore who will attend? As well, children are saying that they are waiting for summer holidays to have a good rest after a whole year's work. P2 FG3.

4.3.3.4.3 Increasing recreation facilities

Participants perceived the need for an increase in the number of playing grounds and leisure facilities like recreation centres, clubs, and parks. They also addressed the importance of openness and easy accessibility to families. Moreover, they suggested the need for indoor facilities as hot weather decreases children's physical activity in open areas. This was further discussed but did not get prioritized by many groups except the Canteen Manager and Physician and Government representative groups; as it was felt it is a difficult task that needs government and higher authority approval, commitment, and sufficient funds and resources. There were also concerns around the safety of children and cost of activities, especially for families with more than one child.

Box 4.51 Quotes about increasing recreation number facilities

We need to have an official request to increase recreation centres in order to practice physical activities and they should be near the housing area/compounds. We need to have a number of recreation centres because what we have are few parks which are not available everywhere. We have large clubs available but not all of us can avail to

practice physical activities due to religious and cultural concerns. Regarding open playing areas, these should be placed suitably for both children and family so that parents can observe their children while playing and should be fitting for various age levels. P1 FG5

4.3.3.4.4 Work with local restaurants to offer healthy menu options

Participants from Mother, Physician and Government Representative suggested working with local restaurants in developing and offering healthy menu options such as '*add special stamp or logo for healthy choice in the menu*' Another suggestion was to '*add total calories and nutrient content beside each meal in the menu*' This activity was not prioritized in the final list.

Box 4.52 Quotes about work with local restaurants to offer healthy menu options

We can work with local restaurants to add table of calories and nutrient contents like in Europe where MacDonald added calories for each item in their menu e.g. for French fries you will see 869 so you will panic and be scared to eat all those calories. Also added label of contents will have an effect too. P1 FG5

4.3.4 Frequently prioritised interventions

In the focus groups we asked participants to prioritize the interventions in term of importance and most successful intervention, and then we asked them to select the most feasible and changeable intervention in the context of their local settings and community.

Finally, they were encouraged to identify their top 8 interventions to prevent obesity in children. The prioritization process was not an easy task for the groups and agreement on the short list of interventions was not always possible, particularly among the Teacher. Focus groups participant defined a set of principles to guide intervention development and **(Table 4.4)** shows the frequently prioritised interventions.

Table 4.4 Frequently prioritised interventions by intervention setting

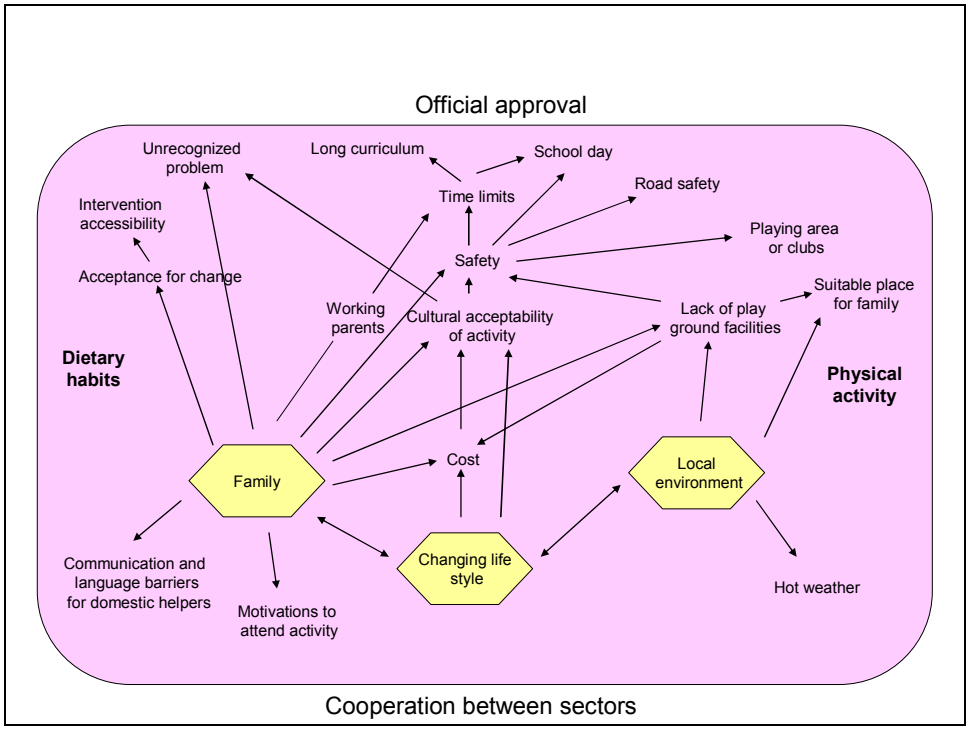
Setting	Example of intervention	FG1	FG2	FG3	FG4	FG5
Family setting	• Education sessions (suggestion to include domestic helpers). • Written education materials. • Reduce sedentary behaviour in the home.	√	 √ √	√	√ √ √	 √
School setting	• Health education through school curriculum. • Improve school food provision • School staff professional development. • Increasing physical activity provision. • Written education materials.	√ √ √ √	√ √ √	√ √ √ √	√ √ √	√ √ √ √ √
Community setting	• Education sessions in community facilities. • Written education materials. • Improve and extend existing children's after school and holiday activity programmes. • Increasing recreation number facilities.	 √ √	√		√ √ √	 √ √

4.4 Perceived barriers for intervention activities

Barriers were discussed across focus groups either as general or specific to certain intervention components. Overarching messages were consistent across the group and were related to lack of cooperation between different sectors and the importance of higher official approval and support.

The themes that emerged were consistent across groups and are summarized in (**Figure 4.4**). The perceived barriers could be grouped in similar way to perceived causes and were related to 'dietary habit' or 'physical activity' or both. Three main themes emerged relating to these two factors which are summarized as: role of the family, changes in lifestyle habits, and environmental factors.

Figure 4.4 Perceived barriers and facilitators for the intervention factors that influence obesity in school children in Qatar



4.4.1 Time pressures

Time limits for the school day and long curriculum are factors that make it difficult to introduce new concepts in school unless consideration is initially sought from the appropriate sector for higher education approval. The teachers group were aware of the school time limits as "*School curriculum long, and had tight schedule, time just enough to be compliant with curriculum requirement".*

Lack of time, and staff were recognized as barriers in implementing and sustainability of activities. In addition "parents' working" makes it difficult to have enough time for them to do an activity with their children.

4.4.2 Intervention accessibility

Participants were concerned about education intervention accessibility which includes access to parents, mothers and care givers (domestic helpers more specifically) and other family members and their motivation to attend educational activities or even reading educational materials. Other concerns included communication, literacy and language barriers for educating domestic helpers (as they came from different countries and have lower back ground information).

Family acceptance to change behaviour related to parenting such as '*not to using unhealthy foods as a sign of love and affection*', or '*as incentive or rewards*' was seen as a challenge.

4.4.3 Cost

High price for leisure facilities fees was identified as a barrier for families to join especially if they have more than one child '*In some families, financial level may not allow them to have their children join these clubs for swimming or playing'*. The perceived cheap price for '*junk food meals*' compared to healthy meals was also seen as an incentive for families to choose such foods and a barrier to healthy eating. Lack of funding, and resources for schools were recognized as barriers in implementing sustainable activities. Nurse participants specifically suggested '*educational activity about healthy breakfast*' but recognized that such a programme and activity needs specific funding and ongoing commitment.

4.4.4 Environment factors

Some of the local environmental factors were considered as important barriers that discourage children to be physically active, such as hot weather and lack of recreational centres, parks and suitable places for families.

4.4.5 Safety issue

Safety through schools was one of the concerns of keeping children running, jumping and playing in school grounds. Participants identified having 'multiple children with wider *age range practicing physical activity in clubs or in open areas*' as a challenge from the '*supervision and safety*' points of view. Another issue was unsafe roads for walking or cycling, in addition to general safety concerns from playing in open areas without supervision. Participants from the Canteen Manager group acknowledged that 'some *families do not like their children to play outside because of fear*'.

4.4.6 Cultural norms and acceptability of activity

Cultural norms and also family play an important roles in discourage females in particular from practicing physical activity in open areas and the need to have a suitable place for families to supervise their children while they are playing. As was identified by the School Canteen Manager focus group '*Clubs are available in our countries but not all of us can go there to practice physical activity because of our concerns to our religious and cultures'.*

Some people do not recognize obesity as a problem for their child and belief that '*fat*' is healthy and yet more are concerned about under-weight which makes it more difficult to intervene.

4.5 Perceived facilitators for intervention implementation

All the groups discussed and expressed a views that multidisciplinary programmes were recommended and the importance of cooperation between different sectors so to work together as a team to initiate policy and roles to facilitate activity implementation. This is now discussed.

4.5.1 School action plans and policies related to health

There were several suggestions across the focus groups relating to this component. Most ideas were about evaluation of school's written policy to limit availability of unhealthy foods and drinks and to develop action plan to improving students' health. Another idea was to initiate policy relating to increasing physical activity (as discussed earlier **section 4.3.1.4** with increased physical activity under school setting), such as increasing the length of school break times to give children a chance to play and increase the number of physical education sessions on a daily basis.

All focus groups discussed the importance of school policies for health promotion programme in school. This item was discussed a lot, but the Teacher group was the only group that prioritized this policy. I felt this is significant but other groups did not feel confident to make this a priority in their final list.

4.5.2 Initiating policy to help obligate multi-sector team work

There were several suggestions amongst Teacher, Physician and Government representative focus groups relating to initiating policy to help obligate multi-sector agencies to work together as a team. The team could include '*Super Supreme Council of Family Affairs, Ministry Of Education, Ministry Of Health and Hamad Medical Corporation apart from any organizations concerned on child health*'.

Teacher participants suggested activities to help in preventing obesity (as was discussed earlier with education through school curriculum, **section 4.3.1.1.**, under school setting) and highlighted the need for cooperation and involvement of different sectors, official approval and policy to include the activity in the time schedule. Using assessments of professional development for teachers and regular evaluation were believed to be facilitators for successful implementation. The Physician and Government representative participants highlighted the importance of '*political wellness'* and support for implementation to help obligate multi-sector agencies to work together as a team. Another suggestion was publishing research study findings announcement and publicity through the media would help seek attention from higher authorities.

One of the Government representative participants suggested the important role for the Super Supreme Council of Family Affairs to take responsibility for organization of intervention implementation as a powerful and strong government organization. On the other hand another participant disagreed based on previous experience where another agency had undertaken all the work for a project, but all the achievement had been

accredited to the Supreme Council of Family Affairs. The other agency had then lost interest in collaboration.

Box 4.53 Quotes about importance of multi-sector involvement

Example of lack of teamwork between different sectors:

The problem is not situated in one level alone but involves different levels and sectors. We need teamwork and collaboration amongst different sectors. This is not a one man show or Anter [famous person in the old Arabic story] who will be able to solve all these predicaments alone. I am talking about real examples that are currently happening based on my discussions with Dr.1. and Dr.2. from the paediatrics department at Hamad general hospital. I felt that their hands are tied. Although they have specialized people in nutrition, endocrinology and paediatrics they can not do things alone. It is really imperative to seek cooperation amongst HMC, Ministry of Education, and Super Supreme Council for Family Affairs to carry out and implement these changes despite various obstacles. P 2 FG5.

4.5.3 Highest authority support and approval

Another suggestion was to '*organize a national strategic plan to prevent obesity with consideration, support and approval of the highest authority*' and involvement of specialized people from relevant sectors. Interestingly a Government representative participant shared her experience of involvement in writing a health strategy plane (see box below) which was never implemented despite involvement of other sectors. This was

attributed to there being no policy to obligate strategy implementation nor the supreme council to evaluate strategy implementation. Participants acknowledged the importance of learning from ongoing activities and building on what others perceived as '*programme organized by WHO'* or any successful program implemented in one of the neighbouring countries.

Box 4.54 Quotes about a national strategic plan to prevent obesity

Example of participants involved in national strategic plan implementation:

I would like to comment on P2 point about organizing a plan to prevent obesity by specialized people from different sectors. When we wrote a health strategy plan for youth which included children from 10 years onwards, we included physical activities like activities implemented at school level; we also included educational instructions about healthy food. But as we said earlier, if we do not obligate the different sectors to work as a team, the youth health strategy can not be implemented. So we need to have clear policies for various sectors that will look after these issues. P1 FG5

Accordingly the most important facilitator is perceived to be governmental approval, to initiate a policy to help obligate multi-sector team work, and oversee implementation, management and evaluation of health related policies. Media promotion, scientific publication and support from the highest authority were also perceived to aid implementation.

In conclusion, participants recognised obesity as a common national and international problem, and as a growing problem in Qatar society. They were aware of a range of causes of childhood obesity.

The rapid socioeconomic development and affluence as a result of oil production was defined as a key factor which influences obesity. The availability of westernized food, lack of parenting skills, increase in working mother and father's role in determining food choice at home were also discussed. Lack of playground area, hot weather, and cultural beliefs and traditions for girls were highlighted as key factors that discourage physical activity.

In terms of interventions, Government approval and multi-sectoral team working were seen as key aspects of intervention planning. The school setting was the favoured setting for prevention interventions and health education through the school curriculum was popular in discussion and prioritization. Education for parents particularly mothers and other family members (including domestic helpers) was a common constant theme for intervention.

4.6 Discussion

Participants recognized obesity as a growing problem and were aware of a range of causes of obesity. In term of interventions, the focus groups provide valuable important local contextual information on childhood obesity development, and defined a set of principles to guide intervention development for future obesity prevention. Some findings were consistent with the results from the cross sectional survey, providing triangulation.

4.6.1 Perceptions of the causes of childhood obesity

The participants recognised that the causes of the obesity were multifactorial. These findings are consistent with those of several previous studies.[198;199] All groups identified two important influences, 'poor dietary habit' and 'reduced physical activity habit' as a result of rapid socio-economic change and affluence which has increased since oil production. Increased availability and affordability of westernized food, lack of parenting skills, working mothers and the father's role in determining what is eaten at home were also highlighted. Lack of space (playground), the climate and cultural norms for girls were described as barriers to physical activity. Lack of recognition of obesity by parents was also discussed.

4.6.1.1. Changes in Qatar society and life style

Findings indicate that participants were aware of the size of the obesity problem and it was recognized as a growing problem internationally. Participants believed that changes in Qatar society and life style contribute to obesity, such as adapting western food habits (fast food meals), increased sedentary activity, (e.g. television, internet, video game

viewing), and increased dependence on cars rather than walking. These views were similar to conclusions drawn by Musaiger and Farrage.[16;17] Musaiger conducted a review on food and nutrition habits in the Arabian Gulf countries in 1987, concluding that sedentary life style and lack of exercise combined with high intake of energy rich foods may be the main reasons for obesity in the Gulf area.[17] Farrage highlights impact of rapid economic development on the Arabian Gulf Countries, the effect of mothers working and dependence on the domestic helper in home management and looking after children.[16]

4.6.1.2. Dietary and physical activity habits

Findings from the focus groups showed that perceptions and views of the causes of obesity were generally in agreement with the scientific evidence, which were related to energy imbalance, with high consumption of unhealthy food and lower energy expenditure due to reduced physical activity and increased sedentary time. These views were similar to findings from a study by Neumark- Sztainer and colleague on obesity related beliefs and attitudes among teachers and school healthcare providers from 17 junior and senior high schools through mailed surveys in the US.[198] Questionnaires were completed by 115 science, health, home economics, and physical education teachers, school nurses, and school social workers from the 17 schools. Respondents were aware that multiple factors play a role in the development of obesity. Approximately half of the study population believed that obesity is caused by poor dietary and physical activity behaviour and a similar percentage of respondents suggested that biological factors play an important role.[198] On the other hand Hardus et al conducted a cross sectional study a

randomly selected sample of 315 adults in a shopping centre in Australia, to explore the views of the community through self completed questionnaires. Participants were asked to describe their perceptions of the causes of obesity in children and their views regarding approaches to prevention. The researchers found that participants believed that over-consumption of unhealthy food, media promotion of unhealthy food, and eating in front of the television were the key factors contributing to childhood obesity. In this study, participants perceived that children's diet rather than physical activity was important in causing obesity. They also suggested that causes of obesity are multifactorial and included parent responsibility, modern technology, children's lack of knowledge, the physical activity environment, lack of availability of healthy food and physical activity opportunities. Interestingly many environmental factors were not seen as important causes of obesity (e.g. safe paths for walking or cycling, or places that encourage activity, or price of healthy food).[199]

Our focus group findings also suggest that high consumption of unhealthy food is perceived as an important cause of obesity in children, as reported by others [87], Malik et al [91], Muller et al [88], and others.[65;88-90;104;117] On the other hand, our cross sectional survey finding did not demonstrate any association between dietary patterns and obesity, except for consumption of sweetened beverages. With regards to physical activity behaviour, our focus group and cross sectional findings were consistent and in line with existing evidence that inactivity is an important risk factor associated with childhood obesity.[65;193]

4.6.1.3. Family influence

4.6.1.3.1 Lack of parenting skills

Participants in our study believed that parents lack the knowledge, skills, and health awareness to help their children be healthier and maintain healthy weight. These ideas are similar to the findings from Styles and colleague who conducted a qualitative study using 8 focus groups for parents and care givers of (5-8 years old) between 2004-2005 in North Carolina. They explored parents' views about obesity in young children in groups consisting of Hispanic, black and white parents of young children. They reported that parents and caregivers believed parents lack knowledge and skill related to support their child maintaining a healthy weight, and inadequate support was perceived to come from physicians, the community and schools.[200]

4.6.1.3.2 Working mothers

Consistent with existing evidence [103;201] our participants suggested that working mothers were an importance influence on obesity in children. A study conducted in the UK found a higher BMI among children of employed mothers [103], whilst another study conducted in the US [201] found children were more likely to be overweight if their mother worked more hours per week. Our cross sectional survey showed no association between maternal employment and increasing obesity prevalence however.

4.6.2 Identified potential components for an intervention programme in preventing obesity amongst children in the State of Qatar

The result of the focus groups indicate that participant have a sophisticated understanding of the complexity of the obesity problem and suggested prevention intervention components are similar to those found in other setting.

It is very clear from the data that participants might experience some level of uncertainty regarding programme implementation, thus their suggestions focused on the importance of facilitation through government approval and multi-sector team working.

Participants emphasised the importance of obesity prevention strategies starting from the early years and before children start at school. This is consistent with findings of studies with parents in Hesketh et al [202] and with teachers in a study by Wilkenfed and colleague.[203]

Hesketh and colleague conducted focus groups to explore child and parent views regarding social and environmental barriers to children obesity prevention programmes. Three demographically diverse primary schools in Australia were selected. 119 children aged 7 – 8 years and 10-11 years, and 17 parents participated in this study between November and December 2002. Parents recommended that obesity prevention strategies needed to begin early in a child's life before reaching school and suggested the content of childhood obesity prevention strategies should include diet, physical activity, and promotion of healthy food and activity choices across settings (school and family).[202] Another qualitative study conducted with Wilkenfed and colleague [203] explored teacher,

school principals, and students' perceptions of causes and prevention measures for childhood overweight and obesity. Data was collected from 4 areas with a wide range of socioeconomic status from primary and secondary schools in Sydney in 2005. Teachers and students believed in addressing physical and nutrition issues from an early age. All agreed that school should play a significant role in the prevention of overweight and obesity among children, with individual and family involvement and responsibilities. Primary school teachers were more likely to considerer a whole school approach whole of school to nutrition and physical activity, while secondary school teachers were more likely to favour curriculum based approaches (health education, physical education and personal development) and having a school canteen strategy.

Although the focus group participants in this study identified family, school and community as important settings for preventing obesity and encouraging their children to maintain healthy behaviours related to diet and physical activity, the school setting was the favoured setting for prevention intervention. The majority of discussion and suggestions were focused on the school setting, a finding that is consistent with previous studies conducted to explore perceptions of parent and caregivers [200;202] and teachers and students. [203] Furthermore, most of the previous intervention studies were school based [100;109;111;112;114;115;117-120;122;124-126;128;132;134;184] [see chapter one intervention prevention literature review and **Table 1.3** for detailed studies]. This might be due to schools having ongoing contact with many children and parents; they are in a unique position to help obesity prevention.

Whilst our focus groups participants agreed that school should play a significant role in the prevention of overweight and obesity among children, schools were not seen to have complete responsibility and individual and family involvement were also discussed. This again is consistent with findings from an Australian qualitative study of primary and secondary school teachers and students [203] and a US study examining perceptions of secondary school staff.[198] Previous intervention studies were also conducted in a family setting.[113-115;123;128]

4.6.2.1. Education

Education is only the first step in developing a practical strategy to prevent childhood obesity. It is most likely that inclusive strategies will be needed across all the settings to ensure consistent messages are passed to children and their parents and family.

4.6.2.1.1 School curriculum

All the focus groups participants suggested the importance of addressing healthy dietary habits and physical activity through school curricula. Participants identified many practical and thoughtful suggestions for schools (such as classroom sessions, home work, and activity e.g. song, story, role play), which should go through official approval before implementation in Qatar.

Educational messages might be provided through the school curriculum and through general policy and school environments. This is consistent with findings from other studies.[199;202;203]

4.6.2.1.2 Parents and family members

Evidence suggests that parents' behaviour influences what children learn, and how to respond to the external environment. Childhood obesity prevention strategies have greater likelihood of success when involving parents as well as children. Our study identified the importance of education and raising awareness for children, parents, and other family members in addition to domestic helpers in order to get their support in achieving skill development and to promote behaviour modification toward healthy options regarding food selection and physical activity. School and community settings (e.g. Primary health care centres or shopping malls) have been identified as the best places for addressing parents' educational needs regarding preventing of childhood overweight and obesity.[200;202]

4.6.2.1.3 Professional development for school staff

Focus group participants perceived a need for educating school staff (teacher and school nurse) on obesity, healthy diet and physical activity, skill development and issues related to obesity prevention. This is in agreement with other studies.[198;204] Our cross sectional study shows no significant association between school staff training and children's weight status, although almost all schools staff participated in education training.

4.6.2.2. School food provision

Participants recommended liaison with the school food services to reinforce healthy educational messages by offering affordable and accessible healthy foods in the canteen (such as increase availability of fruit, vegetable, milk and water and banning selling of sweets and carbonated drinks). This finding is similar to recommendations from other studies.[199;200;202-204]

They also identified a variety of prevention intervention strategies including dissemination of educational materials, media promotion; encouraging walking to school and increasing the number of club and recreation centre facilities to encourage physical activity.

Summary

Previous studies and systematic reviews of prevention interventions are inconclusive and call for a focus on intervention development in future trials, incorporating views of local communities. There are few qualitative studies to gather the views of the local community, and much of what has been done was conducted in western countries; US, Australia, and UK. As such, this study makes a valuable contribution to building the Qatar literature base.

The findings from this study suggest a number of principles that need to be considered for intervention development in Qatar. For prevention of obesity a combination of long term and multi-component prevention interventions implemented through the

community, schools and family are likely to be needed. Interventions need to promote healthy dietary habits and physical activity and should not be limited to the school setting only. Health promotion through mass media campaigns, newspaper, magazines and the internet should support any intervention programme. Further input from local authorities, political action, and a national strategic plan will facilitate intervention development.

4.6.3 Strength and limitation

4.6.3.1. Strengths

Although obesity is a growing problem worldwide, most studies on obesity prevalence and its causes have been conducted in western populations. As far as I am aware, this is the first qualitative study to explore community perceptions of the causes of obesity and to seek to understand views on prevention interventions approaches and potential barriers to such interventions in the Qatar community. The study attempted to elicit perceptions and explore opinions of stakeholders from different backgrounds (including Mothers, Teachers, Schools Canteen Manager and Nurses, Physicians and Local Government representatives). This work makes a valuable contribution to building a baseline from which to develop obesity prevention interventions for Qatar.

4.6.3.2. Limitation and difficulties encountered during data collection

There were a number of limitations in this study. The number of participants in each focus group was relatively small (3-5), this was below the numbers quoted as being optimal for a focus group (usually 6-8).[205;206] This may have limited the range of

discussion and development of themes within the focus groups. The organization of focus groups was a challenge in practice and there were difficulties in coordinating and getting full attendance at meetings, with participants often cancelling at the last minute. It became apparent that it was difficult to engage individuals and groups from community in this activity, due to lower levels of individual engagement in similar activity previously or interest in attendance.

However, a number of approaches were used to increase participation in focus groups, including rearrangements of session dates, calls for confirmation and reminder to attend sessions, and sending SMS text messages. Despite these attendance was limited. There were also many days during the data collection period when holding sessions was not convenient, and participants were not willing to attend. These included Ramadan (fasting month for Muslims), the Eid holiday, and also summer holidays when many people travel abroad. The other issues contributing to non-participation included this being seen as low priority because obesity was not perceived to be a problem, work and time commitments, and family commitments. Reported reasons for non-attendance for participant who cancelled at the last minute included sickness (participant or one of their children) or not being able to find anyone to drive them to the venue. Despite the relatively small number of participants, those who did attend were from a wide variety of backgrounds and the groups did actively discuss, with a range of themes emerging. Furthermore, the themes emerging from the focus groups agreed well and correlated with some of the cross-sectional findings and with findings from similar studies in other countries.

A major limitation was that the views expressed were from a female perspective only as fathers were not included in focus groups neither in mixed groups (mothers and fathers) nor in a separate focus group, because they did not agree to take part. For cultural reasons, mothers playing an important role in looking after children while fathers occupy their time by working, leaving mothers to look after the children. In addition, tradition leaves women uncomfortable among male strangers in public.

The greater participation by mothers is similar to other studies and indicates the vital role of mothers as primary child carers in most studies.[207]

This is a potential area for further exploration. It is possible, that had fathers participated in the focus groups, the emergent themes would have been different.

Chapter 5

The aim of this project was to set the scene for the development of an intervention programme for preventing obesity amongst children in the State of Qatar. In chapter 3, the prevalence of obesity among primary school children was estimated, and some of the individual and environmental risk factors for obesity were examined. Chapter 4 used data from focus groups with Mothers, Teachers, Canteen managers, school Nurses and Physician and Local Government Representative to explore perceptions on obesity, and to understand what interventions were believed to be most important and feasible in this community. The main findings are concluded below.

5 Conclusion

Obesity has become one of the major health problems worldwide, and associated with several chronic diseases. The epidemic proportion of obesity in both adult and children in the developed and developing countries has prompted more intensive research on this condition.

Qatar, as other countries, is experiencing rapid socio-economic development and industrialisation, and is thus expected to have a high burden of obesity. However, most previous studies were conducted in the western countries and therefore clinical guideline and preventive strategic plans have been tailored to western world. The lack of available information from Qatar on the determinants of obesity has impeded the understanding of obesity in a local context, which is necessary in order to develop an appropriate management and prevention strategy.

This study is one of the largest studies of its kind in Qatar, aiming to describe the prevalence of obesity among 6-7 years old school children, investigate factors that contribute to childhood obesity, and identify potential components for a preventive intervention programme in the State of Qatar.

5.1 Summary

5.1.1 Prevalence of obesity

The result presented in this thesis indicated that the prevalence of overweight and obesity in the state of Qatar was lower than that observed among children in the other Gulf countries and intermediate to the levels in developing and developed countries. Whilst rates are currently lower, Qatar is likely at the start of the obesity epidemic, and based on evidence from other countries, rates will rise steeply over the coming years. Therefore interventions for prevention are timely and could help halt the predicted rate of increase.

Data from this study suggests that in Qatar there is coexistence of underweight and obesity in primary school children. This combined nutrition problem is common in other GCC and developing countries. Whilst this thesis has focused on overweight, the findings suggest further research is needed to evaluate individual and environmental factors that contribute to the development of underweight problem in Qatar also. Underweight is likely to become less important with increasing affluence, but nevertheless needs to be addressed particularly as it is more deprived populations that are affected.

A range of international and national reference data are available to define obesity, but there is no agreement yet as to which one is more appropriate. Using international references, especially those standards which include databases from developing countries such as WHO growth charts is recommended.

5.1.2 Dietary habit and obesity

Even with rapid socio-economic development and shifts in terms of dietary patterns from traditional foods toward higher fat westernized diets, our data shows no significant differences in diet between obese and non obese children except for sweetened beverages. This could be related to limitations in the dietary assessment instrument and the incomplete reporting of this section of the questionnaire. However, other studies have also been inconsistent in relation to the relationship between dietary components and obesity. Further research is needed to better understand which dietary patterns, components or micro- or macro-nutrients are most important in contributing to obesity. Better understanding of such biological factors would help in developing future interventions. Our data however confirmed the finding in previous studies that consumption of sweetened beverages was associated with overweight. The widespread availability of such drinks, including within schools, suggests a target for future interventions.

5.1.3 Physical activity and sedentary activity level and obesity

Similarly to studies in other countries, we found that inactivity is quite common among young children, particularly among girls. Although we found a weak non-significant

association between activity levels and overweight, the low proportion of children achieving recommended levels of physical activity is a concern. Physical activity has several health benefits, and strategies to increase activity levels are urgently needed.

5.1.4 School environment and obesity

Data from this thesis support the observation in a limited number of previous studies of the importance of the school environment and school food and nutrition and physical activity policies in relation to obesity prevention. Further research is needed to explore the impact of changing the school food and physical activity environment and policies on student eating and activity practices both during and after school hours. This is a potential area for future intervention development.

5.2 What this thesis adds

This thesis makes a valuable contribution to the evidence-base which may be used to inform the development of an anti-obesity strategy by national health planners and policymakers in Qatar. This is the first study in the state of Qatar that has explored various aspects of childhood obesity and its prevention, to inform intervention development.

The cross-sectional study confirmed known patterns of obesity in Qatar, lending validity to the study. The use of qualitative methods enabled exploration and understanding of local context and the perceptions of the community members in relation to causes of childhood obesity within Qatar communities and assisted in the identification of the most feasible and practical interventions. The importance of understanding the rapid

socioeconomic development and cultural context is brought out in this study. The findings of this thesis demonstrate the influence of the school environment on the development of obesity, and this may be mediated through the lack of availability of school food and nutrition policies. However in term of prevention, other settings and environments also need to be targeted. Furthermore, an overwhelming view was that educational interventions were needed to be delivered at all levels. These findings demonstrate the importance of involving a wide range of stakeholders, and including multiple components to build a prevention intervention and to maximise the chances of success.

5.3 Recommendation for future work

Qatar and other developing countries are experiencing an obesity epidemic, and prevention interventions are needed to avert the consequent complications. In line with recommendations from systematic reviews and using the MRC framework for complex interventions as a guide, this thesis has undertaken some preparatory work which will help to inform the development of childhood obesity prevention interventions which take account of contextual factors in Qatar and are likely to be locally relevant.

The findings from the focus groups highlighted the importance of state level intervention and approval for any obesity prevention intervention, which is unique to Qatar. Any intervention is likely to involve schools, although including a family or community

component should also be considered. The potential components for an intervention programme are summarised in **Box 5.1.**

Box 5.1. Suggested potential components for an intervention programme in preventing obesity amongst children in the State of Qatar.

1- Education and raising awareness and skill development for parents, family, all community members including

- Aim at parents mothers more specifically:

Education sessions about:

  - Nutrition, healthy food, and promotion of healthy eating habits for family and children (e.g. reduced calorie intake, fatty food, and fast food)
  - Health information (e.g. obesity problem, causes, and solutions)
  - Promote importance of increase physical activity as routine on daily basis (e.g. walking, climbing stairs and cycling)
  - Promote importance of reducing sedentary behaviour (e.g. reduced television viewing and video game); and
  - promote importance of being a good role
  - Increase cooking skills (in healthy ways) through cooking programme at television.

- Promote healthy behaviours in family and home environmental change:
  - Encourage and support whole family to modify their behaviour and promote healthy eating and physical activity habit all together.

- Lifestyle modification and reduced sedentary behaviours
- Parental monitoring of sedentary activities.
- Promote importance of family participation through school and community events and activities together

- Aim at children

Education and raising awareness of healthy diet and physical activity through

- School curriculum (e.g. nutrition and general health education)
- School activity (e.g. field trip to farm, and hospital)
- Education material (e.g. poster, newsletters).
- Class room discussion about diet, and activity diaries and self monitoring
- Class room sessions on goal setting and self monitoring

- Aim at school staff professional development
  - Provide training so that teachers are able and confident to teach physical activity to children
  - Knowledge update about nutrition and physical activity.
  - Teacher education for being a good role models (e.g. promote more walking and choice of healthy food)

2- Increase physical activity through school curriculum and activity including:

- Increase physical activity within the school day and school curriculum
- Offer great range of physical activity
  - Added structural 10 minute bouts of physical activity to classroom
  - Organizing physical activity or exercise activity at class and at breaks
  - Providing fitness based education (non-competitive)

- Organizing field trip activities (e.g. farm, spire (sport centre), through school liaison with clubs. And organize linking with local community physical activity facility.

3- School food provision to supply healthier food choice in school canteen, including

- Increase availability of fruit, vegetable, milk and water
- Supply healthy sandwiches
- Stop selling sweet, bicarbonate drinks and crisps
- Reduce price of the healthy food

4- Encourage cooperation between different sector, involvement of all community members in multi-sector programme organization which may offer possibility to improve the existing programme and care.

The next step will be to set up an exploratory trial to assess the feasibility and acceptability of the intervention components in practice, before embarking on a definitive randomised controlled trial to assess effectiveness and cost-effectiveness.

Appendices

Appendix 1	**Main questionnaires for the Preventing Childhood Obesity Survey Part 1**
Appendix 2	**Main questionnaires for the Preventing Childhood Obesity Survey Part 2**
Appendix 3	**Main questionnaires for the Preventing Childhood Obesity Survey Part 3**
Appendix 4	**Main questionnaires for the Preventing Childhood Obesity Survey Part 4**
Appendix 5	**Consent forms**
Appendix 6	**Validity and reliability of parent questionnaire instrument**
Appendix 7	**Anthropometric measurements protocol**
Appendix 8	**Guideline for the Focus group**
Appendix 9	**Record Sheet and consent form for Stakeholder Focus Groups Participants**

Appendix 1

Preventing Childhood Obesity Survey

Instructions

Schools can influence students' nutrition and physical activity behaviours in a lot of ways (policies, economic, curriculum, role modelling, etc). The purpose of this questionnaire is to attain a picture of your school's policies and practices relating to nutrition and physical activity. In addition it will also assist in exploring and identifying environmental factors influencing obesity both within and outside school. This information will be used to identify practical ways to try and change children's behaviour.

There are four parts of this survey:

Part 1: (this part) is to be filled out by the Principal or a senior administrator.

Part 2: is to be filled out by the canteen manager or food service operator;

Part 3: is to be filled out by the nurse who has access to the student's health records available in school; and

Part 4: is to be filled out by the parents/ mothers of the entire student in the first grade.

Part 5: is focus group meeting to identify participants views about reason of obesity how we can prevent obesity problem in Qatar community.

It will take approximately 15 minutes to fill out this part **(part 1)**. All parts of the questionnaire are self-administered.

Answer the questions honestly; your answers will remain confidential. Where research related to this information is reported, your name and your school will not be identified.

Thank you for taking the time to complete this questionnaire.

Please return completed questionnaire to researcher.

In case of questions, you can contact researcher

Dr Amal Al-Muraikhi via:
Mobile [redacted]
Email [redacted]

Thank you for taking the time to complete this questionnaire

When you have completed this questionnaire please return it back to [Insert name of the school focal point person].

Serial No. | | | | |

Preventing Childhood Obesity Survey

Part 1

To be filled in by the principal/ senior administrator who has access to the school policies
(You will need to have them on hand)

School Name _____

Your Name _____

Your phone number _____
(In case a member of the research team would like to contact you to clarify any of your responses).

What is your position?

- ❑ Principal
- ❑ Deputy Principal/ Senior Administrator
- ❑ Other, specify _____

Serial No. | | | | |

6 School food service

1.In your school, is there a food service *(food service means canteen, tuck-shop, or breakfast order system)* operating at your school?

- ☐ Yes
- ☐ No ***(go to question 6)***

2.Who operated the food service?

- ☐ Canteen manager employed by the school **(go to question 4)**
- ☐ Volunteers (students, parents, etc) coordinated by school staff **(go to question 4*)***
- ☐ External food company (e.g., local shop, food service organisation)
- ☐ Other, specify_____

3.If an external food service company operated the school food service was it covered by a written contract?

- ☐ No
- ☐ Yes, and it is up for renewal within 2 years
- ☐ Yes, and it is **not** up for renewal within 2 years

4.Is the school food service an important source of funds for the school?

- ☐ Yes
- ☐ No

5.Did your school food service provider have a contract with a carbonated drink bottler or other food manufacturer giving the company exclusive rights or preference to sell carbonated drinks or other foods at your school?

- ☐ Yes
- ☐ No

7 Food and nutrition

6. Did your school have a written policy (or policies) relating to promoting and supporting nutrition and healthy eating at school?

❑ Yes **(Please attach copy of your school policy)**

❑ No **(If no, go to question 11)**

7. Did the policy (or policies) include:	Yes	No
What foods are available in the canteen?	❑	❑
The availability of drinking water for students?	❑	❑
Vending machines at school?	❑	❑
Foods used for fundraising?	❑	❑
Food associated with school events? (e.g. sports days, parent evenings)	❑	❑
Teaching food and nutrition in the curriculum?	❑	❑
Staff acting as role models for healthy eating?	❑	❑

Questions 8, 9 and 10 relate to a written policy that promotes healthy eating.

8. What proportion of teachers do you think were aware of this policy?

❑ All

❑ Mostly or almost all

❑ About half

❑ Some or few

❑ None

9. What proportion of parents do you think were aware of this policy (or policies)?

❑ All

❑ Most or almost all

❑ About half

❑ Some or few

❑ None

10. How good was the School's compliance with the healthy eating and nutrition policy (policies)?

- ❑ Very good
- ❑ Good
- ❑ Fair
- ❑ Poor
- ❑ Very poor

11. About how often in the school year did your school give information to parents about healthy food and eating (at school events, in newsletters, etc.)?

- ❑ None at all
- ❑ 1-3 times
- ❑ 4-6 times
- ❑ 7-10 times
- ❑ More than 10 times

12. About how often in the school year did you have sporting, social or cultural events in your school be sponsored by soft-drink, fast food or confectionary companies?

- ❑ None at all
- ❑ 1-3 times
- ❑ 4-6 times
- ❑ 7-10 times
- ❑ More than 10 times

8 Physical education, sports and physical activity

13. Did the school have a written policy relating to promoting and supporting physical activity at school?

❑ Yes **(Please attach copy of your school policy)**

❑ No **(If no, go to question 18)**

14. Did this policy include:

	Yes	No
The use of school grounds 'out of school hours'?	❑	❑
Providing access to sports equipment outside of formal sport or physical education?	❑	❑
Promoting cycling and/or walking to school?	❑	❑
Encouraging participation in sports or other active programmes (e.g. aerobics)	❑	❑

Questions 15, 16 and 17 relate to a written policy that promotes sport and other physical activity

15. What proportion of teachers do you think were aware of this policy?

❑ All

❑ Mostly or almost all

❑ About half

❑ Some or few

❑ None

16. What proportion of parents do you think were aware of this policy?

- ❑ All
- ❑ Mostly or almost all
- ❑ About half
- ❑ Some or few
- ❑ None

17. How good was the Schools' compliance with this policy?

- ❑ Very good
- ❑ Good
- ❑ Fair
- ❑ Poor
- ❑ Very poor

18. On average, how many periods a week were devoted to formal physical education (PE) for the following year levels?

If PE is not compulsory for a year level, please tick the box for either 'Optional PE or equivalent' or 'No option for PE or equivalent'

	1 period /week	**2 periods / week**	**3 periods / week**	**4 periods / week**	**5 periods / week**	**6 periods / week**	**7 periods / week**	**Optional PE or equivalent**	**No option for PE or equivalent**
Grad 1									
Grad 2									
Grad 3									
Grad 4									
Grad 5									
Grad 6									

19. On average, how often are the school grounds utilised by external clubs and other groups for supervised sports?

- ❑ Not at all **(go to question 21)**
- ❑ 1 day a week
- ❑ 2 days a week
- ❑ 3 days a week
- ❑ 4 days a week
- ❑ 5 days a week
- ❑ 6 days a week
- ❑ Every day of the week

20. In the school year, how many different clubs or community groups utilised the school grounds for sports and other recreational activities?

_____ number of clubs/groups

21. In the school year, could students access the school's outdoor facilities at any time outside of school hours (i.e. Weekends and holidays)?

❑ Yes
❑ No

22. Were there indoor facilities for physical activity (e.g. a gym, basketball court)?

❑ Yes
❑ No

23. Do most teachers participate in professional development / continuing education at least once a year?

❑ Yes
❑ No

24. Do staffs have the opportunity for professional development training regarding the health benefits of nutrition and physical activity?

❑ Yes
❑ No

Thank you for taking the time to complete this questionnaire.

Appendix 2

Preventing Childhood Obesity Survey

Instructions

Schools can influence students' nutrition and physical activity behaviours in a lot of ways (policies, economic, curriculum, role modelling, etc). The purpose of this questionnaire is to attain a picture of your school's policies and practices relating to nutrition and physical activity. In addition it will also assist in exploring and identifying environmental factors influencing obesity both within and outside school. This information will be used to identify practical ways to try and change children's behaviour.

There are four parts of this survey:

Part 1: is to be filled out by the Principal or a senior administrator;

Part 2: (this part) is to be filled out by the canteen manager or food service operator;

Part 3: is to be filled out by the nurse who has access to the student's health records available in school; and

Part 4: is to be filled out by the parents/ mothers of the entire student in the first grade.

Part 5: is focus group meeting to identify participant's view about reason of obesity how we can prevent obesity problem in Qatar community.

It will take approximately 10 minutes to fill out this part **(part 2).** All parts of the questionnaire are self-administered.

Answer the questions honestly; your answers will remain confidential. Where research related to this information is reported, your name and your school will not be identified.

Thank you for taking the time to complete this questionnaire.

Please return the completed questionnaire together with a copy of your canteens current price list (including all items for sale) to researcher

In case of questions, you can contact researcher

(Dr Amal Al-Muraikhi) via:
Mobile [redacted]
Email [redacted]

Thank you for taking the time to complete this questionnaire

When you have completed this questionnaire please return it back to [Insert name of the school focal point person].

Serial No. | | | | |

Preventing Childhood Obesity Survey

Part 2

This part of the questionnaire is to be completed by someone who has a close working knowledge of the school food service.

Thank you for taking the time to complete this questionnaire. This should be answered by someone who has a close working knowledge of the school food service such as a canteen manager or food service operator. Please answer the questions as best as you can. The contents of this questionnaire will remain confidential to the research team and to your school. Where research related to this information is reported, your school name will not be identified.

School Name _____

Your Name _____

Your phone number _____
(In case a member of the research team would like to contact you to clarify any of your responses.)

What is your position?

❑ Canteen manager

❑ Other: Specify_____

1.How many days per week does the school food service operate?

- ❑ 1 day
- ❑ 2 days
- ❑ 3 days
- ❑ 4 days
- ❑ 5 days

2.Which of the following times during the day was the school food service open to students? ***(Check all that apply)***

- ❑ Before school starts
- ❑ Intervals/ breaks
- ❑ After school
- ❑ It's open the entire school day

3.How adequate was the space at school for food preparation?

- ❑ Very adequate
- ❑ Adequate
- ❑ Inadequate
- ❑ Very inadequate
- ❑ Not applicable

4.Were the following foods and beverages usually (usually meaning most days of the week) available from the school food service?

	Yes	No
Fruit	❑	❑
Salad options	❑	❑
Milk (including flavoured milk)	❑	❑
Yoghurt	❑	❑
Filled rolls/ sandwiches	❑	❑
Lollies/ chocolate	❑	❑
Crisps	❑	❑
Pastries	❑	❑
100% fruit juice	❑	❑
Sweetened drinks	❑	❑
Pepsi or Coca-Cola (carbonated drinks)	❑	❑
Water	❑	❑
Ice blocks, ice poles, or ice creams	❑	❑

5. Did the school food service have a pricing policy that encouraged the sale of healthy food choices at a reduced cost?

- ❑ Yes
- ❑ No
- ❑ Don't know

6. Did the school food service routinely promote and advertise healthy food choices (e.g., highlight healthy foods on menu, offer taste testing opportunities for new food, have best position in food displays)?

- ❑ Yes
- ❑ No
- ❑ Don't know

7. How often did the schools food service review the food and drinks available?

- ❑ Never
- ❑ About once a year
- ❑ About once every 6 months
- ❑ About once a term
- ❑ Once a month or more
- ❑ As often as necessary

8. How many water fountains or drinking taps were in your school?

- ❑ 0
- ❑ 1-3
- ❑ 4-6
- ❑ 7-10
- ❑ More than 10

9. Indicate your level of agreement/ disagreement with the following statement, **"Our school food service mainly provided foods with high nutritional value".**

- ❑ Strongly agree
- ❑ Agree
- ❑ Neither agree nor disagree
- ❑ Disagree
- ❑ Strongly disagree

10. Please attach a copy of your canteens current price list including all items for sale.

Thank you for taking time to complete this questionnaire.

Appendix 3

Preventing Childhood Obesity Survey

Instructions

Schools can influence students' nutrition and physical activity behaviours in a lot of ways (policies, economic, curriculum, role modelling, etc). The purpose of this questionnaire is to attain a picture of your school's policies and practices relating to nutrition and physical activity. In addition it will also assist in exploring and identifying environmental factors influencing obesity both within and outside school. This information will be used to identify practical ways to try and change children's behaviour.

There are four parts of the survey:

Part 1: is to be filled out by the Principal or a senior administrator;

Part 2: is to be filled out by the canteen manager or food service operator;

Part 3: (this part) is to be filled out by the nurse who has access to the student's health records available in school; and

Part 4: is to be filled out by the parents/ mothers of the entire student in the first grade.

Part 5: is focus group meeting to identified participants view about reason of obesity how we can prevent obesity problem in Qatar community.

It will take approximately 10 minutes to fill out this part **(part 3).** All parts of the questionnaire are self-administered.

Answer the questions honestly; your answers will remain confidential. Where research related to this information is reported, your name and your school will not be identified.

Thank you for taking the time to complete this questionnaire.

Please return completed questionnaire to researcher

In case of questions, you can contact researcher

Dr Amal Al-Muraikhi via:
Mobile [redacted]
Email [redacted]

Thank you for taking the time to complete this questionnaire

When you have completed this questionnaire please return it back to [Insert name of the school focal point person].

Serial No. | | | | |

Preventing Childhood Obesity Survey

Part 3

This part of the questionnaire is to be completed by someone who has a close working knowledge of the school health and has access to the student's health records available in school.

Thank you for taking the time to complete this questionnaire. This should be answered by someone who has a close working knowledge of the school health service such as a nurse. Please answer the questions as best as you can. The contents of this questionnaire will remain confidential to the research team and to your school. Where research related to this information is reported, your school name will not be identified.

School Name _____

Your Name _____

Your phone number _____
(In case a member of the research team would like to contact you to clarify any of your responses.)

What is your position?

❑ Nurse

❑ Other: Specify_____

Serial No. | | | | |

Student ID (file #) : _____

1.Name : _____

2.Address : _____

3.Student telephone Number : _____

Serial No. | | | | |

Student ID (file #) : _____

1.Name : _____

2.Address : _____

3.Student telephone Number : _____

I. Socio-demographic factors

1.Age : _____ year (date of birth)

2.Gender :

1 - Male ☐ 2 - Female ☐

3.Nationality

1 - Qatari ☐ 2 – Non-Qatari ☐ Specify _____

II. Health information:
Has the child been diagnosed with any of the following?

1. Diabetes Mellitus :

1 - Yes ☐ 2 – No ☐ Comment/medication_____

2. Bronchial asthma

1 - Yes ☐ 2 – No ☐ Comment/medication_____

3. Heart disease

1 - Yes ☐ 2 – No ☐ Comment/medication_____

4. Kidney disease

1 - Yes ☐ 2 – No ☐ Comment/medication_____

5. Hypertension

1 - Yes ☐ 2 – No ☐ Comment/medication_____

6. Epilepsy

1 - Yes ☐ 2 – No ☐ Comment/medication_____

7. Any type of anemia

1 - Yes ☐ 2 – No ☐ Comment/medication_____

8. Allergy

1 - Yes ☐ 2 – No ☐ Comment/medication _____

III. Is the child on any regular medication?

1 - Yes ☐ 2 – No ☐

If yes, specify _____

IV. Anthropometrics measurements

1.Current weight _____ (kg)

2.Current height _____ (cm)

V. Haemoglobin result

_____ (mg/dl)

VI. Blood pressure result _____

Thank you for taking the time to complete this questionnaire.

Appendix 4

Preventing Childhood Obesity Survey

Instructions

Schools can influence students' nutrition and physical activity behaviours in a lot of ways (policies, economic, curriculum, role modelling, etc). The purpose of this questionnaire is to attain a picture of your school's policies and practices relating to nutrition and physical activity. In addition it will also assist in exploring and identifying environmental factors influencing obesity both within and outside school. This information will be used to identify practical ways to try and change children's behaviour.

There are four parts of the survey:

Part 1: is to be filled out by the Principal or a senior administrator;

Part 2: is to be filled out by the canteen manager or food service operator;

Part 3: is to be filled out by the nurse who has access to the student's health records available in school; and

Part 4: (this part) is to be filled out by the parents/ mothers of the entire student in the first grade.

Part 5: is focus group meeting to identified participants view about reason of obesity how we can prevent obesity problem in Qatar community.

It will take approximately 45-60 minutes to fill out this part **(part 4)**. All parts of the questionnaire are self-administered

Answer the questions honestly; your answers will remain confidential. Where research related to this information is reported, your name and your school will not be identified.

Thank you for taking the time to complete this questionnaire.

Please return completed questionnaire to researcher

In case of questions, you can contact researcher

Dr Amal Al-Muraikhi via:
Mobile [redacted]
Email [redacted]

Thank you for taking the time to complete this questionnaire

When you have completed this questionnaire please return it back to [Insert name of the school focal point person].

Serial No. | | | | |

Preventing Childhood Obesity Survey

Part 4

This part of the survey is to be completed by a parents/ mother or father

Thank you for taking the time to complete this questionnaire. This part of the questionnaire contains a number of personal ratings and judgements about the dietary and physical activity practice for your child from the last 7 days (in the last week).

Please answer the questions as best as you can. The contents of this questionnaire will remain confidential to the research team and to your school. Where research related to this information is reported, your name and the phone number will not be identified.

School Name _____

Student Name _____

Your Name _____

Your phone number _____

(In case a member of the research team would like to contact you to clarify any of your responses.)

What is your relationship to this child?

1. Mother
2. Father
3. Other specify_____

After completing data collection for this survey, obesity problem in Qatar community will be discussed through focus groups meeting to get your views and ideas on why children become overweight and obese and what can be done to try to prevent this problem in our community; This information will be used to identify practical ways to try and change children's behaviour.

Would you be willing to talk to us further on your ideas, in a focus group meeting?
Yes / No

If your answer yes, please write your telephone number in order to get in touch with you.

Telephone no.: …….

Signed …….

Serial No. ☐☐☐☐

I-Socio-demographic factors:

1.Mother's information:

a. What is the highest level of education obtained by the mother?

1.Post graduate ☐ 2.University ☐ 3.Secondary certificate ☐

4.Preparatory certificate ☐ 5.Primary certificate ☐ 6.Illiterate ☐

b. What is her current occupation? _____

2.Father's information:

a. What is the highest level of education obtained by the father?

1.Post graduate ☐ 2.University ☐ 3.Secondary certificate ☐

4.Preparatory certificate ☐ 5.Primary certificate ☐ 6.Illiterate ☐

b. What is his current occupation? _____

3.How many people are currently living in the same house: _____

- How many children do you have? _____

4.What is the order of this child in the family? _____

5.What is the monthly income of the family (in Qatari Riyal)

1) Less than 3.000 ☐ 2) 3.000-5.999 ☐

3) 6.000-11.999 ☐ 4) 12.000-24.999 ☐

5) 25.000 and over ☐

6.What are the weight and height of all family members?

	Weight (kg.)	Height (cm.)
Mother		
Father		
Children 1-		
2-		
3-		
4-		
5-		

II- Dietary Assessment (Nutritional status of student) :

A. General data:

1.What was the pattern of feeding in infancy?

1) Breastfeeding ☐ 2) Bottle feeding ☐ 3) Mixed feeding ☐

If breastfeeding, specify duration: _____

2. Who is responsible for cooking in your home?

1) Mother ☐ 2) Housemaid ☐ 3) From outside ☐

3. Is the child taking the following meals?

Breakfast

1) Never ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week ☐

4) 5-6 times per week ☐ 5) Yes every day ☐

Lunch

1) Never ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week ☐

4) 5-6 times per week ☐ 5) Yes every day ☐

Dinner

1) Never ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week ☐

4) 5-6 times per week ☐ 5) Yes every day ☐

Snacks

1) Never ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week ☐

4) 5-6 times per week ☐ 5) 1 time per day ☐ 6) 2 times per day ☐

7) 3 times per day ☐ 8) 4 times per day ☐ 9)5 or more times per day ☐

Specify what type of snacks? _____

4. What is your child's main meal?

1) Breakfast ☐ 2) Lunch ☐ 3) Dinner ☐

4) Others ☐ specify _____

5. What is the food intake of child during school time?

1) Food prepared at home ☐ 2) Buy food from school ☐ 3) Do not eat in the school ☐

6. Is your child eating in a separate dish?

☐ Yes ☐ No.

7. What do you think about your child's weight?

☐ 1) Ideal (Normal) ☐ 2) Overweight ☐ 3) Underweight

☐ If he/she is overweight, what do you think is the reason for it?

_____

_____

Note: Dear parent keep in mind that:

1 cup = 250 ml (measuring cup)

Meat/ chicken and fish measure by weighing scale in gram

(If you don't have scales then please describe the amount, thickness and number of piece)

Tea spoon = 5 mg

Table spoon = 15 mg

B. Fat Screener.

Instructions:

Choose the best answer for each question. **Mark only one** response for each question. If you mark "**never"** for a question, follow the "**Go to"** instruction.

About how often did your child eat or drink each of the following foods or drinks in the past 7 days? *Remember to include those that were eaten at breakfast, lunch, dinner, and snacks whether eaten at home or away from home. Also specify the number of times per week and number of portions.*

1.a Over the last week, how many times per week or day did he/she eat **meat** (lamb or beef)?

1) Never (go to 2.a)	☐	2) 1-2 times per week	☐	3) 3-4 times per week	☐
4) 5-6 times per week	☐	5) 1 time per day	☐	6) 2 times per day	☐
7) 3 times per day	☐	8) 4 times per day	☐	9)5 or more times per day	☐

1.b Each time he/she eat **meat** (lamb or beef), how much did he/she usually eat? (Specify weight in gram) _____

2.a Over the last week, how many times per week or day did he/she eat **chicken**?

1) Never (go to 3.a)	☐	2) 1-2 times per week	☐	3) 3-4 times per week	☐
4) 5-6 times per week	☐	5) 1 time per day	☐	6) 2 times per day	☐
7) 3 times per day	☐	8) 4 times per day	☐	9)5 or more times per day	☐

2.b Each time he/she eat chicken, how much did he/she usually eat? (Specify weight in gram) _____

3.a Over the last week, how many times per week or day did he/she eat **fish**?

1) Never (go to 4.a)	☐	2) 1-2 times per week	☐	3) 3-4 times per week	☐
4) 5-6 times per week	☐	5) 1 time per day	☐	6) 2 times per day	☐
7) 3 times per day	☐	8) 4 times per day	☐	9)5 or more times per day	☐

3.b Each time he/she eat fish, how much did he/she usually eat? (Specify weight in gram) _____

4. A Over the last week, how many times per week or day did he/she eat **eggs, fried or scrambled in margarine, butter or oil**?

1) Never (go to 5.a)	☐	2) 1-2 times per week	☐	3) 3-4 times per week	☐
4) 5-6 times per week	☐	5) 1 time per day	☐	6) 2 times per day	☐
7) 3 times per day	☐	8) 4 times per day	☐	9)5 or more times per day	☐

4. B Each time he/she eat **eggs**, how much did he/she usually eat?

1) 1-2 table spoon	☐	2) 3-4 table spoon	☐	3) 5-6 table spoon	☐
4) 1 egg	☐	5) 2 eggs	☐	6) 3-4 eggs	☐
7) 5 or more than 5	☐				

5.a Over the last week, how many times per week or day did he/she drink **milk or on cereal (cereals asked in question7)**?

1) Never (go to 6.a)	☐	2) 1-2 times per week	☐	3) 3-4 times per week	☐
4) 5-6 times per week	☐	5) 1 time per day	☐	6) 2 times per day	☐
7) 3 times per day	☐	8) 4 times per day	☐	9)5 or more times per day	☐

5.b Each time he/she drink **milk**, how much did he/she usually drink

1) Less than 1 cup	☐	2) 1 to 2 cups	☐	3) 3 to 4 cups	☐
4) More than 4 cups	☐				

6.a Over the last week, how many times per week or day did he/she eat **cheese**?

1) Never (go to 7.a)	☐	2) 1-2 times per week	☐	3) 3-4 times per week	☐
4) 5-6 times per week	☐	5) 1 time per day	☐	6) 2 times per day	☐
7) 3 times per day	☐	8) 4 times per day	☐	9)5 or more times per day	☐

6.b Each time he/she eat **cheese**, how much did he/she usually eat?

1) 1-2 tea spoon (5mg)	☐	2) 3-4 tea spoon (10mg)	☐	3) 1 table spoon (15mg)	☐
4) 2 table spoon (30mg)	☐	5) 3 table spoon (45mg)	☐		

7.a Over the last week, how many times per week or day did he/she eat **cereal**?

1) Never (go to 8.a)	☐	2) 1-2 times per week	☐	3) 3-4 times per week	☐
4) 5-6 times per week	☐	5) 1 time per day	☐	6) 2 times per day	☐
7) 3 times per day	☐	8) 4 times per day	☐	9)5 or more times per day	☐

7.b Each time he/she eat **cereal**, how much did he/she usually eat?

1) Less than ½ cup	☐	2) ½ to less than 1 cup	☐	3) 1 to less than 1½ cups	☐
4) 1½ to less than 2 cups	☐	5) 2 cups or more	☐		

8.a Over the last week, how many times per week or day did he/she eat **Bread (included Arabic bread, or toast bread)**?

1) Never (go to 9.a) ☐	2) 1-2 times per week ☐	3) 3-4 times per week ☐
4) 5-6 times per week ☐	5) 1 time per day ☐	6) 2 times per day ☐
7) 3 times per day ☐	8) 4 times per day ☐	9)5 or more times per day ☐

8.b Each time he/she eat **bread**, how much did he/she usually eat?

1) Less than ¼ Arabic bread/ 1 toast bread ☐	2) ¼ Arabic bread/ 1 toast bread ☐	3) ½ Arabic bread/ 2 toast bread ☐
4) ¾ Arabic bread/ 3 toast bread ☐	5) 1 Arabic bread/ 4 toast bread ☐	

9.a Over the last week, how many times per week or day did he/she eat **Rice**?

1) Never (go to 10.a) ☐	2) 1-2 times per week ☐	3) 3-4 times per week ☐
4) 5-6 times per week ☐	5) 1 time per day ☐	6) 2 times per day ☐
7) 3 times per day ☐	8) 4 times per day ☐	9)5 or more times per day ☐

9.b Each time he/she eat **rice**, how much did he/she usually eat?

1) Less than ½ cup ☐	2) ½ to less than 1 cup ☐	3) 1 to less than 1½ cups ☐
4) 1½ to less than 2 cups ☐	5) 2 cups or more ☐	

10.a Over the last week, how many times per week or day did he/she eat **pasta (macaroni)**?

1) Never (go to 11.a) ☐	2) 1-2 times per week ☐	3) 3-4 times per week ☐
4) 5-6 times per week ☐	5) 1 time per day ☐	6) 2 times per day ☐
7) 3 times per day ☐	8) 4 times per day ☐	9)5 or more times per day ☐

10.b Each time he/she eat **pasta (macaroni)**, how much did he/she usually eat?

1) Less than ½ cup ☐	2) ½ to less than 1 cup ☐	3) 1 to less than 1½ cups ☐
4) 1½ to less than 2 cups ☐	5) 2 cups or more ☐	

11.a Over the last week, how many times per week or day did he/she eat **French fries (fried potatoes)**?

1) Never (go to 12.a) ☐	2) 1-2 times per week ☐	3) 3-4 times per week
4) 5-6 times per week ☐	5) 1 time per day ☐	6) 2 times per day
7) 3 times per day ☐	8) 4 times per day ☐	9)5 or more times per day

11.b Each time he/she eat **French fries** (**fried potatoes)**, how much did he/she usually eat?

1) Small order or less (about 1 cup or less) ☐ 2) Medium order (about 1½ cups) ☐ 3) Large order (about 2 cups)

4) Super size order or more (about 3 cups or more) ☐

12.a Over the last week, how many times per week or day did he/she eat **fast food**?

1) Never (go to 13.a) ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week

4) 5-6 times per week ☐ 5) 1 time per day ☐ 6) 2 times per day

7) 3 times per day ☐ 8) 4 times per day ☐ 9)5 or more times per day

12.b Each time he/she eat **fast food**, how much did he/she usually eat? Specify component and amount of fast food?

1- 2- 3-

4- 5- 6-

7- 8- 9-

13.a Over the last week, how many times per week or day did he/she eat **crisps**?

1) Never (go to 14.a) ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week

4) 5-6 times per week ☐ 5) 1 time per day ☐ 6) 2 times per day

7) 3 times per day ☐ 8) 4 times per day ☐ 9)5 or more times per day

13.b Each time he/she eat **crisps**, how much did he/she usually eat?

1) Less than 1 pack ☐ 2) 1 pack (15gm) ☐ 3) 2 packs

4) 3 packs ☐ 5) 4 packs ☐ 6) 5 packs or more

14.a Over the last week, how many times per week or day did he/she eat **sweet (chocolate)**?

1) Never (go to section C) ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week

4) 5-6 times per week ☐ 5) 1 time per day ☐ 6) 2 times per day

7) 3 times per day ☐ 8) 4 times per day ☐ 9)5 or more times per day

14.b Each time he/she eat **sweet (chocolate)**, how much did he/she usually eat? Specify brand name, size and amount

1- 2- 3-

4- 5- 6-

7- 8- 9-

C. Vegetable screener

Instructions:

Choose the best answer for each question. **Mark only one** response for each question. If you mark **"never"** for a question, follow the **"Go to"** instruction.

About how often did your child eat or drink each of the following foods or drinks in the past 7 days? *Remember include those that were eaten at breakfast, lunch, dinner, and snacks whether eaten at home or away from home. Also specify the number of times per week and number of portions.*

1.a Over the last week, how many times per week or day did he/she eat **green salad**?

1) Never (go to 2.a) ☐	2) 1-2 times per week ☐	3) 3-4 times per week ☐
4) 5-6 times per week ☐	5) 1 time per day ☐	6) 2 times per day ☐
7) 3 times per day ☐	8) 4 times per day ☐	9)5 or more times per day ☐

1.b Each time he/she eat **green salad**, how much did he/she usually eat?

1) Less than ½ cup ☐	2) ½ to less than 1 cup ☐	3) 1 to less than 1½ cups ☐
4) 1½ to less than 2 cups ☐	5) 2 cups or more ☐	

2.a Over the last week, how many times per week or day did he/she eat **mixtures that included vegetables**? Count such foods as sandwiches, stews, and omelette?

1) Never (go to 3.a) ☐	2) 1-2 times per week ☐	3) 3-4 times per week ☐
4) 5-6 times per week ☐	5) 1 time per day ☐	6) 2 times per day ☐
7) 3 times per day ☐	8) 4 times per day ☐	9)5 or more times per day ☐

2.b Each time he/she eat **mixtures that included vegetables**, how much did he/she usually eat?

1) 1-2 table spoon or about ¼ cup ☐	2) 3-4 table spoon or about ½ cup ☐	3) 5-6 table spoon or abut 1 cup ☐
4) More than 1cup ☐		

3.a Over the last week, how many times per week or day did he/she eat **vegetable soups** (include tomato soup, beef with vegetable soup, minestrone soup, and other soups made with vegetables)?

1) Never (go to 4.a) ☐	2) 1-2 times per week ☐	3) 3-4 times per week ☐
4) 5-6 times per week ☐	5) 1 time per day ☐	6) 2 times per day ☐
7) 3 times per day ☐	8) 4 times per day ☐	9)5 or more times per day ☐

3.b Each time he/she eat **vegetable soups**, how much did he/she usually eat?

1) Less than ½ cup ☐	2) ½ to less than 1 cup ☐	3) 1 to less than 1½ cups ☐
4) 1 ½ to less than 2 cups ☐	5) 2 cups or more ☐	

4.a Over the last week, how many times per week or day did he/she eat **cooked dried beans** (count baked beans, bean soup, refried beans, or other bean dishes)?:

1) Never (go to section D) ☐	2) 1-2 times per week ☐	3) 3-4 times per week
4) 5-6 times per week ☐	5) 1 time per day ☐	6) 2 times per day
7) 3 times per day ☐	8) 4 times per day ☐	9)5 or more times per day

4.b Each time he/she eat **cooked dried beans**, how much did he/she usually eat?

1- less than ½ cup 2- ½ to less than 1 cup 3- 1 to less than 1½ cups
4- 11/2 to less than 2 cups 5- 2 cups or more

D. Fruit screener

Instructions:

Choose the best answer for each question. **Mark only one** response for each question. If you mark **"never"** for a question, follow the **"Go to"** instruction.

About how often did your child eat or drink each of the following foods or drinks in the past 7 days? *Remember include those that were eaten at breakfast, lunch, dinner and snacks whether eaten at home or away from home. Also specify the number of times per week and number of portions.*

1.a Over the last week, how many times per week or day did he/she **drink 100% fresh juice**?

1) Never (go to 2.a) ☐	2) 1-2 times per week ☐	3) 3-4 times per week
4) 5-6 times per week ☐	5) 1 time per day ☐	6) 2 times per day
7) 3 times per day ☐	8) 4 times per day ☐	9)5 or more times per day

1.b Each time he/she **drink 100% fresh juice**, how much did he/she usually drink?

1) Less than 1 cup ☐	2) 1 to less than 2 cups ☐	3) 2 to less than 3 cups
4) 3 cups or more ☐		

2.a Over the last week, how many times per week or day did he/she eat **fruit**?

1) Never (go to section D) ☐	2) 1-2 times per week ☐	3) 3-4 times per week
4) 5-6 times per week ☐	5) 1 time per day ☐	6) 2 times per day
7) 3 times per day ☐	8) 4 times per day ☐	9)5 or more times per day

2.b Each time he/she eat **fruit**, how much did he/she usually eat?

1) Less than medium fruit ☐	2) 1 medium fruit ☐	3) 2 medium fruits
4) More than 2 medium fruits ☐		

E. Drink screener

Instructions:

Choose the best answer for each question. **Mark only one** response for each question. If you mark **"never"** for a question, follow the **"Go to"** instruction.

About how often did your child drink each of the following drinks in the past 7 days? *Remember include those that were drunk at breakfast, lunch, dinner, and snacks whether at home or away from home. Also specify the number of times per week and number of portions.*

1.a Over the last week, how many times per week or day did he/she drink **sweetened juice** like, tang, sweetened fruit juice and other juice?

1) Never (go to **q 2.a**) ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week

4) 5-6 times per week ☐ 5) 1 time per day ☐ 6) 2 times per day

7) 3 times per day ☐ 8) 4 times per day ☐ 9)5 or more times per day

1.b Each time he/she **sweetened juice**, how much did he/she usually drink?

1) Less than 1 cup ☐ 2) 1 to less than 2 cup ☐ 3) 2 to less than 3 cups

4) 3 cups or more ☐

2.a Over the last week, how many times per week or day did he/she drink **carbonated drink**?

1) Never (go to section F) ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week

4) 5-6 times per week ☐ 5) 1 time per day ☐ 6) 2 times per day

7) 3 times per day ☐ 8) 4 times per day ☐ 9)5 or more times per day

2.b Each time he/she **carbonated drink**, how much did he/she usually drink?

1) Less than 1 cup ☐ 2) 1 to less than 2 cup ☐ 3) 2 to less than 3 cups

4) 3 cups or more ☐

F. Physical activity

We are interested in finding out about the kinds of physical activities that your child does as part of his / her everyday lives. The questions will ask you about the time he/she spent being physically active in the **last 7 days**. Please answer each question even if you do not consider your child to be an active person. Please think about the activities he/she do at school, to get from place to place, and in his/her spare time for recreation, exercise or sport.

Vigorous Physical Activities:

Think about all the **vigorous** activities that he/she did in the **last 7 days**. **Vigorous physical activities** refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that he/she did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did your child does **vigorous** physical activities like aerobics, or fast bicycling or fast swimming or playing hard or running or jumping or playing football?

_____**days per week**

☐ No vigorous physical activities **(Skip to question 3)**

2. How much time did your child usually spend doing **vigorous** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Moderate Activities:

Think about all the **moderate** activities that your child does in the **last 7 days**. **Moderate activities** refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that he/she did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did your child does **moderate** physical activities like bicycling at a regular pace? Do not include walking.

_____**days per week**

☐ No moderate physical activities **(Skip to question 5)**

4. How much time did your child usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Walking:

Think about the time your child spent **walking** in the **last 7 days**. This includes at school and at home, walking to travel from place to place, and any other walking that he/ she might do solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did your child **walk** for at least 10 minutes at a time?

_____**days per week**

☐ No walking of at least 10 minutes was done. **(Skip to question 7)**

6. How much time did your child usually spend **walking** on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Mode of Travel:

These questions are about how your child traveled from place to place, including to places like school, stores, movies, and so on.

7. During the **last 7 days**, on how many days did your child **travel in a motor vehicle** like a bus or car?

____**days per week**

☐ Did not travel in a motor vehicle **(Skip to question 9)**

8. How much time did your child usually spend on one of those days **travelling** in a bus or car, or other kind of motor vehicle?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Time spent for sitting:

These questions are about the time your child spent **sitting** on weekdays and weekend days during the **last 7 days**. Include time spent at school, at home, while doing course work (home work) and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

9.During the **last 7 days**, how much time did your child spend **sitting** on a **weekday**?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

10. During the **last 7 days**, how much time did your child spend **sitting** on a **weekend**?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Time spent for sleeping:

The last questions are about the time your child spent **sleeping** on weekdays and weekend days during the **last 7 days**

11. During the **last 7 days**, how much time did your child spend **sleeping** on a **weekday**?

_____ **hours per day**

☐ Don't know/Not sure

12. During the **last 7 days**, how much time did your child spend **sleeping** on a **weekend**?

_____ **hours per day**

☐ Don't know/Not sure

This is the end of the questionnaire, thank you for participating.

Appendix 5

Preventing Childhood Obesity Survey
Consent Form

I have received explanation about prevention of childhood obesity survey information. I understand what my involvement in the survey will be. I am assured that any information I give will be anonymous and that I will not be identified in any way. I am willing to take part in the survey and I am assured that I will be free to withdraw at any time.

Signed ……. **Date** …….

Appendix 6

Validity and reliability of parent questionnaire instrument

1-Mother's information:

a. What is the highest level of education obtained by the mother?

1.Post graduate ☐ 2.University ☐ 3.Secondary certificate ☐

4.Preparatory certificate ☐ 5.Primary certificate ☐ 6.Illiterate ☐

2-What is the order of this child in the family? _____

3-What is the monthly income of the family (in Qatari Riyal)

1) Less than 3.000 ☐ 2) 3.000-5.999 ☐

3) 6.000-11.999 ☐ 4) 12.000-24.999 ☐

5) 25.000 and over ☐

4- What is your child's main meal?

1) Breakfast ☐ 2) Lunch ☐ 3) Dinner ☐

4) Others ☐ , specify _____

5. What do you think about your child's weight?

☐ 1) Ideal (Normal) ☐ 2) Overweight ☐ 3) Underweight

☐ If he/she is overweight, what do you think the reason for it?

1. _____

2. _____

6.a Over the last week, how many times per week or day did he/she eat **chicken**?

1) Never (go to 3.a) ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week ☐

4) 5-6 times per week ☐ 5) 1 time per day ☐ 6) 2 times per day ☐

7) 3 times per day ☐ 8) 4 times per day ☐ 9)5 or more times per day ☐

6.b Each time he/she eat chicken, how much did he/she usually eat? (Specify weight in gram) _____

7.a Over the last week, how many times per week or day did he/she eat **fast food**?

1) Never (go to 13.a) ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week

4) 5-6 times per week ☐ 5) 1 time per day ☐ 6) 2 times per day

7) 3 times per day ☐ 8) 4 times per day ☐ 9)5 or more times per day

7.b Each time he/she eat **fast food**, how much did he/she usually eat? Specify component and amount of fast food?

1-	2-	3-
4-	5-	6-
7-	8-	9-

8.a Over the last week, how many times per week or day did he/she eat **fruit**?

1) Never (go to section D) ☐ 2) 1-2 times per week ☐ 3) 3-4 times per week

4) 5-6 times per week ☐ 5) 1 time per day ☐ 6) 2 times per day

7) 3 times per day ☐ 8) 4 times per day ☐ 9)5 or more times per day

8.b Each time he/she eat **fruit**, how much did he/she usually eat?

1) Less than medium fruit ☐ 2) 1 medium fruit ☐ 3) 2 medium fruits

4) More than 2 medium fruits ☐

9.a During the **last 7 days**, on how many days did your child does **moderate** physical activities like bicycling at a regular pace? Do not include walking.

_____**days per week**

☐ No vigorous physical activities →

Skip to question 10

9.b How much time did your child usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

10. During the **last 7 days**, how much time did your child spend **sitting** on a **weekend**?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Appendix 7

Anthropometric measurements protocol

Weight:

- Periodically calibrate the scale for accuracy, using known weights.
- The person should be weighed in light clothing without shoes.
- Record weight to the nearest 0.1 kg.

Height

- The person should be barefoot or wearing only socks or stockings.
- The person feet should be standing erect, neither slumped nor stretching, and looking straight ahead without tipping the head up or down.
- A horizontal bar, indicator was lowered to rest on the flat top of the head**.**
- Read the height to the nearest 0.1 cm.

Appendix 8

FOCUS GROUP TOPIC GUIDE
ON PREVENTING OBESITY IN SCHOOL CHILDREN
SEESSION 1

Objectives:

- Explore understanding of obesity, overweight and childhood obesity.
- Explore perception of the reasons for increasing childhood obesity and overweight (in the local setting).
- Explore ideas on what could be done about childhood obesity to prevent childhood obesity particularly for the Qatari population?

Introduction (5-10 minutes)

- Welcome and greet participants
- Introduce researcher, facilitator and participants
- Introduce preventing obesity in school children study. (Target group 6-7 years old Qatari children enrolled in the 1st grade).
- Explain process of focus group (importance of attendance session 2) and role of the facilitators in discussion
- Explain about group discussion
  - -Every body views important
  - -No right or wrong answer
  - -Not to wait for invitation to talk
  - -All ideas are important, even if not finally included in the final intervention component.
- Time 1.5 hours
- Aids
  - -2 Tapes recording
  - -Colour cards and papers
  - -White board
  - -Colour pilot pen and pens
  - -Colour stickers
- Get signed record sheets and consent forms
- Answer queries

Getting started

- Participants to say who they are for tape recorder check.
- Introduce topic and start discussion

1-Explore understanding obesity and overweight and childhood obesity.

Exercise1: (15 minutes)

Write on the cards/ papers what word or short phrase comes to mind when you hear the words overweight and obesity.

Collect cards/ papers and write up ideas on white board/ or stick paper on the white board.

Discussion, explore ideas on white board:

- Explore similarities and differences in view and understanding the concept of overweight and obesity
- Explore ideas on relationships between obesity and overweight and health
- Relate discussion to overweight and obesity in children

2- Explore reasons/causes for increasing childhood obesity and overweight (based on the local setting).

Exercise2: (15 minutes)

Think about causes of childhood obesity in the **context of local setting/environment**. Write done your idea on the card/paper (to collect paper by the end of exercise 2)

Discussion, explore ideas on white board:

- Explore why people think children become overweight and obese.
- Explore reasons behind poor diet and lack of physical activity
- Explore why is childhood obesity increasing
- Explore our own experiences of influences on children's diet and physical activity

3- Preventing childhood obesity (based on the local setting).

Exercise3: (45 minutes)

Think about measures to encourage children to maintain healthy weights. Keep in mind that these measures should be practical and implemental interventions in our community.

Write your ideas (at least 3 ideas) on the cards/papers which will be collected by the end of exercise 3)

Discussion, explore ideas on white board:

- Share participants ideas
- Explore similar idea/ concepts/ measures
- Explore how the ideas could be implemented in our community within the cultural norm – include barriers for implementations.

- Explore our own experiences of measures that help change behaviours. (Explore participant role and involvement in implementations)
- Summarize all ideas. Chick that all participant agree with the list on the white board.(invite for any additions, corrections or deletions)

Collect paper with interventions ideas from white board.

Conclusion FG1 (5 minutes)
-Thanks participants
-Remind of follow up Session2 within 1 week
-Any questions.

FOCUS GROUP TOPIC GUIDE
ON PREVENTING OBESITY IN SCHOOL CHILDREN
SEESSION 2

Objectives:

- To present list of interventions from first session.
- To present list of interventions from literature.
- To prioritise potential interventions and come up with a list of maximum 8 intervention in term of importance and changeability.

Introduction (5-10 minutes)

- Welcome and greet participants
- Recapitulate
  - Overall aims of study
  -What we covered on session 1
  -The expected outcome from today session
  [We would like the group to have prioritized 8 ideas that they think should be included in a package to encourage children to maintain a healthy weight]
- Remind about group discussion
  -every body views important
  -no right/ wrong answer
  -not wait for invitation to talk
  -all ideas are important, even if not finally included in the intervention
- Time 1.5 hours
- Aids
  -2 Tape recording
  -cards and papers
  - white board
  -colour pilot pen and pens
- Answer queries

Getting started

- Participants to say who they are for tape recorder check.
- Introduce topic/ start discussion

1- To present list of interventions from first session FG1. (5 minutes)

Participants will get summary of the interventions they came up with from their first session (FG1)

- Allow a few minutes for participants to read
- Ask for any comments on the summarized interventions
- Ask if anyone has further thoughts

2- To present list of interventions from literature.(10-15 minutes)

Participants will get summary/list of the interventions from literature.

- Allow a few minutes for participants to read
- Ask if anyone needs clarification on what is presented
- Explore participant perceptions of the interventions from literature
- Ask the participants how do the ideas from the literature relate to their ideas

3- priorities potential interventions

Put up yellow card/paper with participants ideas and blue card/ paper for intervention components from literature placed in white board.

All the intervention components will be written on separated card that can be placed in the white boards for the prioritizations exercises.

Prioritization exercises (45 minutes)

Explain that participants will try to prioritise all the ideas that are presented by using color sticker through three stages. At each stage the group will discuss which ideas to include to each stage, until we end up with a list of no more than 8 ideas that the group would like to see included in an intervention package.

Discussion, ideas on white board:

Stage 1 Important: (15 minutes)

Encourage participants to think about what might be **the most successful** or **effective interventions**

- Ask them to prioritise which of the interventions (from original board) should be included in the **important** group and to used **orange** sticker tag.

Stage 2 Changeable: (15 minutes)

Encourage participants to think about what interventions might be **feasible** and **most changeable** in the context of their local settings and communities.

- Ask them to prioritise which of the interventions cards on either of the first two groups (original and important groups) should be included along to **changeable** group and to used **green** sticker tag

Stage 3 interventions component: (15 minutes)

Encourage participants to use changeable group and think about what might be the most important and changeable interventions.

- Ask them to use the changeable group to come up with a final list of maximum 8 intervention components that they feel should be included in the package of activities and use **pink** color tag (NB it can be less than 8 if the group decide to include less, but not more than 8)
- Use the 'practical' group as the final board; so, directed by the group, keep the interventions they want in the final list on this group.
- Once the group has come to a final decision, get them to reflect on the interventions that they have finally included and those they have left out
- Ensure all group members are happy with their decision, invite individuals to express any concerns with the final choices

Concluding FG2 (5 mins)

- Thank participants
- Explain how this group will fit in with findings from other groups and plan for taking the findings forward

Appendix 9

Record Sheet for Stakeholder Focus Groups Participants

Name: …….

Age: ……..

Sex: Female Male

Occupation: ……

Number and Age of children …… (If relevant)

Feedback on today's meeting:
……

……

……

……

……

……

Would you be willing to talk to us further on your ideas, in an interview if needed?
Yes / No

(All the information you give us is confidential and your name would not be used in the project)

If your answer yes, please write your telephone number in order to get in touch with you.

Telephone no.: …….

Thank you very much for your help and ideas today

Preventing Childhood Obesity Survey

Consent Form for Stakeholder Focus Groups Participants

I have received explanation about prevention childhood obesity survey information. I understand what my involvement in the survey will be. I am assured that any information I give will be anonymous and that I will not be identified in any way. I am willing to take part in the focus group meetings and I am assured that I will be free to withdraw at any time.

Signed ……. **Date** ……

Appendix 10

Table 10.1 Reported frequency of consumption of selected food items during past week, by gender and nationality

Items	Frequency	Number (%)		Total
		Girls	Boys	
Animal protein				
Red meat	Never	33 (9.3)	34 (15.3)	67 (11.7)
	1-2 per week	240 (68.0)	133 (59.9)	373 (64.9)
	3-4 per week	61 (17.3)	32 (14.4)	93 (16.2)
	5-6 per week	7 (2.0)	6 (2.7)	13 (2.3)
	1 or more per day	12 (3.4)	17 (7.7)	29 (5.0)
Chicken	Never	5 (1.4)	4 (1.8)	9 (1.6)
	1-2 per week	81 (22.9)	48 (21.7)	129 (22.4)
	3-4 per week	170 (48)	94 (42.5)	264 (45.9)
	5-6 per week	55 (15.5)	29 (13.1)	84 (14.6)
	1 or more per day	43 (12.1)	46 (20.8)	89 (15.5)
Fish	Never	64 (18)	50 (22.8)	114 (19.8)
	1-2 per week	225 (63.2)	126 (57.5)	351 (61)
	3-4 per week	52 (14.6)	31 (14.2)	83 (14.4)
	5-6 per week	4 (1.1)	2 (0.9)	6 (1.0)
	1 or more per day	11 (3.1)	10 (4.6)	21 (3.7)
Egg	Never	34 (9.6)	25 (5.9)	59 (10.3)
	1-2 per week	145 (41)	78 (35.5)	223 (38.9)
	3-4 per week	123 (34.7)	73 (33.2)	196 (34.1)
	5-6 per week	24 (6.8)	10 (4.5)	34 (5.9)
	1 or more per day	28 (7.9)	34 (15.5)	62 (10.8)
Dairy				
Milk	Never	22 (6.2)	16 (7.3)	38 (6.6)
	1-2 per week	74 (21)	41 (18.6)	115 (20.1)
	3-4 per week	90 (25.5)	41 (18.6)	131 (22.9)
	5-6 per week	57 (16.1)	27 (12.3)	84 (14.7)
	1 or more per day	110 (31.2)	95 (43.2)	205 (35.8)
Cheese	Never	24 (6.8)	9 (4.1)	33 (5.8)
	1-2 per week	68 (19.3)	48 (21.8)	116 (20.2)
	3-4 per week	104 (29.5)	57 (25.9)	161 (28.1)
	5-6 per week	48 (13.6)	22 (10)	70 (12.2)
	1 or more per day	109 (30.9)	84 (38.2)	193 (33.7)
Carbohydrate				
Bread	Never	3 (0.8)	1 (0.5)	4 (0.7)
	1-2 per week	25 (7.1)	19 (8.6)	44 (7.7)
	3-4 per week	50 (14.2)	30 (13.6)	80 (14)

	5-6 per week	70 (19.8)	30 (13.6)	100 (17.5)
	1 or more per day	205 (58.1)	140 (63.6)	345 (60.2)
Rice	Never	1 (0.3)	2 (0.9)	3 (0.5)
	1-2 per week	18 (5.1)	24 (10.9)	42 (7.4)
	3-4 per week	57 (16.2)	41 (18.6)	98 (17.2)
	5-6 per week	94 (26.8)	48 (21.8)	142 (24.9)
	1 or more per day	181 (51.6)	105 (24.8)	286 (50.1)
Cereal	Never	70 (19.8)	52 (23.6)	122 (21.3)
	1-2 per week	148 (41.9)	83 (37.7)	231 (40.3)
	3-4 per week	66 (18.7)	32 (14.5)	98 (17.1)
	5-6 per week	18 (5.1)	15 (6.8)	33 (5.8)
	1 or more per day	51 (14.4)	38 (17.3)	89 (15.5)
Pasta	Never	62 (17.7)	39 (17.9)	101 (17.8)
	1-2 per week	237 (67.5)	138 (63.3)	375 (65.9)
	3-4 per week	34 (9.7)	24 (11)	58 (10.2)
	5-6 per week	2 (0.6)	3 (1.4)	5 (0.9)
	1 or more per day	16 (4.6)	14 (6.4)	30 (5.3)
Fruit and Vegetables				
Vegetables	Never	70 (20.1)	50 (22.9)	120 (21.2)
	1-2 per week	117 (33.5)	58 (33.5)	175 (30.9)
	3-4 per week	50 (14.3)	34 (15.6)	84 (14.8)
	5-6 per week	30 (8.6)	17 (7.8)	47 (8.3)
	1 or more per day	82 (23.5)	59 (27.1)	141 (24.9)
Fruit	Never	10 (2.9)	10 (4.6)	20 (3.5)
	1-2 per week	90 (25.8)	50 (23)	140 (24.7)
	3-4 per week	102 (29.2)	69 (31.8)	171 (30.2)
	5-6 per week	26 (7.4)	12 (5.5)	38 (6.7)
	1 or more per day	121 (34.7)	76 (35)	197 (34.8)
Fresh fruit juice	Never	57 (16.3)	35 (16.1)	92 (16.3)
	1-2 per week	141 (40.4)	84 (38.7)	225 (39.8)
	3-4 per week	70 (20.1)	48 (22.1)	118 (20.8)
	5-6 per week	17 (4.9)	4 (1.8)	21 (3.7)
	1 or more per day	64 (18.3)	46 (21.2)	110 (19.4)

P-values are based on Chi-squared test for difference between categories.

Data presented are numbers (percentages).

Table 10.2 Reported frequency of consumption of unhealthy foods and drinks during past week, by gender.

Items	Frequency	Number (%)		Total
		Girls	Boys	
Fried potato chips	Never	30 (8.5)	32 (14.6)	62 (10.9)
	1-2 per week	164 (46.7)	96 (43.8)	260 (45.6)
	3-4 per week	108 (30.8)	52 (23.7)	160 (28.1)
	5-6 per week	14 (4)	10 (4.6)	24 (4.2)
	1 or more per day	35 (10)	29 (13.2)	64 (11.2)
Fast food meals	Never	82 (23.4)	55 (25.1)	137 (24)
	1-2 per week	225 (64.1)	137 (62.6)	362 (63.5)
	3-4 per week	29 (8.3)	12 (5.5)	41 (7.2)
	5-6 per week	0 (0)	3 (1.4)	3 (0.5)
	1 or more per day	15 (4.3)	12 (5.5)	27 (4.7)
Crisps	Never	41 (11.7)	20 (9.1)	61 (10.7)
	1-2 per week	133 (37.9)	74 (33.8)	207 (36.3)
	3-4 per week	102 (29.1)	47 (21.5)	149 (26.1)
	5-6 per week	19 (5.4)	17 (7.8)	36 (6.3)
	1 or more per day	56 (16)	61 (27.9)	117 (20.5)
Confectionery	Never	11 (3.1)	6 (2.7)	17 (3)
	1-2 per week	83 (23.7)	54 (24.7)	137 (24.1)
	3-4 per week	92 (26.3)	43 (19.6)	135 (23.7)
	5-6 per week	35 (10)	25 (11.4)	60 (10.5)
	1 or more per day	129 (36.9)	91 (41.6)	220 (38.7)
Sweetened drink*	Never	30 (8.6)	19 (8.8)	49 (8.7)
	1-2 per week	72 (20.6)	43 (19.8)	115 (20.3)
	3-4 per week	71 (20.3)	35 (16.1)	106 (18.7)
	5-6 per week	41 (11.7)	20 (9.2)	61 (10.8)
	1 or more per day	135 (38.7)	100 (46.1)	235 (41.5)
Carbonated drink	Never	103 (29.5)	56 (25.8)	159 (28.1)
	1-2 per week	157 (45)	88 (40.6)	245 (43.3)
	3-4 per week	49 (14)	27 (12.4)	76 (13.4)
	5-6 per week	10 (2.9)	5 (2.3)	15 (2.7)
	1 or more per day	30 (8.6)	41 (18.9)	71 (12.5)

**fresh fruit juice not included*

P-values are based on Chi-squared test for difference between categories.

Data presented are numbers (percentages).

Table 10.3 Relationship between parental socioeconomic variables and child's healthy and unhealthy food consumption number and percentage

Food consumption	Father's educational level				Mother's educational level			
	Low	Medium	High	p-value	Low	Medium	High	p-value
Healthy foods consumption								
Animal protein	6 (33.3)	25 (20.0)	46 (26.3)	0.67	6 (26.1)	22 (24.7)	49 (23.7)	0.77
Dairy product	16 (33.3)	75 (30.4)	62 (22.9)	0.03	21 (41.2)	63 (31.8)	70 (22.0)	<0.01
Carbohydrate	23 (47.9)	101 (41.1)	107 (39.5)	0.34	25 (49.0)	81 (41.5)	125 (39.1)	0.20
Fruits and vegetables	9 (18.8)	37 (15.0)	32 (12.0)	0.16	13 (26.0)	29 (14.9)	37 (11.7)	0.01
Unhealthy foods consumption								
Sweetened beverages	12 (25.0)	43 (17.5)	45 (16.7)	0.94	13 (25.5)	32 (16.4)	56 (17.6)	0.56
Crisps	19 (39.6)	92 (37.1)	90 (33.3)	0.33	22 (43.1)	81 (41.3)	99 (30.9)	0.02
Fast food	3 (7.9)	9 (4.0)	6 (2.4)	0.07	4 (10.3)	8 (4.7)	7 (2.3)	0.20
Confectionery	18 (50.0)	83 (46.4)	112 (30.5)	0.46	16 (44.4)	73 (50.7)	124 (48.2)	0.99

P-values are based on Chi-squared test for difference between categories.

Data presented are numbers (percentages).

Table 10.4 Relationship between family monthly income and mother's working status and child's healthy and unhealthy food consumption number and percentage

Food consumption	Family monthly income				Mother's working status		
	Low	Medium	High	p-value	Not working	Working	p-value
Healthy foods							
Animal protein	34 (23.9)	27 (22.0)	15(30.0)	P=0.562	27 (23.7)	33 (22.9)	0.88
Dairy product	84 (30.5)	50 (25.3)	16(18.4)	P=0.021	59 (29.5)	55 (23.1)	0.15
Carbohydrate	118 (42.9)	79 (39.9)	31(36.5)	P=0.268	85 (42.1)	91 (38.6)	0.49
Fruits and vegetables	45 (16.5)	25 (12.8)	8 (9.3)	P=0.071	32 (15.9)	29 (12.4)	0.33
Unhealthy foods							
Sweetened beverages	56 (20.5)	31 (15.7)	13 (15.1)	0.50	36 (17.7)	40 (17.2))	0.34
Crisps	110 (40.1)	68 (34.3)	22(25.3)	0.03	74 (36.6)	78 (32.9)	0.50
Fast food	14 (5.6)	68 (34.3)	2 (2.6)	0.09	10 (5.6)	5 (2.3)	0.23
Confectionery	102 (48.6)	75 (50.0)	35 (50.0)	0. 89	74 (45.7)	92 (51.7)	0.31

P-values are based on Chi-squared test for difference between categories.

Data presented are numbers (percentages)

Table **10.5** Proportions N (%) of boys and girls who are engaging in walking, moderate and vigorous physical activity for at least 10 minute at a time, based on the numbers of days per week.

Number of days per week	Walking			Moderate activities			Vigorous activity		
	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls
0	211 (38.1)	68 (32.9)	143 (41.2)	216 (38.8)	81 (37.9)	135 (39.4)	287(51.3)	287 (51.3)	189(54.5)
1	33 (6)	6 (2.9)	27 (7.8)	49 (8.8)	17 (7.9)	32 (9.3)	47 (8.4)	47 (8.4)	28 (8.1)
2	46 (8.3)	19 (9.2)	27 (7.8)	72 (12.9)	22 (10.3)	50 (14.6)	76 (13.6)	76 (13.6)	55 (15.9)
3	29 (5.2)	6 (2.9)	23 (6.6)	47 (8.4)	15 (7)	32 (9.3)	37 (6.6)	37 (6.6)	22 (6.3)
4	22 (4)	10 (4.8)	12 (3.5)	35 (6.3)	10 (4.7)	25 (7.3)	22 (3.9)	22 (3.9)	12 (3.5)
5	29 (5.2)	16 (7.7)	13 (3.7)	34 (6.1)	19 (8.9)	15 (4.4)	19 (3.4)	19 (3.4)	8 (2.3)
6	15 (2.7)	6 (2.9)	9 (2.6)	10 (1.8)	4 (1.9)	6 (1.7)	13 (2.3)	13 (2.3)	7 (2)
7	169 (30.5)	76 (36.7)	93 (26.8)	94 (16.9)	46 (21.5)	48 (14)	59 (10.5)	59 (10.5)	26 (7.5)
Total	554	207	347	557	214	343	560	560	347

Walking P = 0.002
Moderate activity P =0.034
Vigorous activity P = 0.001

Table **10.6** Proportions N (%) of Qatari and non Qatari who are engaging in walking, moderate and vigorous physical activity for at least 10 minute at a time, based on the numbers of days per week.

Number of days per week	**Walking**			**Moderate activities**			**Vigorous activity**		
	All	**Qatari**	**Non Qatari**	**All**	**Qatari**	**Non Qatari**	**All**	**Qatari**	**Non Qatari**
0	211 (38.1)	179 (40)	32 (30.2)	216 (38.8)	18.2(40.4)	34 (32.1)	287 (51.3)	238 (52.5)	49 (45.8)
1	33 (6)	22 (4.9)	11 (10.4)	49 (8.8)	40 (8.9)	9 (8.5)	47 (8.4)	33 (7.3)	14 (13.1)
2	46 (8.3)	35 (7.8)	11 (10.4)	72 (12.9)	60 (13.3)	12 (11.3)	76 (13.6)	59 (13)	17 (15.9)
3	29 (5.2)	24 (5.4)	5 (4.7)	47 (8.4)	35 (7.8)	12 (11.3)	37 (6.6)	31 (6.8)	6 (5.6)
4	22 (4)	15 (3.3)	7 (6.6)	35 (6.3)	28 (6.2)	7 (6.6)	22 (3.9)	16 (3.5)	6 (5.6)
5	29 (5.2)	24 (5.4)	5 (4.7)	34 (6.1)	26 (5.8)	8 (7.5)	19 (3.4)	17 (3.8)	2 (1.9)
6	15 (2.7)	12 (2.7)	3 (2.8)	10 (1.8)	10 (2.2)	0 (0)	13 (2.3)	11 (2.4)	2 (1.9)
7	169 (30.5)	137 (30.6)	32 (30.2)	94 (16.9)	70 (15.5)	24 (22.6)	59 (10.5)	48 (10.6)	11 (10.3)
Total	554	448	106	557	451	106	560	453	107

Walking P = 0.610
Moderate activity P = 0.059
Vigorous activity Df 7, P = 0.964

Table **10.7** Proportions N (%) of boys and girls who are engaging in walking, moderate and vigorous physical activity based on the numbers of minutes per week.

Number of minute per day	**Walking**			**Moderate activities**			**Vigorous activity**		
	All	**Boys**	**Girls**	**All**	**Boys**	**Girls**	**All**	**Boys**	**Girls**
0	211 (49.1)	68 (42.2)	143 (53.2)	216 (44.9)	81 (43.3)	135 (45.9)	287(56.8)	98 (50.3)	189 (61)
10-30	79 (18.4)	32 (19.9)	47 (17.5)	87 (18.1)	33 (17.6)	54 (18.4)	68 (13.5)	25 (12.8)	43 (13.9)
31-60	75 (17.4)	34 (21.1)	41 (15.2)	95 (19.8)	35 (18.7)	60 (20.4)	98 (19.4)	51 (26.2)	47 (15.2)
61-120	36 (8.4)	11 (6.8)	25 (9.3)	44 (9.1)	21 (11.2)	23 (7.8)	31 (6.1)	12 (6.2)	19 (6.1)
121-150	3 (0.7)	1 (0.6)	2 (0.7)	5 (1)	3 (1.6)	2 (0.7)	1 (0.2)	0 (0)	1 (0.3)
151 and more	26 (6)	15 (9.3)	11 (4.1)	34 (7.1)	14 (7.5)	20 (6.8)	20 (4)	9 (4.6)	11 (3.5)
Total	430	161	269	481	187	294	505	195	310

Walking P = 0.022
Moderate activity P = 0.338
Vigorous activity P = 0.033

Table **10.8** Proportions N (%) of Qatari and non Qatari who are engaging in walking, moderate and vigorous physical activity based on the numbers of minutes per week.

Number of minutes per day	**Walking**			**Moderate activities**			**Vigorous activity**		
	All	**Qatari**	**Non Qatari**	**All**	**Qatari**	**Non Qatari**	**All**	**Qatari**	**Non Qatari**
0	211 (49.1)	179 (51.6)	32 (38.6)	216 (44.9)	182 (46.7)	34 (37.4)	287 (56.8)	238 (58)	49 (51.6)
10-30	79 (18.4)	60 (17.3)	19 (22.9)	87 (18.1)	67 (17.2)	20 (22)	68 (13.5)	52 (12.7)	16 (16.8)
31-60	75 (17.4)	55 (15.9)	20 (24.1)	95 (19.8)	80 (20.5)	15 (16.5)	98 (19.4)	79 (19.3)	19 (20)
61-120	36 (8.4)	28 (8.1)	8 (9.6)	44 (9.1)	31 (7.9)	13 (14.3)	31 (6.1)	25 (6.1)	6 (6.3)
121-150	3 (0.7)	1 (0.3)	2 (2.4)	5 (1)	2 (0.5)	3 (3.3)	1 (0.2)	1 (0.2)	0 (0)
151and more	26 (6)	24 (6.9)	2 (2.4)	34 (7.1)	28 (7.2)	6 (6.6)	20 (4)	15 (3.7)	5 (5.3)
Total	430	347	83	481	390	91	505	410	95

Walking P = 0.463
Moderate activity P = 0.164
Vigorous activity P = 0.363

Table 10.9 Relationship between schools food and nutrition policy and child's healthy and unhealthy food consumption and weight status N (%)

Variable	School food and nutrition policy			
	No	Yes	Total	p-value
Food consumption				
Fruit and vegetable				
Low intake	191 (86.0)	293 (85.9)	484 (86.0)	0.97
Ideal and High intake	31 (14.0)	48 (14.1)	79 (14.0)	
Total	222 (100)	341 (100)	563 (100)	
Animal protein				
Low intake	95 (77.2)	148 (75.1)	243 (75.9)	0.67
Ideal and High intake	28 (22.8)	49 (24.9)	77 (24.1)	
Total	123 (100)	197 (100)	320 (100)	
Dairy product				
Low intake	160 (71.1)	254 (74.1)	414 (72.9)	0.44
Ideal and High intake	65 (28.9)	89 (25.9)	154 (27.1)	
Total	225 (100)	343 (100)	568 (100)	
Carbohydrate				
Low intake	137 (60.9)	199 (58.2)	336 (59.3)	0.52
Ideal and High intake	88 (39.1)	143 (41.8)	231 (40.7)	
Total	225 (100)	342 (100)	567 (100)	
Sweetened beverages				
Low	137 (61.4)	214 (62.6)	351 (62.1)	0.88
Moderate	49 (22.0)	64 (18.7)	113 (20.0)	
High	37 (16.6)	64 (18.7)	101 (17.9)	
Total	223 (100)	342 (100)	565 (100)	
Crisps				
No intake	30 (13.5)	30 (8.7)	60 (10.6)	0.92
Moderate	108 (48.4)	198 (57.4)	306 (53.9)	
High	85 (38.1)	117 (33.9)	202 (35.6)	
Total	223 (100)	345 (100)	568 (100)	
Fast food				
No intake	56 (28.3)	81 (25.9)	137 (26.8)	0.55
Moderate	135 (68.2)	220 (70.3)	355 (69.5)	
High	7 (3.5)	12 (3.8)	19 (3.7)	
Total	198 (100)	313 (100)	511 (100)	
Confectionery				
No intake	6 (3.4)	11 (4.2)	17 (3.9)	0.64
Moderate	81 (46.6)	126 (47.7)	207 (47.3)	
High	87 (50.0)	127 (48.1)	214 (48.9)	
Total	174 (100)	264 (100)	438 (100)	

Weight status				
Non obese	345 (81.0)	478 (86.4)	823(84.1)	0.02
Overweight or obese	81 (19.0)	75 (13.6)	156 (15.9)	
Total	426 (100)	553 (100)	979 (100)	
School district				
District I	256 (60.1)	273 (49.4)	529 (54.0)	<0.01
District III	170 (39.9)	157 (28.4)	327 (33.4)	
District III	0 (0)	123 (22.2)	123 (12.6)	
Total	426 (100)	553 (100)	979 (100)	

Table 10.10 Relationship between schools physical activity policy and child's physical activity level and weight status

Variable	**School physical activity police**			
	No	**Yes**	**Total**	**p-value**
Physical activity level				
Low	87 (41.2)	88 (54.3)	175 (46.9)	0.07
Moderate	56 (26.5)	27 (16.7)	83 (22.3)	
High	68 (32.2)	47 (29.0)	115 (30.8)	
Total	211 (100)	162 (100)	373 (100)	
Weight status				
Non obese	428 (84.1)	395 (84.0)	823 (84.1)	0.98
Overweight or obese	81 (15.9)	75 (16.0)	156 (15.9)	
Total	509 (100)	470 (100)	979 (100)	
School district				
District I	241 (47.3)	288 (61.3)	529 (54.0)	<0.01
District III	203 (39.9)	124 (26.4)	327 (33.4)	
District III	65 (12.8)	58 (12.3)	123 (12.6)	
Total	509 (100)	470 (100)	979 (100)	

References

(1) Summerbell CD, Waters E, Edmunds L, Kelly SAM, Brown T, Campbell KJ. Interventions for Preventing Obesity in Children. 3. 2009. *The Cochrane Library*.

(2) Dehghan M, khtar-Danesh N, Merchant AT. Childhood obesity, prevalence and prevention. *Nutrition Journal* 2005; 4:24.

(3) World Health Organization. Obesity: Preventing and Managing the Global Epidemic. Geneva, WHO; 1998.

(4) Bianchini F, Kaaks R, Vainio H. Weight control and physical activity in cancer prevention. *Obesity Reviews* 2002; 3(1):5-8.

(5) Hubert HB, Feinleib M, McNamara PM, Castelli WP. Obesity as an independent risk factor for cardiovascular disease: a 26- year follow-up of participants in the Framingham Heart Study. *Circulation* 1983; 67(5):968.

(6) Must A, Jacques PF, Dallal GE, Bajema CJ, Dietz WH. Long-term morbidity and mortality of overweight adolescents. A follow-up of the Harvard Growth Study of 1922 to 1935. *N Engl J Med* 1992; 327(19):1350.

(7) Bray GA. The Underlying Basis for Obesity: Relationship to Cancer. *J Nutr* 2002; 132(11):3451S-3455.

(8) Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000; 320(7244):1240.

(9) Friedenreich CM. Physical Activity and Cancer Prevention: From Observational to Intervention Research. *Cancer Epidemiol Biomarkers Prev* 2001; 10(4):287.

(10) Musaiger A.O., Gregory WB. Profile of body composition of school children (6-18y) in Bahrain. *Int J Obes Relat Metab Disorder* 2000; 24(9):1093-1096.

(11) Al-Haddad F, Al-Nuaimi Y, Lille BB, Thabit M. Prevalence of obesity among school children in the United Arab Emirates. *American Journal of Human Biology* 2000; 12(4):498-502.

(12) Sorkhou I, Al-Qallaf K, Al-Shamali N, Hajia A, Al-Qal B. Childhood obesity in Kuwait prevalence and trends. *Family medicine* 2003; 35(7):463-464.

(13) El-Hazmi MA, Warsy AS. A comparative study of prevalence of overweight and obesity in children in different provinces of Saudi Arabia. *J Trop Pediatric* 2002; 48(3):172-177.

(14) Al-Nuaim AR, Bamgboye EA, Al-Herbish A. The pattern of growth and obesity in Saudi Arabia male school children. *Int Jobes Relat Metab Disorder* 1996; 20(11):1000-1005.

(15) A-Isa A.N, Moussa MA. Nutritional status of Kuwaiti elementary school children aged 6-10 years: Comparison with the NCHS/CDC reference population. *Int J Food Sci Nutr* 2000; 51(4):221-228.

(16) Farrag OL. The state of child nutrition in the Gulf Arab states. *J trop Pediat* 1983; 29:325-329.

(17) Musaiger AO. The State of Food and Nutrition in the Arabian Gulf Countries. *World Rev Nutr Diet* 1987; 54:105-173.

(18) Qotba H, A-Isa AN. Anthropometric measurements and dietary habits of schoolchildren in Qatar. *International Journal of Food Sciences and Nutrition* 2007; 58(1):1-5.

(19) Alkhalaf FA, Darwish EA, Katab M, Soliman A. Prevalence of underweight, overweight and obesity among primary school children in Qatar. National report, editor. HMC; 2004.

(20) Muller MJ, Mast M, Asbeck I, Langn K, Grund A. Prevention of obesity - is it possible? *Obesity Reviews* 2001; 2(1):15-28.

(21) Hardeman W, Griffin S, Johnston M, Kinmonth AL, Wareham NJ. Interventions to prevent weight gain: a systematic review of psychological models and behaviour change methods. *International Journal of Obesity* 2000; 24(2):131-143.

(22) Ebbeling CB, Pawlak DB, Ludwig DS. Childhood obesity: public-health crisis, common sense cure. *Lancet* 2002; 360(9331):473-482.

(23) Dietz WH. Childhood Weight Affects Adult Morbidity and Mortality. *The Journal of Nutrition* 1998; 128(2):411S.

(24) Gunnell DJ, Frankel SJ, Nanchahal K, Peters TJ, Davey Smith G. Childhood obesity and adult cardiovascular mortality: a 57-y follow-up study based on the Boyd Orr cohort. *Am J Clinical Nutrition* 1998; 67(6):1111.

(25) Mossberg HO. 40-year follow-up of overweight children. *Lancet* 1989; 2(8661):491-493.

(26) Guo SS, Wu W, Chumlea WC, Roche AF. Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. *Am J Clinical Nutrition 20*02; 76(3):653-658.

(27) Fitzgibbon ML, Stolley MR, Dyer AR, VanHorn L, KauferChristoffel K. A Community-Based Obesity Prevention Program for Minority Children: Rationale and Study Design for Hip-Hop to Health Jr. *Preventive Medicine* 2002; 34(2):289-297.

(28) Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. Do obese children become obese adults? A review of the literature. *Prev Med* 1993; 22(2):167-177.

(29) Sinha R, Fisch G, Teague B, Tamborlane WV, Banyas B, Allen K et al. Prevalence of Impaired Glucose Tolerance among Children and Adolescents with Marked Obesity. *N Engl J Med* 2002; 346(11):802.

(30) Saydah SH, Loria CM, Eberhardt MS, Brancati FL. Abnormal Glucose Tolerance and the Risk of Cancer Death in the United States. *Am J Epidemiol* 2003; 157(12):1092.

(31) Fruhbeck G. Childhood obesity: time for action, not complacency. *BMJ* 2000; 320(7231):328.

(32) Power C, Lake JK, Cole TJ. Measurement and long-term health risks of child and adolescent fatness. *Int J Obes Relat Metab Disord* 1997; 21(7):507-526.

(33) World Health Organization. Diet, nutrition and the prevention of chronic diseases. Geneva, WHO Technical report series; 916, 1-149. 2003.

(34) Reilly JJ, Methven E, McDowell ZC, Hacking B, Alexander D, Stewart L et al. Health consequences of obesity. *Arch Dis Child* 2003; 88(9):748-752.

(35) Park K. Park's Text Book Of Preventive and Social Medicine. 14 ed. Jabslpar, India: M/S Banarsidas Bhanat Publishers; 1995.

(36) World Health Organization. Physical status: The use and interpretation of anthropometry. Geneva, WHO; 1995.

(37) Zimmermann MB, Gubeli C, Puntener C, Molinari L. Detection of overweight and obesity in a national sample of 6-12-y-old Swiss children: accuracy and validity of reference values for body mass index from the US Centers for Disease Control and Prevention and international Obesity Task Force. *Am J Clinical Nutrition* 2004; 79:838-43.

(38) Wang Y, Moreno LA, Caballero B, Cole TJ. Limitations of the current World Health Organisation growth references for children and adolescents. *Food nutrition bulletine* 2006; 27(4):S175-S188.

(39) Reilly JJ, Kelly J, Wilson DC. Accuracy of simple clinical and epidemiological definitions of childhood obesity: systematic review and evidence appraisal. *Obesity Reviews* 2010; 11:645-655.

(40) WHO expert consultation. Appropriate body-mass index for Asian populations and its implications for policy and interventions strategies. *Lancet* 2004; 363:157-63.

(41) Marshall JD, Hazlett CC, Spady DW, Conger PLR, Quinney HA. Validity of convenient indicators of obesity. *Human Biology* 1991; 63:137-153.

(42) McCarthy HD, Ellis SM, Cole TJ. Central overweight and obesity in British youth aged 11-16 years: cross sectional surveys of waist circumference. *BMJ* 2003; 326(7390):624.

(43) Dietz WH, Bellizzi MC. Introduction: the use of body mass index to assess obesity in children. *Am J Clinical Nutrition* 1999; 70(1):123S-125.

(44) Flegal KM, Tabak CJ, Ogden CL. Overweight in children: definitions and interpretation. *Health education research* 2006; 21(6):755-760.

(45) Heshka S, Allison DB. Is obesity a disease? *International Journal of Obesity* 2001; 25(1401):1404.

(46) Must A, Anderson SE. Body mass index in children and adolescent: considerations for population based application. *International Journal of Obesity* 2006; 30:590-594.

(47) Jotangia D, Moody A, Stamatakis E, Wardle H. Obesity among children under 11. London, National Centre for Social Research, Department of Epidemiology and Public Health at the Royal Free and University College Medical School; 2005.

(48) Guillaume M. Defining obesity in childhood: current practice. *Am J Clin Nutr* 1999; 70(suppl):126S-130S.

(49) Romero-Corral A, Montori VM, Somers VK, Korinek J, Thomas RJ, Allison TG. Association of body weight with total mortality and with cardiovascular events in coronary artery disease: a systematic review of cohort studies. *Lancet* 2006; 368:666-78.

(50) Prentice AM. Beyond body mass index. *Obesity Reviews* 2001; 2:141-147.

(51) Deurenberg P, Deurenberg-Yap M, Guricci S. Asians are different from Caucasians and from each other in there body mass index/ body fat percent relationship. *Prev Med* 2002; 3:141-146.

(52) Helitzer DL, Davis SM, Gittelsohn J, Going SB, Murray DM, Snyder P et al. Process evaluation in a multisite, primary obesity-prevention trial in American Indian schoolchildren. *Am J Clinical Nutrition* 1999; 69(4):816S-8824.

(53) Reilly JJ, Dorosty AR, Emmett PM, ALSPAC study team. Identification of the obese child: adequacy of the body mass index for clinical practice and epidemiology. *International Journal of Obesity* 2000; 24:1623-1627.

(54) Barlow SE, Dietz WH. Obesity evaluation and treatment: Expert committee recommendation. The maternal and child health Bureau, Health resources and services administration and Department of health and human services. *Pediatrics* 1998; 102(3):E29.

(55) Himes JH, Dietz WH. Guideline for overweight in adolescent preventive services: recommendations from an expert committee. The expert committee on clinical guidelines for overweight in adolescent preventive services. *Am J Clinical Nutrition* 1994; 59:307-316.

(56) Kuczmarski RJ, Ogden CL, Guo SS, et al. 2000 CDC growth charts for the United States: methods and development. 11 ed. National center for health statistics; 2002.

(57) de Onis M, Onyango AW, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-age children and adoleescents. *Bull World Health Organization* 2007; 85(9):660-667.

(58) Al-Sendi AM, Shetty P, Musaiger AO. Prevalence of over weight and obesity among Bahraini adolescents: a comparison between three different sets of criteria. *Eur J Clin Nutri* 2003; 57(3):471-474.

(59) Kain J, Uauy R, Vio F, Albala C. Trends in overweight and obesity prevalence in Chilean children: comparison of three definitions. *European journal of clinical nutrition* 2002; 56:200-204.

(60) de Onis M, Garza C, Onyango AW, Borghi E. Comparison of the WHO child Growth Standards and the CDC 2000 Growth Charts. *Journal of Nutrition* 2007;148.

(61) Ramirez E, Grijalva-Haro MI, Ponce JA, valencia ME. [Prevalence of overweight and obesity in northwest Mexico by three references of body mass index: differences in classification]. *Arch Latinoam Nutr* 2006; 56(3):251-6.

(62) Lobstein T, Frelut ML. Prevalence of overweight among children in Europe. *Obesity Reviews* 2003; 4:195-200.

(63) Ogden C.L., Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of overweight and obesity in the United States 1999-2004. *JAMA* 2006; 295(13):1549-1555.

(64) Wang Y, Monteriro C, Popkin BM. Trends of obesity and underweight in older children and adolescents in the United States, Brazil, China, and Russia. *Am J Clinical Nutrition* 2002; 75:971-977.

(65) Janssen I, Katzmarzyk PT, Boyce WF, Vereecken C, Mulvihill C, Roberts C et al. Comparison of overweight and obesity prevalence in school-aged youth from 34 countries and their relationships with physical activity and dietary patterns. *Obesity Reviews* 2005; 6(2):123-132.

(66) Bagchi K. Nutrition in the Eastern Mediterranean Region of the World Health Organization. *Eastern Mediterranean Health Journal* 2008; 14:S107-S113.

(67) Musaiger A.O. Overweight and obesity in the Eastern Mediterranean Region: can we control it? *Eastern Mediterranean Health Journal* 2004; 10(6):789-793.

(68) Bener A. Prevalence of obesity, overweight, and underweight in Qatar adolescents. *Food nutrition bulletin* 2006; 27(1):39-45.

(69) Al-Haddad FH, Little BB, Ghafoor AGMA. Childhood obesity in United Arab Emirates schoolchildren: A national study. *Annals of Human biology* 2005; 32(1):72-79.

(70) Abalkhail BA, Shawky SaSNK. Validity of self-reported weight and height among Saudi school children and adolescents. *Saudi Medical Journal* 2002; 23(3):831-837.

(71) Al-Sendi AM, Shetty P, Musaiger AO. Anthropometric and body composition indicator of Bahraini adolescents. *Ann Hum Biol* 2003; 30(4):367-379.

(72) Stamatakis E, Wardle J, Cole TJ. Childhood obesity and overweight prevalence trends in England:evidence for growing socioeconomic disparities. *International Journal of Obesity* 2010; 34:41-47.

(73) Sobal J, Stunkard AJ. Socioeconomic status and obesity: a review of the literature. *Psychol Bull* 1989; 105(2):260-275.

(74) Wang Y. Cross-national comparison of childhood obesity: the epidemic and the relationship between obesity and socioeconomic status. *International Journal of Epidemiology* 2001; 30:1129-1136.

(75) Saxena S, Ambler G, Cole TJ, Majeed A. Ethnic group differences in overweight and obese children and young people in England: cross sectional survey. *Arch Dis Child* 2004; 89(1):30-36.

(76) Wardle J, Brodersen NH, Cole TJ, Jarvis MJ, Boniface DR. Development of adiposity in adolescence: five year longitudinal study of an ethnically and socioeconomically diverse sample of young people in Britain. *BMJ* 2006; 332:1130-1135.

(77) Adair LS. Child and adolescent obesity: epidemiology and developmental perspectives. *Physiol Behav* 2008; 94:8-16.

(78) Ogden CL, Yanovski SZ, Carroll MD, Flegal KM. The epidemiology of obesity. *Gastroenterology* 2007; 132:2087-2102.

(79) Whitlock EP, Williams SB, Gold R, Smith PR, Shipman SA. Screening and interventions for childhood overweight: a summary of evidence for the US Preventive Services Task Force. *Pediatrics* 2005; 116(1):e125-e144.

(80) Kosti RI, Panagiotakos DB. The epidemic of obesity in children and adolescents in the world. *Cent Eur J Publ Health* 2006; 14(4):151-159.

(81) Hill JO, Peters JC. Environmental contributions to the obesity epidemic. *Science* 1998; 12:1371-1374.

(82) Lobstein T, Baur L, Uauy R, IASO International Obesity Task Force. Obesity in children and young people: a crisis in public health. *Obesity Reviews* 2004; 1(4):104.

(83) Aylott J, Brown I, Copeland R, Johnson D. Tackling Obesity: The Foresight Report and Implications for Local Government. UK, Sheffield Hallam University; 2008.

(84) Foresight. Tackling obesity - future choices project report. London: Government Office for Science; 2007.

(85) Swinburn B, Egger G. Preventive strategies against weight gain and obesity. *Obesity Reviews* 2002; 3(4):289-301.

(86) Johnson RK. Changing eating and physical activity patterns of US children. *Proceeding of nutrition society* 2000; 59:295-301.

(87) Jequier E. Is fat intake a risk factor for fat gain in children? *Journal of Clinical Endocrineology and Metabolism* 2001; 86:980-983.

(88) Muller MJ, Koertzing I, Mast M, Langnase K, Grund A. Physical activity and diet in 5 to 7 years old children. *Public Health Nutrition* 1999; 2(3a):443-444.

(89) Ludwig DS, Peterson KE, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *Lancet* 357, 505-08. 2001.

(90) Harnack L, Stang J, Story M. Soft drink consumption among US children and adolescent: nutrional consequences. *J Am Diet Assoc* 1999; 99(436):441.

(91) Malik VS, Schulze MB, Hu FB. Intake of sugar-sweetened beverages and weight gain: a systematic review. *Am J Clinical Nutrition* 2006; 84(2):274-288.

(92) Atkin L-M, Daies P. Diet composition and body composition in preschool children. *Am J Clinical Nutrition* 2000; 72:15-21.

(93) Ebbeling CB, Feldman HA, Osganian SK, Chomitz VR, Ellenbogen SJ, Ludwig DS. Effect of decreasing sugar-sweetened beverage consumption on body weight in adolescents: A randomized, controlled pilot study. *Pediatrics* 2006; 117(3):673-680.

(94) Smithers G, Gregory JW, Bates CJ, Prentice A, Jackson LV, Wenlock R. The national diet and nutrition survey: young people aged 4 to 18 years. *Nutrition Bulletin* 2000; 25(2):105-111.

(95) Davison KK, Birch LL. Childhood overweight: a contextual model and recommendations for future research. *Obesity Reviews* 2, 159-171. 2001.

(96) Anderson RE, Crespo CJ, Bartlett SJ, Cheskin LJ, Pratt M. Relationship of physical activity and television watching with body weight and level of fatness among children: result from the Third national Health and Nutrition Examination Survey. *JAMA* 1998; 279:938-942.

(97) Triost SG, Kerr LM, Ward DS, Pate RR. Physical activity and determinants of physical activity in obese and non-obese children. *International Journal Obes Relat Metab Disorder* 2001; 25:822-829.

(98) Epstein LH, Paluch RA, Consalvi A, Riordan K, Scholl T. Effects of manipulating sedentary behavior on physical activity and food intake. *J Pediatr* 2002; 140:334-339.

(99) Robinson TN. Does television cause childhood obesity? *JAMA* 1998; 279:959-960.

(100) Robinson TN. Reducing children's television viewing to prevent obesity: A randomised controlled trial. *JAMA* 1999; 282(16):1561-1567.

(101) Farooqi IS, O'Rahilly S. Recent advances in the genetics of severe obesity. *Arch Dis Child* 2000; 83:31-34.

(102) Lake JK, Power C, Cole TJ. Child to adult body mass index in the 1958 British birth cohort: associations with parents obesity. *Arch Dis Child* 1997; 77(5):375-6.

(103) De Moria AP, Power C, Li L. Changing influences on childhood obesity:A study of 2 generations of the 1958 British birth cohort. *Am J Epidemiol* 2010; 171(12):1289-98.

(104) Danielzik S, Czerwinski-Mast M, Langnase K, Dilba B, Muller MJ. Parent overweight, socioeconomic status and high birth weight are the major determinants of overweight and obesity in 5-7 y-old children: baseline data of the Kiel Obesity Prevention Study (KOPS). *International Journal of Obesity* 2004; 28:1494-1502.

(105) Mamun.A.A., Lawlor DA, O'Callaghan MJ. Family and early life factors associated with changes in overweight status between ages 5 and 14 years: finding from the Mater University study of pregnancy and its outcomes. *Int J Obes* 2005; 29(5):475-482.

(106) Whitaker RC, Dietz WH. Role of the prenatal environment in the development of obesity. *J Pediatr* 1998; 132(5):768-776.

(107) Benton D. Role of parents in the determination of the food preferences of children and the development of obesity. *International Journal of Obesity* 2004; 28(7):858-69.

(108) Bogaert N, Steinbeck KS, Baur LA, Brock K, Bermingham MA. Food, activity and family-environmental vs biochemical predictors of weight gain in children. *European journal of clinical nutrition* 2003; 57(10):1242-49.

(109) Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK et al. Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health. *Arch Pediatr Adolesc Med* 1999; 153(4):409-418.

(110) Mo-suwan L, Pongprapai S, Junjana C, Puetpaiboon A. Effects of a controlled trial of a school-based exercise program on the obesity indexes of preschool children. *Am J Clinical Nutrition* 1998; 68(5):1006-1011.

(111) Donnelly JE, Jacobsen DJ, Whatley JE, Hill JO, Swift LL, Cherrington A et al. Nutrition and physical activity program to attenuate obesity and promote physical and metabolic fitness in elementary school children. *Obes Res* 1996; 4(3):229-243.

(112) Flores R. Dance for health: improving fitness in African American and Hispanic adolescents. *Public Health Reports* 1995; 110(2):189-193.

(113) Stolley MR, Fitzgibbon ML. Effects of an obesity prevention program on the eating behavior of African American mothers and daughters. *Health Education & Behavior* 1997; 24(2):152-164.

(114) Muller MJ, Asbeck I, Mast M, Langnase K, Grund A. Prevention of obesity-more than an intention. Concept and first results of the Kiel Obesity Prevention Study (KOPS). *International Journal of Obesity & Related Metabolic Disorders* 2001; 25 Suppl 1:S66-S74.

(115) Epstein LH, Gordy CC, Raynor HA, Beddome M, Kilanowski CK, Paluch R. Increasing fruit and vegetable intake and decreasing fat and sugar intake in families at risk for childhood obesity. *Obes Res* 2001; 9(3):171-178.

(116) Mulvihill C, Quigley R. The management of obesity and overweight: an analysis of reviews of diet, physical activity and behavioural approaches. Evidence briefing. London, UK, Health Development Agency; 2003.

(117) James J, Thomas P, Cavan D, Kerr D. Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomised controlled trial. *BMJ* Online First 2004; 328(7450).

(118) Sahota P, Rudolf MCJ, Dixey R, Hill AJ, Barth JH, Cade J. Evaluation of implementation and effect of primary school based intervention to reduce risk factors for obesity. *BMJ* 2001; 323(7320):1027.

(119) Warren JM, Henry CJK, Lightowler HJ, Bradshaw SM, Perwaiz S. Evaluation of a pilot school programme aimed at the prevention of obesity in children. *Health Promot Int* 2003; 18(4):287-296.

(120) Baranowski T, Baranowski JC, Cullen KW, Thompson DI, Nicklas T, Zakeri IE et al. The fun, food, and fitness Project (FFFP): the Baylor GEMS pilot study. *Ethnicity and Disease* 2003; 13(suppl 1):S30-39.

(121) Beech BM, Klesges RC, Kumanyika SK, Murray DM, Kleges L, McClanahan B et al. Child- and- parent- targeted interventions: the Memphis GEMS pilot study. *Ethnicity and Disease* 2003; 13(Suppl 1):S40-53.

(122) Dennison BA, Russo TJ, Burdick PA, Jenkins PL. An intervention to reduce television viewing by preschool children. *Archives of Pediatrics and Adolescent Medicine* 2004; 158(2):170-176.

(123) Harvey-Berino J, Rouke J. Obesity prevention in preschool NativeAmerican children: A pilot study using home visiting. *Obes Res* 2003; 11(606):611.

(124) Kain J, Uauy R, alnala, Vio FCR, Leyton B. School-based obesity prevention in Chilean primary school children: methodology and evaluation of a controlled study. *International Journal of Obesity* 2004; 28(4):483-493.

(125) Neumark-Sztainer D, Story M, Hannan PJ, Rex J. New Moves: a school-based obesity prevention program for adolescent girls. *Preventive Medicine* 2003; 37(1):41-51.

(126) Pangrazi RP, Beighle A, Vehige T, Vack C. Impact of Promoting lifestyle Activity for Youth (PLAY) on cildren's physical activity. *Journal School Health* 2003; 73(8):317-321.

(127) Robinson TN, Killen JD, Kraemer HC, Wilson DM, Matheson DM, Haskell WL et al. Dance and reducing television viewing to prevent weight gain in African-American girls: The Stanford GEMS pilot study. *Ethnicity and Disease* 2003; 13(Suppl 1):S65-77.

(128) Story M, Sherwood NE, Himes JM, Davis M, Jacobs DR, Cartwright Y et al. An after-school obesity prevention program for African-American girls: the Minnesota GEMS pilot study. *Ethnicity and Disease* 2003; 13(Suppl 1):S54-64.

(129) Summerbell CD, Waters E, Edmunds LD, Kelly S, Brown T, Campbell KJ. Interventions for preventing obesity in children. Cochrane Database of Systematic Reviews: Reviews 2005 Issue 3 John Wiley & Sons, Ltd Chichester, UK DOI: 10 1002/14651858 CD001871 pub2 2005;(3).

(130) Stice E, Shaw H, Marti CN. A meta-analytic review of obesity prevention programs for children and adolescents: the skinny on interventions that work. *Psychological Bulletin* 2006; 132(5):667-691.

(131) Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *Obesity Reviews* 2009; 10(1):110-141.

(132) Caballero B, Clay T, Davis SM, Ethelbah B, Rock BH, Tohman T et al. Pathways: a school based, randomized controlled trial for the prevention of obesity in American Indian school children. *Am J Clinical Nutrition* 2003; 78(5):1030-1038.

(133) Sahota P, Rudolf MCJ, Dixey R, Hill AJ, Barth JH, Cade J. Randomised controlled trial of primary school based intervention to reduce risk factors for obesity. *BMJ* 2001; 323(7320):1029.

(134) Sallis JF, McKenzie TL, Alcaraz JE, Kolody B, Hovell MF, Nader PR. Effects of physical education on adiposity in children. *Annals of the New Yourk Academy of Sciences* 1993; 699(127):136.

(135) Flodmark CE, Marcus C, Britton M. Interventions to prevent obesity in children and adolescents: a systematic literature review. *International Journal of Obesity* 2006; 30(4):579-589.

(136) NHS CRD. The prevention and treatment of childhood obesity. NHS Centre for Reviews and Dissemination. Effective Health Care; 7(6), 2002.

(137) Campbell K, Waters E, O'Meara S, Kelly S, Summerbell C. Interventions for Preventing Obesity in Children. The Cochrane Library; 3, 2002.

(138) NHS CRD. A systematic review of the interventions for the prevention and treatment of obesity, and the maintenance of weight loss. University of York: 10, 1997.

(139) Glanz K, Lankenau B, Foerster S, Temple S, Mullis R, Schmid T. Environmental and policy approaches to cardiovascular disease prevention through nutrition: opportunities for state and local action. *Health Education Quarterly*, 1995; 22:512-27.

(140) Resnicow K. School-based obesity prevention. Population versus high-risk interventions. *Ann N Y Acad Sci* 1993; 699:154-166.

(141) Carter MA, Swinburn B. Measuring the 'obesogenic' food environment in New Zealand primary schools. *Health Promot Int* 2004; 19(1):15-20.

(142) Parcel GS, Simons-Morton B, O'Hara NM, Baranowski T, Wilson B. School promotion of healthful diet and physical activity: impact on learning outcomes and self reported behaviour. *Health Education Quarterly* 1989; 16:181-99.

(143) Centres for Disease Control. Guidelines for school health programs to promote lifelong healthy eating. *Journal of school health* 1997; 67:9-26.

(144) Neumark-Sztainer D, French SA, Hannas PJ, Story M, Fulkerson JA. School lunch and snacking patterns among high school students: associations with school food environment and policies. *The International Journal of Behavioral Nutrition and physical Activity* 2005; 2(1):14.

(145) Ravussin E, Swinburn BA. Pathophysiology of obesity. *Lancet* 1992; 340(8816):404-408.

(146) Campbell M, Fitzpatrick R, Haines A, Kinmonth AL, Sandercock P, Spiegelhalter D et al. Framework for design and evaluation of complex interventions to improve health. *BMJ* 2000; 321(7262):694-696.

(147) Dietz WH, Gortmaker SL. Preventing obesity in children and adolescents. *Annu Rev Public Health* 2001; 22:337-353.

(148) Whitaker RC, Wright JA, Seidel D, Dietz WH. Early adiposity rebound and the risk of adult obesity. *Pediatrics* 1998; 101:e5.

(149) The planning council. Qatar in Figures Repoprt. State of Qatar2006.:

(150) The planning council. Annual Statisic Abstract. State of Qatar: 2008.

(151) Statistic Authority. Labour Force Sample Survey. State of Qatar: 2007.

(152) Ministry of Education and Higher Education. Ministry of Education and Higher Education annual reports 2004/ 2005. State of Qatar: 2005.

(153) Medical Research Council. A framework for design and evaluation of RCTs for complex interventions to improve health. London: 2000.

(154) Craig P, Dieppe P, Macintyre S, Michie S, Nazareth I, Petticrew M. Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ* 2008; 337:a1655.

(155) Egger G, Swinburn B. An ecological approach to the obesity pandemic. *BMJ* 1997; 314:477-80.

(156) Swinburn B, Egger G, Raza F. Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Prev Med* 1999; 29(6 Pt 1):563-570.

(157) Lingard L, Albert M, Levinson W. Qualitative Research Grounded Theory: mixed methods and action research. *BMJ* 2008; 337:459-461.

(158) Johnson RB, Onwuegbuzie AJ, Turner LA. Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research* 2007; 1:112-133.

(159) Strauss A, Corbin J. Basic of Qualitative Research: Grounded theory procedures and techniques. Sage; 1990.

(160) International Physical Activity Questionnaire. IPAQ: Short last 7 days self administered format (English version). For use with young and middl -age adults. The Unit for Public Health Nutritions [2001 [cited 2005 May 1];[1-4] Available from: URL:http://www.ipaq.ki.se/questionnaires/IPAQ_S7S_FINAL_MAY_01.pdf

(161) Thompson FE, Subar AF, Smith AF, Midthune D, Radimer K, Kahle LL et al. Fruit and vegetable assessment: Performance of 2 new short instruments and a food frequency questionnaire. *J Am Diet Assoc* 2002; 102(12):1764-1772.

(162) Thompson FE, Kipnis V, Subar AF, Schatzkin A, Potischman N, Kahle L et al. Performance of short instrument to estimate usual dietary intake of percent calories from fat. *Eur J Clin Nutri* 1998; 25(supp 12):S63.

(163) Guillemine F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: Literature review and proposed guidelines. *J Clin Epidemiology* 1993; 46:1417-1432.

(164) WHOQOL Group. Study protocol for the World Health Organization project to develop a Quality Of Life assessment instrument (WHOQOL). *Quality Life Research* 1993; 2(2):153-159.

(165) Turconi G, Celsa M, Rezzani C, Biino G, Sartirana MA, Roggi C. Reliability of dietary questionnaire on food habits, eating behaviour and nutritional knowledge of adolescents. *Eur J Clin Nutri* 2003; 57:753-763.

(166) McPherson RS, Hoelscher DM, Alexander M, Scanlon KS, Serdula MK. Dietary Assessment Methods among School-Aged Children: Validity and Reliability. *Preventive Medicine* 2000; 31(2):S11-S33.

(167) Kohl HW, Fulton JE, Caspersen CJ. Assessment of physical activity among children and adolescents: A review and synthesis. *Preventive Medicine* 2000; 31:S54-S76.

(168) Warren JM, Henry CJ, Livingstone MB, Lightowler HJ, Bradshaw SM, Perwaiz S. How well do children aged 5-7 years recall food eaten at school lunch? *Public Health Nutrition* 2003; 6(1):41-47.

(169) Kaskoun MC, Johnson R, Goran MI. Composition of energy intake by food frequency questionnaire with total energy expenditure by double label water in young children. *Am J Clinical Nutrition* 1994; 60:43-47.

(170) Johnson PK, Driscoll P, Goran.M.I. Cross calibration of energy intake by 24 hour recall against total energy expenditure by double labelled water in young children. *J Am Diet Assoc* 1996; 96:1140-1144.

(171) International Physical Activity Questionnaire. Guide line for Data processing analysis of International Physical Activity Questionnaire (IPAQ) - Short and Long Forms. The Unit for Public Health Nutritions [cited 2005 May 1];[1-15] Available from: URL:http://www.ipaq.ki.se/

(172) International Physical Activity Questionnaire. IPAQ: Short last 7 days self administered format (Arabic version). The Unit for Public Health Nutritions [cited 2005 May 1]; Available from: URL:http://www.ipaq.ki.se/questionnaires/ArabicIQShtel_coverpage.pdf

(173) SPSS I. Statistical Packages for social sciences software programme (version 12). Chicago IL [2001.

(174) US Department of Agriculture. Dietary Guidelines for Americans. US Department of Health and Human Services; 2005.

(175) Rao G. Childhood obesity: Highlights of AMA Expert Committee Recommendations. *Am Fam Physician* 2008; 78((1)):56-63.

(176) Kitzinger J. Qualitative research.Introducing focus groups. *BMJ* 1995; 311(7000):299-302.

(177) Pope C, Ziebland S, Mays N. Qualitative research in health care: analysing qualitative data. *BMJ* 2000; 320:114-116.

(178) Cameron E, Mathers J. Health and well-being: questioning the use of health concepts in public health policy and practice. *Critical Public Health* 2006; 16(4):347-354.

(179) Swinburn B, Gill T, Kumanyika S. Obesity prevention: a proposed framework for translating evidence into action. *Obesity Reviews* 2005; 6(1):23-33.

(180) Statistic Authority, r. Analytical Summary Household Expenditure and Income Survey 2006-2007. State of Qatar [cited 2010 Mar. 7];[1-74] Available from: URL:http://www.qsa.gov.qa/eng/surveys/household_Analytical_e.pdf

(181) AL-Jaber KA, Farid S. Qatar family health survey 1998 principal report. Doha: Minisry of Health: King Fahad national library; 2000.

(182) Amine EK. Nutritional assessment in Qatar. Egypt, EMRO, WHO. 1994.

(183) Flegal KM, Ogden C.L., Wei R, et al. Prevalence of overweight in US children: comparison of US growth charts from the Centers for disease Control and Prevention with other reference values for body mass index. *Am J Clinical Nutrition* 2001;(73):1086-93.

(184) Moussa MAA, Shaltout AA, Nkansa-Dwamena D, Mourad M, AlSheikh N, Agha N et al. Factors associated with obesity in Kuwaiti children. *European Journal of Epidemiology* 1999; 15:41-49.

(185) Kayyali MM, Al-tawil K. Breast feeding practices in Qatar. *Journal Obstetric Gynacology* 1989; 10(1):S19-20.

(186) Arenz S, Ruckrl R, Koletzko B, and Kries RV. Breast-feeding and childhood obesity-a systematic review. *International Journal of Obesity* 2004; 28:1247-1256.

(187) Armstrong J, Reilly JJ, and the Child Health Information Team. Breastfeeding and lowering the risk of childhood obesity. *The Lancet* 2002; 359:2003-04.

(188) Jingxiong J, Rosenqvist U, Huishan W, Koletzko B, Gubeli C, Jing H et al. Relationship of parental characteristics and feeding practices to overweight in infants and young children in Beijing, China. Public Health Nutrition 12[7], 973-78. 2008.

(189) Gillman MW, Rifas-Shiman. SL, Camargo CA, Berkey CS, Frazier AL, Rockett HR et al. Risk of overweight among adolescents who were breastfed as infants. *JAMA* 2001; 285(19):2461-2467.

(190) vonKries R, Koletzko B, Sauerwald T, vonMutius E, Barnert D, Grunert V et al. Breast feeding and obesity: cross sectional study. *BMJ* 1999; 319:147-150.

(191) Popkin BM. The nutrition transition and obesity in the developing world. *The Journal of Nutrition* 2001; 131:871S-873S.

(192) Pardee PE, Norman GJ, Lusting RH, Preud'homme D, Schwimmer JB. Television viewing and hypertention in obese children. *American Journal of Preventive Medicine* 2007; 33(6):439-43.

(193) Hui LL, Nelson EAS, Yu LM, Li AM, Fok TF. Risk factors for childhood overweight in 6 to 7 Y old Hong Kong children. *International Journal of Obesity* 2003; 27:1411-1418.

(194) Ozturk A, Mazicioglu MM, Poyrazogla S, Cicek B, Gunay O, Kurtoglu S. The relationship between sleep duration and obesity in Turkish children and adolesdents. *Acta paediatric* 2007; 98(4):699-702.

(195) Bayer O, Rosario AS, Wabitsh M, Von Kris R. Sleep duration and obesity in children is the association dependent on age and choice of the outcome parameter? *Sleep* 2009; 32(9):1183-1189.

(196) Kubik MY, Lytle LA, Hannan PJ, Perry CL, Story M. The association of the school food environment with dietary behaviors of young adolescents. *American Journal of public health* 2003; 93:1168-73.

(197) Cullen KW, Eagan J, Baranowski T, Owens E, de Moor C. Effect of a la carte and snack bar foods at school on children's lunchtime intake of fruits and vegetables. *Journal of the American Dietetic Association* 2000; 100:1482-86.

(198) Neumark-Sztainer D, Story M, Harris T. Beliefs and attitudes about obesity among teachers and school health care providers working with adolescents. *Journal of nutrition education* 1999; 31(1):3-9.

(199) Hardus PM, van Vuuren CL, Crawford D, Worsley A. Public perceptions of the causes and prevention of obesity among primary school children. International *Journal of Obesity* 2003; 27:1465-1471.

(200) Styles JL, Meier A, Sutherland LA, Campbell MK. Parents' and caregivers' concerns about obesity in young children: A Qualitative study. *Family community Health* 2007; 30(4):279-295.

(201) Anderson PM, Butcher KF, Levine PB. Maternal employment and overweight children. *Journal of Health Economy* 2003; 22(3):477-504.

(202) Hesketh, K, Waters E, Green J, Salmon L, Williams J. Healthy eating and obesity prevention: a qualitative study of parent and child perceptions in Australia. *Health Promot Int* 2005; 20(1):19-26.

(203) Wilkenfed R, Pagnini D, Booth M, Booth S, King L. The Weight of Opinion: Perceptions of school teachers and secondary students on child and adolescent overweight and obesity. 1-43. 2007. Sydney, NSW Centre for Overweight and obesity.

(204) Bauer KW, Patel A, Prokop LA, Austin SB. Swimming upstream: Faculty and staff members from urban middle schools in low- income communities describe their experience implementing nutrition and physical activities. *Preventing chronic disease* 2006; 3(2):A37.

(205) Rabiee F. Focus- group interview and data analysis. *Proceedings of the nutrition society* 2004; 63:655-660.

(206) Krueger RA, Casey MA. Focuse Groups: A practical Guide for Applied Research. third eddition ed. CA: Thousand Oaks: sage publications.; 2000.

(207) Pocock M, Trivedi D, Wills W, Bunn F, Magnusson J. Parental perceptions regarding healthy behaviours for preventing overweight and obesity in young children: a systematic review of qualitative studies. *Obesity Reviews* 2010; 11(5):338-353.