DENTAL IMPLANT PRACTICE AND EDUCATION IN THE UK- CURRENT CHALLENGES AND FUTURE CHALLENGES

by

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ABSTRACT

Dental implants have become one of the important treatment options in restorative dentistry. However, their role in general dental practice in the UK is unclear. The objectives of this research were to explore the status of 1. dental implant practice in the primary care dental services and 2. dental implant education in the UK. A background search identified that the available research included only patient satisfaction surveys on receiving dental implant treatment or dentists' opinion surveys after a training course. There was a gap in understanding the dentists' views on dental implant practice and training. Therefore, the research was focused on getting the opinion of dentists. At the first stage, a questionnaire study was conducted among a representative group of general dental practitioners (GDPs) in the west midlands. The perception of the majority of the dentists who participated in the survey was that implant education was still inconsistent and did not instil confidence in the UK graduated general dentists in managing dental implant patients. However, the survey did not explore the dentists' views further. Therefore, the research was continued using qualitative methodology. At this stage, another review was conducted, revealing that the number of qualitative research publications until 2020 was only minimal. Content analysis of the selected articles revealed that the majority of them explored patient views, not those of dentists.

In-depth interviews were conducted with 22 dentists of different experience levels. While adhering to the principle of information saturation to decide sample size, efforts to ensure inclusion of dentists from different geographic locations, different educational backgrounds, and different levels of experience. NVIVO software was used to code and organise data, and a framework analysis method was used.

Analysis of the interview data identified different themes related to dentists' confidence in managing dental implant patients, the need for guidance in relation to dental implant maintenance and recalls, the current status of the undergraduate (UG) and postgraduate (PG) curriculum. Some suggestions to improve dental implant education were also identified.

Further focus groups and qualitative surveys were conducted with dentists of different experience levels to understand their views about the outcomes of the interview analysis. The dentists confirmed the conclusions of the interview studies and provided additional themes related to possible solutions to the queries raised.

Overall, the research identified many thought-provoking themes related to the opportunities and challenges related to dental implant practice and its education and opened many avenues for further research.

DEDICATED TO

MY PARENTS, SPECIALLY TO MY FATHER

(Late) **Er G JAYACHANDRAN, ME,**
Retd. Superintending Engineer TNPWD

WHO WAS THE FIRST GRADUATE IN THE FAMILY AND HELPED

MANY TO COME UP IN THEIR LIFE

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Table of contents

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
INTRODUCTION

1.1 The prevalence of tooth loss

Population surveys of adult dental health commissioned by government bodies have been undertaken regularly in the countries of the United Kingdom (UK) since 1968. They are conducted approximately every ten years, and so far, five have been completed (Steele et al., 2012). The most recent survey was completed in 2009 and published in 2011, covering England, Wales, and Northern Ireland. A comparison of the data from the current and previous Adult Dental Health surveys (1968, 1978, 1988, and 1998) provides information about the changes in the dental health of adults, their dental experiences and attitudes towards dental care and hygiene (Hill et al., 2013). Compared to the 1998 survey, the 2009 survey reported a decline in the prevalence of dental caries and periodontal disease (White et al., 2012). The prevalence of coronal caries reduced from 46% to 28% in 2009. Also, the prevalence of periodontal pocketing at a depth of 4mm or more has reduced from 55% to 45% (White et al., 2012). The percentage of adults with 21 or more teeth has increased from 12% in 1978 to 86% in 2009 (Steele et al., 2011). The proportion of edentate adults has also fallen from 28% to 6% in 2009 (Steele et al., 2012). Scotland was not included in the survey; however, the figures could not be expected to be different from the rest of the UK (Steele et al., 2012). A similar decline in tooth loss has been reported in other European countries (Müller et al., 2007) and the United States (Douglass and Watson, 2002).

The 2009 survey is vital for the context of this thesis, as it considered the use of dental implants for the first time both in dentate and edentate mouths. A recording of dental implants was made in 1% of the examined dentate population. Subjects (dentate and edentate) were asked whether they had implants placed via a questionnaire, and there was no clinical examination undertaken for the edentate (O'Sullivan et al., 2011).

Therefore, it is suggested that the reported figures may be underestimated values (White et al., 2012, Steele et al., 2011). This estimate has been discussed in the Faculty of Dental Surgery briefing on the House of Lords debate on dental implants and periodontal checks, as half a million adults in the UK have at least one dental implant (FGDPUK, 2014a). Surprisingly, there was no mention of peri-implant diseases, but this survey did not assess implant work clinically. It will be of interest if further consideration of implants will be given in future Adult Dental Health Surveys.

1.2 Options for replacement of missing teeth

The Adult Dental Health survey report reflected improved public dental awareness and willingness to retain teeth and improve oral hygiene (Hill et al., 2013, Berglundh et al., 2019). The need for advanced restorative care such as fixed partial dentures and implant retained prosthesis has been identified (Jablonski and Barber, 2015, Cronin et al., 2009a). Raised patient expectations with conventional complete dentures have also been reported (Zou and Zhan, 2015).

The most common management options are replacing the missing teeth using artificial teeth that are either removable dentures or permanently attached to the remaining teeth (fixed prostheses) or dental implants (Lang et al., 2015). Other less frequent options are either to accept the edentulous space (Käyser, 1981) or to close the space by moving the remaining teeth using surgical or orthodontic methods (Rosa, 2020).

Removable dentures can be partial (if only a few teeth are lost or missing congenitally) and complete (if all the teeth are lost). The patient can remove these prostheses. Removable partial dentures (RPDs) have been extensively studied and used in general dentistry. They are made from acrylic resins or acrylic resins supported by a metal

framework (usually Cobalt Chrome alloy). The metal framework-based removable partial dentures are seen as the ideal form of treatment over resin based partial dentures. Several documents, including the General Dental Council's first five years document (GDC, 2002) and the British Society for the Study of Prosthetic Dentistry guidelines (Winstanley et al., 2005) highlight this (De Bruyn et al., 2009). Therefore, a major part of the removable prosthodontic teaching is dedicated to designing and providing metal-based partial dentures (Clark et al., 2011). In contrast, most of the removable partial dentures made in primary care clinical practices are resin partial dentures (Allen et al., 2008, Graham et al., 2006). These are tissue-borne prostheses that contradict most well-known design concepts, such as tooth support, indirect retention, and clasp assembly, which are part of the tooth-borne principles of partial denture design (Becker et al., 1994, Walmsley, 2003). Also, there is no consensus on partial denture design and classifications (Johnson and Wildgoose, 2010). Therefore, there remains a lack of standardisation in removable partial denture teaching, which can reduce the confidence level of the graduates in providing removable partial dentures as a treatment option. Despite all this teaching, general dentists rely on technicians to design most partial dentures in clinical practice (Yarborough et al., 2020). Patel et al., 2010 in their survey identified that dentists were confident in providing partial dentures in comparison to resin bonded bridges or dental implants, however could not identify why majority of them did not communicate the design to the technicians (Patel et al., 2010).

Fixed partial dentures (FPD) are usually rigidly fixed to the remaining teeth. The abutment teeth to which FPD is attached are prepared by reduction with a rotary drill to achieve the desired shape to retain the artificial teeth (Smith and Howe, 2006). Tooth

preparation range from no or minimal preparation (for resin bonded bridges) to around 1mm depth full circumferential removal of tooth surface (equals to 75.6% of tooth structure) (Edelhoff D, 2002). This cutting may result in damaging the tissues within and around the tooth. This tissue damage is inevitable, and the dentists usually inform the patients during treatment planning. There can also be few inadvertent damages to the adjacent tissues (periodontal tissues and adjacent teeth) due to poor planning or technical expertise. Therefore, justification for the provision of fixed partial dentures has always been under debate. Studies on the impact of wearing RPDs reported that the impact of chewing, and quality of life had increased significantly, however, the masticatory function did not fully recover, and the uncertainty about the prognosis i.e., the initial acceptability may increase or decrease over time (Bessadet et al., 2013, Shekhawat et al., 2017). In addition, many dietary restrictions on chewing hard, and sticky food were provided to the patients (Moynihan & Varghese, 2022). Fixed partial dentures also have been assessed for their success and survival rates. Success was when the fixed restorations remained the same as when they were fitted and functional, and survival was when the restoration remained in situ regardless of its condition (Pjetursson et al., 2004). Pjetursson reviewed the published prospective and retrospective cohort studies of fixed partial dentures up to 2004, with a mean follow-up period of 5 years, and concluded that the 10-year survival rate of 81.8%; and the success rates of 63% (Pjetursson et al., 2004). An analysis of 80000 adult patients treated in the UK under NHS revealed that out of 7874 fixed partial denture abutments around 95 percent of the FPDs survived in the first five years, and around 72% for10 years in the UK (Burke and Lucarotti, 2012). The survival rate after 15 years reduced

to 68 percent (Valderhaug, 1991, De Backer et al., 2006, Lindquist et al., 1996). Table 1.1 describes the differences between RPD and FPD.

Fixed- removable prostheses are the combination of RPDs and FPDs, developed to make use of the advantages of both. These prostheses have three components. The denture replaces the missing teeth (removable part), and the adjacent teeth are prepared and fitted with the crown (fixed part), and both these are attached with a connection called ‘precision attachment’. The denture stays connected to the fixed crown as long as the patient wishes and can be removed by the patient if he/she wishes. Many types of precision attachment systems are available, from simple ball and socket type to complex lock and key attachments. While these prostheses share the benefits of being both fixed and at the same time removable, they also share their drawbacks. In addition, these prostheses are technique sensitive and reserved for specialist practitioners or general dentists with special interest in these types of restorations. Further details about precision attachment dentures are beyond the scope of this thesis and can be obtained from respective references.

Table1.1. Properties of Removable vs. Fixed partial dentures (Based on the reference Budtz-Jørgensen, 1996)

	Removable partial dentures	Fixed partial dentures
Ease of Use	The patient can remove these dentures to clean and when they do not need or want to wear the denture	The patient cannot remove these dentures. Therefore, additional oral hygiene measures are mandatory.
	Potential to repair or to add more teeth if needed in the future	Difficult to repair in the future. The options will be to remake the prosthesis or to consider other replacement strategies (Manappallil, 2008)
Tissue health Vs. potential Damage	It does not involve significant tooth reductions – therefore, RPDs are less invasive to the tissues,	Adjacent teeth need to be reduced /shape modified – therefore, FPDs are invasive to the tissues.

	A well-designed partial denture with adequate oral hygiene allows the patient to maintain dental and periodontal health.	FPDs involve tissue destruction and need well-planned design and additional hygiene measures to maintain the tissue health,
Cost-effectiveness	Less expensive than the other replacement options	Recent advances in materials have brought the cost down.
Definitive indications	These dentures are ideal for the replacement of significant tissue defects.	FPDs are not suitable in cases with large tissue defects.
Caution	RPDs are contraindicated in some patients with diabetes, dry mouth and, allergies (Jepson et al., 2001,Tada et al., 2015)	No such restrictions but should be avoided with patients who cannot maintain adequate oral hygiene without assistance.

The third option is dental implants. There is increasing favourable literature support for the acceptance and success rates of dental implants. Priest in 1999 reported a 97.4 % survival rate of single-tooth implant restorations over a 10-year period (Priest, 1999). Parein, in his 10-year study, reported an 89% success rate for implants and an 82% success rate for implant-supported prostheses in the posterior mandible (Parein et al., 1997). In their 15-year study of 47 edentulous patients restored with mandibular implant retained fixed prostheses (12 units mandibular prostheses using Type III gold alloy with resin facings screwed to six Brånemark implants) , Lindquist et al., reported that at the last follow up, 99% of the implants were successful, and 100% of the prostheses were functional (Lindquist et al., 1996). In addition, dental implant treatment provides the advantage of being the least damaging strategy to the adjacent teeth and supporting periodontal tissues.

However, dental implants are not without problems. Inadequate diagnosis and planning can result in complications during and after surgical placement of implants, and their restorations (Liaw et al., 2015). Intraoperative complications can be over preparation of the osteotomy, Injury to adjacent structures such as teeth roots, nerve bundles (inferior alveolar nerve, lingual nerve), blood vessels (perforation of lingual plate), and perforation of maxillary sinus can be due to poor pre-surgical planning (Omar et al., 2022). Poor prosthetic planning can result in excessive occlusal load and related complications of crown loosening, screw fractures or even implant fractures. Poor maintenance can result in complications due to soft tissue failures around implants. The soft tissues around dental implants respond to the microbial biofilm similarly to the gingival and periodontal tissues (Berglundh et al., 2019). Therefore, the patients treated with dental implants are susceptible to peri-implant mucositis

(equivalent to gingivitis), and peri-implantitis (equivalent to periodontitis). The number of peri-implant disease reports is rising as the number of implant placements increases (Tarawali, 2015). The 6th European workshop of Periodontology consensus reported the prevalence of peri-implant mucositis as 43% and peri-implantitis as 22% (Tonetti et al., 2015). This was an estimate based on the contemporary research at that period, and there was no mention whether it was based on the number of treated people, or the implants placed.

1.3 Dental Implant Education

Dental implants are essential to be considered in modern restorative treatment planning (Lang and DeBruyn 2009). The exponential increase in the number of dental implant companies and their marketing base indicate that the number of people undergoing dental implant treatment has increased (Barber et al., 2015). Therefore, there is an increased probability of current and future dental practitioners encountering implant restored mouths in their general dental practice. Declining to provide dental implant maintenance and continued dental care will place the dentists at risk of falling short of the duty of care set out by the General Dental Council (GDC, 2012). Therefore, irrespective of the level of undergraduate training they received in the provision of dental implants, they must at least maintain the oral health of the patients who had such advanced treatment. The increase in the use of dental implants, and learning requirements set by GDC, necessitated the inclusion of dental implants in the teaching curriculum. One recent questionnaire study observed the responses from heads of educations or programme administrators of the dental schools in the UK and reported that dental implant curriculum is being reviewed to meet the current needs (Hare et al.,

2022). It must be noted at this stage that there are no major changes since 2002 in the GDC's learning outcomes and recommendations to dental schools.

In the UK, there are many postgraduate implant training courses available (Kim & Stagnell, 2018). However, there are differences in the quality of training and the duration of such courses (Addy et al., 2008a). Various course curriculums were briefly reviewed by the author. There were at least eight MSc courses, eight post-graduate diploma courses, two post-graduate certificate courses at the time of review (Kim & Stagnell, 2018). The structure of the University based post-graduate courses was generally similar and in line with FGDP's training standards requirements. However, the clinical content varied in the mode of delivery, the clinical provision, patient numbers, case complexity, and allotment of patients. For example, some institutions provide suitable patients to the candidates, whereas others recommend the candidates provide their patients. In addition, the clinical training is held in either the hospital or in the mentor's private practice. Both commercial and non-academic courses varied significantly in content, duration, and mode of delivery (Ucer et al., 2014).

1.4 Research Aim & Structure

Provision and management of dental implant prostheses in general dental practice depends on the knowledge and experience of the dentists, and the support available to them. available to them. Such support includes the software and hardware technologies, the treatment workflows, mentorships, and the laboratory support. However, less clarity exists about what general dental practitioners learn during their undergraduate courses and why they do or do not seek help from postgraduate courses. Therefore, the research aims to understand the current status of dental implants in general dental practices in the UK. The objectives to achieve the aim are,

1. To evaluate the status of dental implant management in general dental practice in the UK
2. To evaluate the challenges and opportunities in implementing dental implant management in general dental practices in the UK
3. To evaluate the status of undergraduate dental implant education in the UK
4. To evaluate the challenges faced with including dental implant teaching in undergraduate education in the UK

Initial background research identified a gap in understanding the current status of dental implants in general practice. However, there was no input from the actual treatment providers, i.e., the general practitioners. A questionnaire study was conducted amongst a group of GDPs practicing in the west midlands, UK. The survey analysis concluded that general dental practitioners were not confident in managing dental implants. However, the in-depth understanding of why they are not confident was still missing. A continuous search for suitable methodology led me to continue the research using qualitative methods. At that stage, a review of qualitative studies in dental implants was conducted. This review highlighted that the role of qualitative methodology in dental implant research was also minimal. With this background, I continued the research using qualitative methodologies such as in-depth interviews and focus groups.

CHAPTER 2.
BACKGROUND REVIEW

1.1 Introduction

The review of the literature was done in two stages. The first background search, as described in this section was done before we did the questionnaire study, to understand the research subject i.e., dental implants and how is it taught. After the questionnaire study, decision was made to use qualitative methods for future research. At that stage, the second search was done to understand the available qualitative research publications in the field of dental implants

2.2 Brief history of dental Implants

The earliest history of implant dentistry dates back to 3000 BC, to the ancient Egyptian civilization (Ring, 1985). Archaeological records of China, Egypt, and the Americas, listed that stone, metal, ivory, and seashell were used as implant materials. In 1685, in the first modern textbook on dentistry *(Operator for the Teeth),* Charles Allen mentioned using teeth of dogs, baboons, and sheep for implantation. However, during 1685, the possibility of disease transmission with the use of animal teeth was recognized (Allen 1969).

Before Osseo-integration, various designs of dental implants have been reported, but with an unpredictable success rate. The first was the subperiosteal implant framework (Fig 2.1), described in 1949 by Dr.Goldberg and Dr.Gershkoff (Goldberg and Gershkoff, 1949). This design included a Vitallium® framework placed underneath the alveolar mucosa in direct contact with the bone. The framework was resting on the bone, and posts were projecting through the mucosa into the oral cavity. The dentures were made to fit the posts. The main problem was the exposure of metal through the mucosa. Failure rates were around 30 to 50 % in different ten to twenty years follow-

up studies (Bodine et al., 1996, James et al., 1988). Because of these low success rates, this implant framework is no longer used today.

Later in 1968, Dr. Small introduced trans-osseous implants made of either titanium or a gold alloy. These implants trans-versed the mandible from the superior to the inferior cortical plate (Small, 1986). The implants were inserted anterior to the mental foramina. A flat metal plate below the mandible under the skin connected these implants. Posts projected through the mucosa, from the upper plate into the oral cavity. The dentures were made to fit the posts. The drawbacks were the invasive surgery performed under general anaesthesia, and the bone loss around implants. The success rate was 91% after 10 to 16 years of function (Small and Misiek, 1986).

In 1966, Dr. Linkow presented the “blade implant” around the same time as the trans-osseous implant (Linkow and Mahler, 1975). This was an endosseous implant. This implant is inserted intraorally in the bone by making a groove in the alveolar bone. One or more posts were attached to the fin-shaped plate, which anchored the restoration. Albrektsson reviewed the research background of blade implants and reported that the success rate was poor, and no acceptable follow-up results were published (Albrektsson et al., 1986). The review found many 5- year and 10- year reports of studies conducted with animal and human samples, but none of them showed more than 50% success. The problems associated were soft tissue infection and implant loosening. This type of implant is no longer used.

Earlier designs of implants were aimed at mechanical retention either through or around the available bone. They were focussing on the mandible rather than the maxillae. The evolution of osteointegration and titanium-based implants outdated other

metals and led the research towards increasing bone quality and quantity. The use of hydroxyapatite crystals expanded the options for clinicians to manage localized bone loss (Frame, 1987).

2.3 Osseo-integration

Zarb in the early 90's defined osseointegration as

> " The *process whereby clinically asymptomatic rigid fixation of alloplastic materials is achieved and maintained in bone during functional loading"* (Albrektsson and Wennerberg, 2005).

The concept of Osseo-integration (or Osteointegration), which led to the development of endosseous dental implants (Fig 2.2), was an interesting accidental discovery. Per-Ingvar Brånemark, a Swedish orthopaedic surgeon with his research team during 1952s, was studying bone healing on rabbits (Zarb and Albrektsson, 1985). They had implanted optical devices encased in titanium chambers into the leg bones of rabbits. At the end of the experiment, they realised that the bone had fused to the titanium that they could not remove the optical devices. This finding induced their research towards titanium and its biocompatibility with bone, which led to clinical applications. The dental uses were then developed in the 1980s by Brånemark (Zarb and Albrektsson, 1985). He presented the results of his research of over 30 years and his clinical practice for nearly 20 years at the Toronto Conference on Osseo-integration in Clinical Dentistry (Albrektsson and Wennerberg, 2005).

Jokstad et al., in their systematic review, identified over 100 implant companies producing over 200 implant brands since the acceptance of the Brånemark implant system (Jokstad et al., 2003). While the review stated that there was no scientific

evidence to show any differences between implant systems, the authors advised the practitioner to avoid implants with no clinical record or clear and quality assured manufacturing procedures (Jokstad et al., 2003).

An evidence-based consensus was made in the 2009 annual BSSPD (British Society for the Study of Prosthetic Dentistry) conference conducted in York. The consensus statements confirm that the two-implant retained mandibular overdentures should be the minimum offered as the first choice of treatment to the edentulous patients (Thomason et al., 2009). This evidence supported the previous McGill consensus statement, published after a symposium conducted in Montreal, Canada in 2002 (Thomason et al., 2012). Despite this fact, dental implant management is still a skill reserved for some experienced clinicians. These dentists sometimes brand themselves as ‘implant specialist or implantologist’ against the GDC’s advice not to use these misleading titles (GDC, 2017).

Inconsistencies in conventional dental implant education leave the interested dentists with the only option to seek expensive independent courses. Hence, further review in this thesis is focused on dental implant education.

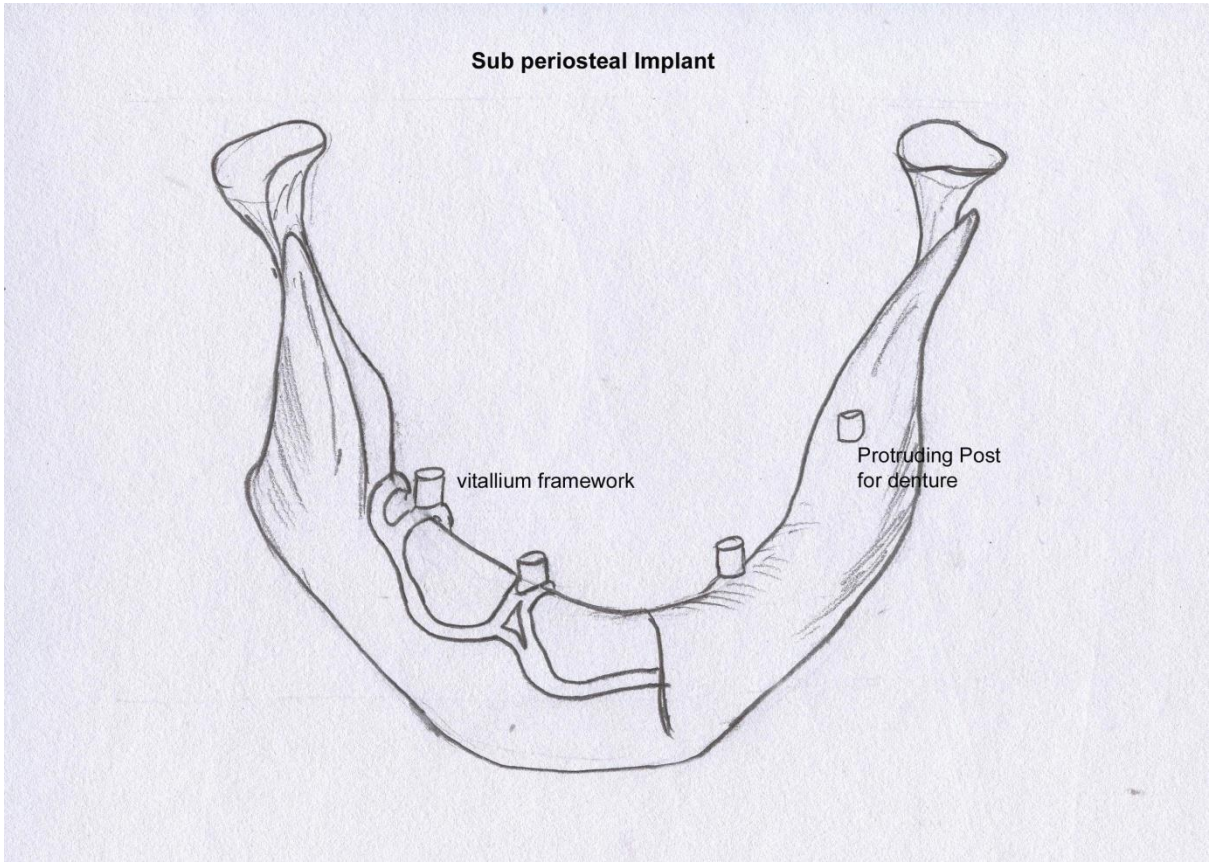


Fig2.1. Sub periosteal implant.
The metal framework in placed under the mucosa and posts protrude through the mucosa to stabilize the denture.

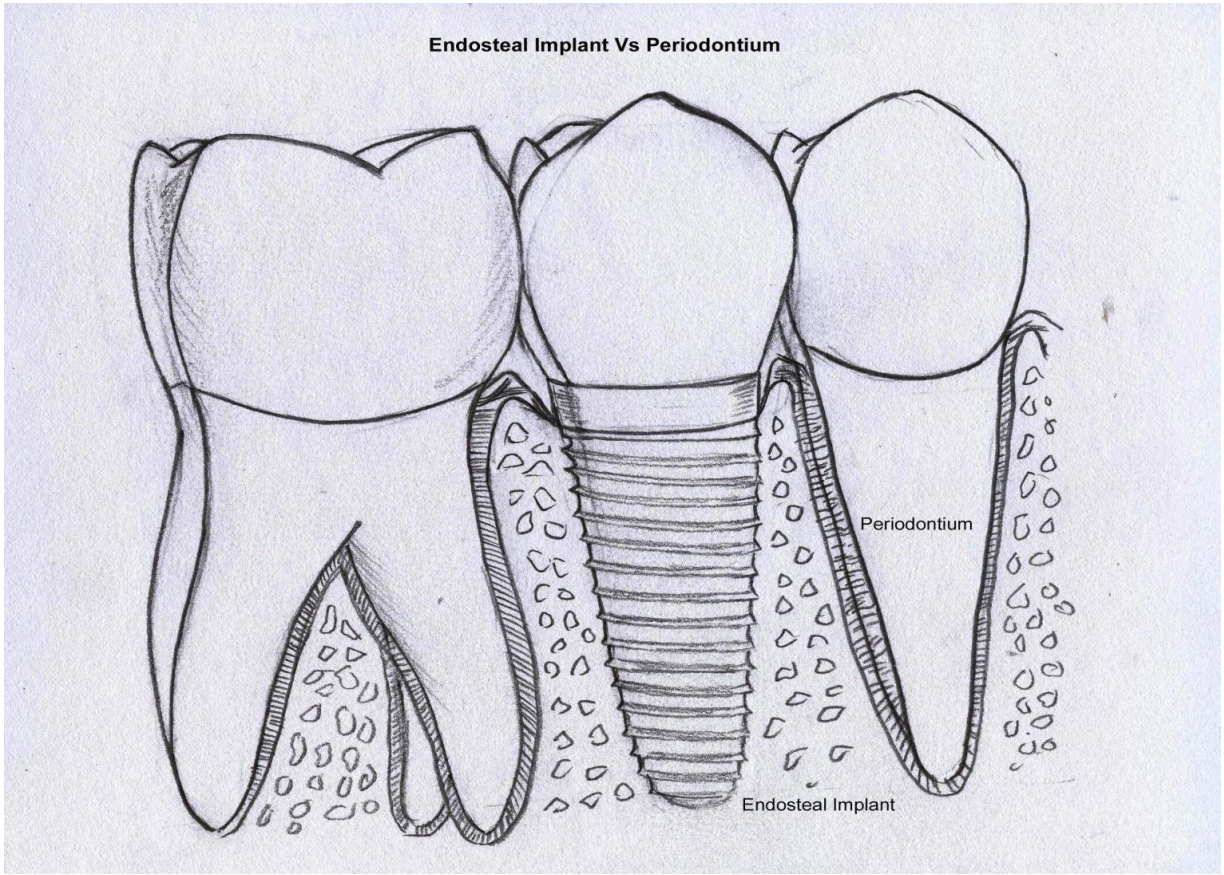


Fig 2.2. Endosteal implant replacing second premolar tooth.

The difference between Osseo integration (direct bone to implants contact) and the natural periodontal attachment is illustrated.

2.4 Mastering a discipline - Adult Learning stages

An adult starts to learn a subject either due to personal interest or as a job requirement. The learner goes through the five stages, novice, beginner, competent, proficient, and expertise during this learning (Chambers, 1998).

A *novice learner* starts to build information about the subject. The learner may obtain information from educational resources, either formal or informal. In professional learning, the teacher or the mentor provides the information and guides the learner on focusing on the subject. With this background knowledge, the learner becomes *the beginner*- the second stage of adult learning. The beginner still requires guidance on how to apply the knowledge, but they are beginning to think and process their performance. They attempt to try different choices and choose the ones that work for them. Continued learning and practice under guidance encourage the learner to become a *competent performer.* They develop skills and knowledge and internal standards and become more independent in decision making. They will be ready to perform without supervision at this stage but will be happy to seek guidance if needed. In the next stage, the learner adapts to new practice settings or environments. Constant practice of what has been learnt and confidence to involve in active experimentations make the learner a proficient and expert in the subject area.

Traditional education involved setting a time-based curriculum for the learners. At the end of term, the students advance to the next stage regardless of the quality of learning. The students' experience in the field is counted more than their expertise. Health education has moved away from this style and many educational institutes have adopted competency-based teaching, which differs from traditional learning in many ways (Frank JR et al., 2010).

`2.5 Competency-Based Learning

Competency was first proposed in 1973 by David McClelland (McClelland, 1973) as a critical differentiator of performance. Competency has been defined in different ways based on the context. A major development in understanding competency was in the workforce area, as competency-based training was more effective than traditional apprenticeship training (Cornford, 2000). Therefore, many of the earlier definitions were based on performance in employment (Garavan and McGuire, 2001, Newton and Wilkinson, 1995, Mabon, 1995, Boyatzis, 2008). Boyatzis in 1982 defined competency as the "underlying characteristic of a person, which results in an effective and/or superior performance in a job" (Boyatzis, 2008). From this, he developed the different levels of competencies, ranging from a "threshold level" to a "superior performance level." Scroder, in 1989, mentioned competency as a set of behaviours that result in high performance in complex organisational environments (Boyatzis, 2008, Sparrow and Hiltrop, 1994). Nordhaug and Gronhaug defined competency as the ability to perform within an occupation (Boyatzis, 2008, Sparrow and Hiltrop, 1994).

Later definitions of competency have become multidimensional because of the better understanding and its widespread application. National Council for Vocational Qualifications (NCVQ) in 1997 mentioned competency as the ability to apply knowledge, understanding, and skills to achieve required standards for the context.

Competency models seek to identify the ideal combination of skills, knowledge, attitudes, and experience. Competencies fall into three categories, behavioural, managerial, and core competencies (Sparrow and Hiltrop, 1994).

Behavioural competencies describe how an activity or situation is approached, and they are not the knowledge needed to complete a specific task. For example, it is not how a dentist places an implant but how the dentist arrives at the treatment decision before the procedure.

Managerial competencies involve the ability to meet complex demands using psychological resources such as attitude and personal behaviours. Decision-making and execution of the plan based on the understanding of consequences come under managerial competencies. When they achieve managerial competencies, an average performer will proceed to become an excellent performer (Sparrow, 1994) . The development of communication skills is the additional key quality expected at a managerial level.

Core competencies combine pooled knowledge and technical capacities that allow a trainee to be competitive in the field. It should also be difficult for competitors to replicate. In an organisational context, core competency can be a useful tool in assessing the developmental needs of future experts (Prahalad, 1990). Core competencies identified in medical education are procedural skills, knowledge, practice-based learning and development, communication skills, professionalism, and systems-based practice (Albarqouni et al., 2018). In the 1997 national conference meet of deans of the dental schools in the UK, the concept of core competencies in dental education was discussed. They addressed the comparison between content-based and competency-based education and concluded that the future direction should focus on defining and assessing knowledge, skills, and attitudes (Mossey,1998). A recent review commissioned by the GDC on competency assessment, included an interesting

concept of self- assessment of competencies. This document recommend that self-assessment should be taught as a skill for lifelong learning (GDC,2020).

2.5.1 Competency based Teaching

Competency-based education with its teaching and learning approaches has received much attention and support within the health professions (Du Toit et al., 2010, Albanese et al., 2008). In many countries, including the UK, health education has adopted a 'competency-based' learning methodology (Boyd et al., 1996, Kassebaum et al., 2004). The learner undergoes a sequence of experiences to learn a subject in contrast to the older discipline-based methodology (Leung, 2002, Boyatzis, 2008, Sparrow and Hiltrop, 1994). "Competency in dentistry is the level of knowledge, skills, and values required by the new graduate to begin an independent and unsupervised dental practice (Licari and Chambers, 2008) or the skill performed to a specific standard under specific conditions" (Sullivan and McIntosh, 1996).

The definitions for competency-based education differ with context. However, there are some common elements. These are as follows:-

- The learner actively participates in acquiring knowledge, skills, and professional behaviours (Fullerton et al., 2011, Norton, 1987).
- The definitions include an evidence-based description of the learning outcomes (i.e., the specific competencies) (Leung, 2002). There should be a clear understanding of these learning outcomes between the teachers and students (Smithers, 1997).

A competent clinician is one who can perform a clinical skill to a satisfactory standard. Therefore, every student participating in the program will have demonstrated mastery upon program completion (Bell and Mitchell, 2000).

Table 2.1 Characters of Competency based teaching
Benefits
• The training aims toward mastering specific knowledge and skills. • Learner or participant centred. • Time management is efficient as the training is personalised. Therefore, more time is devoted to evaluating learners' abilities (Fullerton et al., 2011, Norton, 1987)
Drawbacks
• A suitable trainer needs to be identified or trained • There is always a tendency to slip back to the traditional way of training • To identify and define the required competencies for the purpose, e.g., training standards for implant dentistry. • Specific training materials and training approaches (e.g., learning guides, checklists, and coaching) need to be designed (Fullerton et al., 2011, Norton, 1987).

2.5.2 Competency Based Training in Dentistry

> *" Competency is the level of knowledge, skills, and values required by the new graduate to begin independent, unsupervised dental practice (Licari and Chambers, 2008) or the skill performed to a specific standard under specific conditions" (Sullivan & McIntosh, 1996)*

Competency is not achieved immediately but is gained in stages, as described by Chambers and Glassman (Chambers, 1998). The process is facilitated by a defined instructional element such as practicing the specific task of appropriate skills (cognitive aspect) and explaining the relation between the skill and the clinical application (informed instruction). For example, ***Cognitive***: learn to do ridge mapping; ***Informed***: the evidence-based explanation of why and how the skills work, later with advanced imaging techniques.

Competency based teaching and assessment are different from traditional teaching methods. For complete inclusion of this method, the administrators (decision-makers in higher education Institutions) and teachers must understand the benefits and drawbacks. This understanding will help them organise how competency-based teaching can be implemented in different areas of dental education (Fullerton et al., 2011). Fortunately, the competency-based curriculum is widely accepted in the health education, UK and various guidelines have already been published (Du Toit et al., 2010, Albanese et al., 2008)

With this brief understanding of the background of dental implants and teaching theories, a further search revealed the status of dental implant education in the following sections.

2.6 Review Part 1-Dental Implant Education

A systematic review of the literature was conducted to understand the current status of dental implant education. The search was conducted in the electronic databases Medline (Pub med), ERIC (Educational), CINAHL (Allied Health), and Scopus. The Medline (Medical Literature Analysis and Retrieval System Online) supported the Medical Subject Heading (MeSH) search and allowed the search to be saved to a personal account.

The database search was supplemented with a manual search of the online archives of the following journals: European Journal of Dental Education, Journal of Dental Education, International Journal of Prosthodontics, and Journal of Oral Rehabilitation. The original review covered from 1978 to early 2015. In addition, the bibliographies of the selected literature were searched for relevant additional articles – supplemented by the Google Scholar search engine. This search resulted in a list of articles, including citations from other works. At the time of writing the thesis, the search was updated to include recent research up to January 2021.

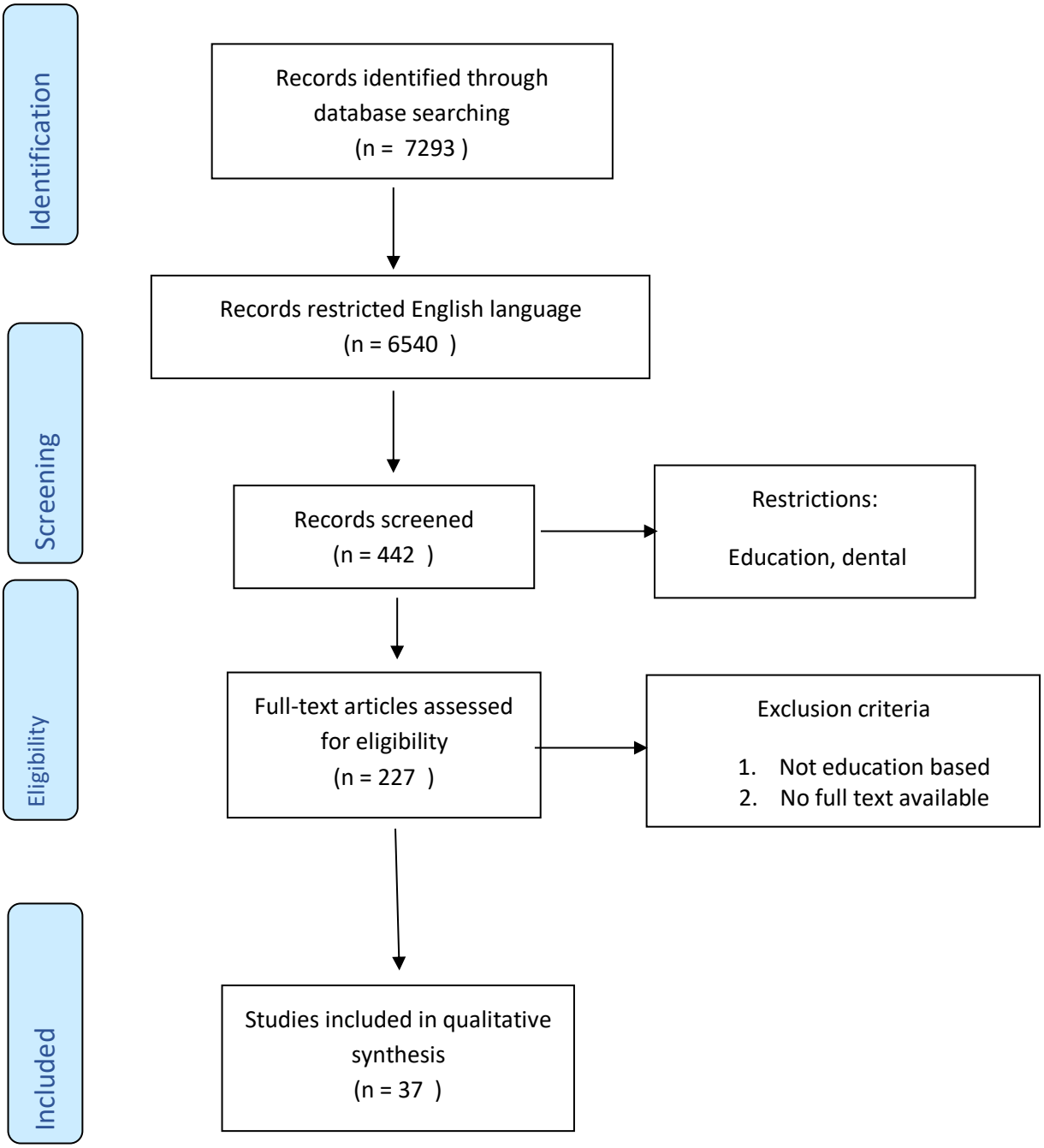
2.6.1 Keyword6

The search terminologies included *dentistry, education, dental education, competenc*, learning, e-learning, Online learning, Computer-assisted instruction, Computer-assisted learning, CPD, Continuing professional education, continuing education.* This search was combined with the additional keywords *Dentistry, dental implant*, Osseo-integration*.

Different Boolean combinations of AND OR were performed, and the search results were limited to English language.

The initial keyword search and the expanded journal search resulted in 442 articles. These were hand-searched and reviewed by the author. The focussed search resulted in 37 articles relevant to the education and learning of dental implants Fig 2.3. The references were managed using EndNote reference management software (Clarivate analytics, HQ London).

Fig 2.3 Systematic Selection of articles- Dental Implant Education (Adopted from PRISMA guidelines)



2.6.2 Requirements from the Graduating Dentist

The Association of Dental Education Europe (ADEE) is an independent organisation that provides guidance and harmonises dental education in most of the EU. The ADEE envisaged that dental educators will adhere to the guidelines (Plasschaert et al., 2006). The EU directorate of education and culture funded the thematic network projects DentEd from 1997 to 2000 to implement higher standards in dental education (Shanley et al., 2002b). This project was then extended to DentEd Evolves in 2000-03 (Shanley et al., 2002a) and DentEd III 2004-07 (Ferrillo et al., 2008). The ADEE in 1997 agreed to support this project initially but later took over the whole project. This association brought various dental school curricula into a discussion forum under the ADEE (Plasschaert et al., 2005, Cowpe et al., 2010). One of the DentEd III project results is the 'Profile and Competencies for the European Dentist' document (Plasschaert et al., 2005). The document is regularly revised by a team of educators and then approved by the General Assembly of ADEE. The first revision was approved in 2009, and the most recent one was in 2017 (Cowpe et al., 2010, Field 2017). This document recommends that a dentist have a broad-based understanding of all the aspects of dentistry. It also expects the European dentist to keep up to date with the latest developments, communicate, work as part of the dental team, and follow evidence-based problem-solving approaches. One survey conducted five years after the 2009 profile statement confirmed that many schools have started to integrate dental implants into their undergraduate curriculum and identified the need to align the curriculum to the learner's educational needs (Koole et al., 2014).

The General Dental Council (GDC) regulates dental education in the UK under the Dentist Act 1984. In 1993, the GDC published the standards document *Professional*

Conduct and Fitness to Practice (Craig, 2015). In 1997, the guidance *Maintaining Standards* was published. This guidance was improved to Standards for Dental Professionals in 2005 (GDC, 2005) and then to *Standards for the dental team* in 2013 (GDC, 2013). This document defines standards in terms of conduct, performance and ethics to govern dentists registered to practice in the UK. In addition, the document *Preparing for Practice* (first published in 2011 and revised in 2015) (GDC, 2012) defines the learning outcomes for the dental team.

These educational outcomes required for the dentist fall within the following domains: ***Clinical, Communication, Professionalism, and Management & Leadership***. This document defines the roles and responsibilities of the education providers and refers to meeting the European Directive of dental training requirements.

Both the ADEE and the GDC recommend that the graduating dentist diagnose and explain the range of implant treatment options to the patients. Dentists are expected to understand and discuss the risks and benefits of dental implants and the treatment outcomes. It is surprising to note that the GDCs Preparing for Practice document lists the competency requirement for the dentists as follows:-

> *1.14.12 Recognise and explain to patients the range of implant treatment options, their impact, outcomes, limitations, and risks*

But includes management of peri-implant tissues as a requirement for dental therapists and hygienists,

> *1.11.8 Describe the risks related to dental implant therapy and manage the health of peri-implant tissues*

2.6.3 Implant Education in the United Kingdom – Undergraduate level

The recent ADEE profile statement recommends that the new dentist 'be competent to describe the indications and contraindications, principles, and techniques of surgical placement of Osseo-integrated implant fixtures' (Plasschaert, 2005). Dentists need to be familiar with case selection, the surgical and restorative implant procedures, the diagnosis and management of implant-related pathology, and the maintenance of dental implants and their supra structures. GDC outlines the undergraduate curriculum in the document *The First Five Years- A framework for Dental Undergraduate Education- third education published in 2008.* It states

> *'The provision of dental implants and implant-retained crowns and bridges requires a team approach. The student should understand the principles of implant therapy and see implants being maintained within healthy tissues.'*

This was updated in dentists' section of Preparing for practice (GDC, 2015) document as

> *'1.14.12 Recognise and explain to patients the range of implant treatment options, their impact, outcomes, limitations, and risks'*

While the GDC's *learning outcomes* documents refer to European Directive requirements, it is interesting that the competency required from the UK dentists is only knowing, observing, or seeing implant treatment and maintenance rather than actual clinical involvement (GDC, 2002)

The European consensus statement in 2009 raised a comment that the knowledge base for dental implants provided for graduating dentists will depend on the teaching

institution's policy about implant education (Mattheos et al., 2009). Surveys conducted in the UK confirm the inclusion of dental implant education in the undergraduate curriculum (Young et al., 1999, Addy et al., 2008b, Chin et al., 2018, Blum et al., 2008b, Blum et al., 2008a, Chin et al., 2019). However, the amount of information provided, and the teaching mode are variable and include mostly theoretical implant training (De Bruyn et al., 2009). Many schools now include implant-retained over-dentures in the undergraduate curriculum as a routine procedure (Chin et al., 2018, McAndrew et al., 2010). In addition, there was marked variation in the year of introduction of the subject to undergraduate students, the number of lectures and lecture topics, teaching formats used, and the use of adjunctive teaching aids. Didactic implant training is usually started in the third, fourth, and fifth years. The current teaching includes mostly theoretical implant training, devoting less than 10 hours (De Bruyn et al., 2009). There are few opportunities to attend implant placement sessions and to have laboratory-based hands-on experience (Lang et al., 2009)

Mather in 2018 reviewed the recently published curriculum documents from different countries and identified that the UK's undergraduate teaching of dental implants falls behind to European, American, and Australian dental school curricula (Mather et al., 2018). Barriers such as lack of funding, staff availability, and lack of suitable patients have been recognised. Suggestions were made to the universities to report the content of their implant programmes to aid in comparison and possible harmonisation (Koole and De Bruyn, 2014). The need to expand dental implant training to dental hygiene and therapy courses (Chin et al., 2019) and assessment methods (Arnett et al., 2020) have been recognised.

Whilst there is a body of dental opinion that wishes to see more dental implant teaching to take place, it is recognised that people are retaining their teeth longer. Over the period 1968 to 2009 the prevalence of tooth loss has decreased (Steele et al., 2011). Opinions on what constitutes a functional natural dentition have been recognised e.g., concepts such as the reduced dental (Käyser, 1981). It may be argued that the emphasis of dental education should be on managing the needs of the majority of patients. Therefore, there is much debate in undergraduate education on the priorities for the qualifying dentist with implant training being one area that is often highlighted. The training objectives should include assessment of potential patient need and to support referral. The newly qualified dentist will come across implants and therefore knowledge and skill in the maintenance of such implants that have been placed by others. The newly qualified dentist should be able to diagnosis failure and to provide advice on the clinical options. The area of restoration of implants and their placement is best taught at a postgraduate level when the newly qualified dentist has gained more experience.

2.6.4 Implant Education in the United Kingdom – Postgraduate level

Once graduated from the University, the career pathway for the dentist ranges from general clinical practice to specialist training or research training. Most of them choose the general practice pathway over the highly competitive specialty training posts. Once they are in general practice and are interested in dental implants and wish to establish their career in that field, this training is only possible through a part-time course or continuing professional education programmes. These may be University-based courses, private courses from CPD recognised providers, manufacturer organised courses, and implant organisations accredited courses (Ismail, 1990, Simons et al.,

1995, Jokstad, 2008). Many dental schools, professional organisations (National Dental Councils, professional boards, etc.,), scientific societies, and commercial companies have introduced implant dentistry in a variety of postgraduate training schemes (Petropoulos et al., 2006, Afsharzand et al., 2005) often restoring dental implants rather than placing them (Valentine CL, et al, 2005).

The European consensus statement discusses postgraduate implant education from a quality control view (Mattheos et al., 2014). This statement suggests that the current implant teaching does not fulfil specialty training requirements, and the learner will not be recognised as a trained specialist in dental implants. Therefore, titles such as specialist or implantologist should be avoided. However, it agrees that the specialty training programmes in oral surgery, prosthodontics, and periodontics include implant training to the complex levels necessary to provide treatment. GDC UK guidelines are similar to this; only dentists who train in the recognised 13 specialist programmes can use the title and dental implant is not one of them.

The consensus statement also includes the requirements for university academic programmes to include

- at least two years full-time duration or equivalent to 120 ECTS to cover the straightforward and advanced procedures, and three years full time to cover complex surgical and restorative aspects of implant dentistry
- multi-disciplinary planning and teaching
- national/ international accreditation.

The Faculty of General Practice (FGDP UK) published the *Training Standards in Implant Dentistry* (TSID) in 2016. The GDC has recommended this document for the education providers and dentists to adhere, to improve the quality of postgraduate

education in dental implantology in the UK (FGDPUK, 2014b, Br Dent J, 2008). The document recommends competency-based training in different aspects of dental implants. A recent report (Kim and Stagnell, 2018) identified 10 Institutions providing master's level postgraduate training in dental implants and at least 13 CPD courses. They varied in the title provided, tuition fee, duration of the training, whether mentored training is provided. This report also concluded that not all the available courses are fully compliant with FGDP guidelines.

2.6.5 Discussion

The continued research and understanding of implant dentistry have been well documented for three decades (Mattheos, 2014). This knowledge base, along with developments in materials and techniques, has made the implant treatment highly predictable. However, there is a gap in the teaching aspect and appropriate curriculum development (Mattheos, 2014). An ideal dental curriculum defines the knowledge, skills, attitude, and values to make the dentist competent to practice safe dentistry independently (Schwarz MR, 2002). The argument will be the differences between the learning content and the necessary learning outcomes. Consensus statements mention that dental implant supported overdentures as the minimal norms. However, does it mean undergraduate students need to learn to place implants? In dental implant management the learning content can be planning related, surgery related, and maintenance related. The learning outcomes set by GDC recommends the dentists to have the basic skills to communicate to the patients about dental implants and provide maintenance care. The recent inclusion of self- assessment of competencies as a skill to be learned, will allow the dentist to further their learning if they wish to.

There have been attempts to incorporate competency-based training in implant education. The competencies fall into two major criteria; those based on domains and those based on complexity levels (Linkow and Mahler, 1975, Leung, 2002). The competencies based on domains have been categorised under clinical, management and leadership, communication, and professionalism. Competencies based on clinical complexities are classified as straightforward, advanced, and complex (Dawson et al., 2009).

The competencies to be developed specifically to implant dentistry can be categorised based on the level of learning (Mattheos et al., 2010). For an undergraduate curriculum, the basic competencies may be outlined as follows. Theoretical training must include bone biology, wound healing, occlusion, diagnostic imaging, infection control procedures, restorative planning, surgical principles, medical emergencies, and peri-implant maintenance (Hicklin et al., 2009). The additional competencies include communication skills, financial management, and practice quality assurance systems. Non-clinical competencies can be incorporated into the existing dental curriculum. However, the clinical, surgical, and restorative training will need additional space in the curriculum. It would be advantageous if implant placement for ‘straightforward’ cases were included (Sanz et al., 2009).

In postgraduate training, the basic competencies are reemphasised and supported with a detailed literature search and a research component. The clinical competencies include complex implants, simple augmentation procedures, treating patients with special needs, and maxillofacial defects. Competencies related to evidence-based treatment methods by critically analysing published work are essential in postgraduate

training. Training in practice management, marketing concerning dental implants will be beneficial for the learners.

2.6.6 Conclusion

The review identified the training standards and the regulations related to dental implant education. Reports have identified that undergraduate education in the UK is not at the same level as other countries. or not in line with the published consensus statements. However, these reviews compared the published curriculum documents, and suggest that the UK curriculum needs revision to be on par with other countries. Also, it appears that the current educational outcomes set by GDC are adequate for a GDP to safely manage dental implants (identify problems, communicate to patients, maintain, or refer in need) and allow them to undergo additional training if they wish. The uniformity in the available post graduate trainings is also lacking.

2.7. Review Part 2. Qualitative research publications on Dental Implant Practice

The results of this work were published as follows.

Jayachandran S, Hill K, Walmsley AD. A critical review of qualitative research publications in dental implants from 2006 to 2020. Clin Oral Implants Res. 2021;32:659-671. doi: 10.1111/clr.13743.

2.7.1 Introduction

The review on the education of implant dentistry led to a further search of the evidence. This new search focussed on the opinion of the personnel involved in clinical treatment with dental implants, including both the dentists and the patients. Qualitative research methods are the ideal methodology to research the in-depth views of participants.

Therefore, a search for qualitative research publications on dental implant practice was performed.

Evidence-based research has become the gold standard in dentistry. The focus of most dental research is interested in seeking evidence. Quantitative methods such as questionnaires offer a convenient tool to interpret the results in numbers (Stewart et al., 2008) so that the significance of the responses can be proved statistically. However, this research methodology fails to interpret the reason behind those responses. The qualitative methodology offers the convenience of understanding the perspectives of respondents individually (Sofaer, 1999). The original research aim was to identify the participants' views towards dental implants, and the initial questionnaire analysis failed to obtain the in-depth views of the dentists. Therefore, the qualitative methodology was chosen as the methodology to investigate the subject further.

Qualitative research involves understanding the experience of people using different approaches. Attempts to define qualitative research have resulted in broader nonspecific descriptions. For example,

> *A research strategy that usually emphasizes words rather than quantification in the collection and analysis of data (Bryman, 2016)*
> *It is an umbrella term for an array of attitudes towards and strategies for conducting an inquiry aimed at discovering how human beings understand, experience, interpret, and produce the social world (Lewis-Beck et al., 2003).*
>
> *(Hammersley, 2012))*

Other attempts to describe qualitative research have resulted in researchers listing how it differs from quantitative research. More extensive studies make it possible to generalize the results. Quantitative research provides measurable answers to research questions and test hypotheses. Qualitative research uses words concerned with meanings, induces hypotheses from data and case studies. This method prefers to observe naturally occurring data rather than measuring the experiments. For example, quantitative research can identify the number of patients seeking dental implant care in a treatment centre, and the prevalence of certain attitudes among patients, so the researcher can compare the results with a different treatment centre locally or at a national level. In contrast, Qualitative research analyses why a patient does or does not seek dental implant treatment in that centre, and the depth of why only the attitudes different or same among those people . This in turn opens the patients' views about dental implants and the treatment centre and allows the researcher to be flexible in exploring the themes in detail.

Different qualitative research approaches are *Ethnography/ Fieldwork, document analysis, Interviews/Surveys, Audio-visual records, and participant observation.* The most widely used methods in health research are in-depth interviews or focus groups. In dentistry, qualitative research is either used as a standalone research methodology or complement a major quantitative study. Common reasons mentioned by dental researchers to use this methodology are to get a deeper understanding of a specific problem, explore the emerging trends in the dental community (Gatten et al., 2011, Cronin et al., 2009b), and allow the interviewer to explore the unplanned areas (Exley et al., 2012).

2.7.2 Methods

Qualitative research articles published about dental implants during 2006 and 2020 were searched systematically. One previous review (Masood et al., 2011) appraised the qualitative research articles published in dentistry from 1999 to 2006. This research used the CASP (Critical appraisal Skills Programme- - *part of the Oxford Centre for Triple Value Healthcare Ltd (3V) portfolio*) tool to assess the quality of these articles. This report concluded that the quality of the appraised articles was poor. With this background, a new search was made from 2006 to the present date, adhering to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Search terminologies were similar to the 2011 study but limited to the subject of dental implants (Table2.2). The search engines used were the Ovid version of MEDLINE; Web of Science, Science Direct, Scopus, and EMBASE. The language of publication was limited to English. The search was triangulated by an independently repeated search by the British Dental Association's library team. The resulting 8421 articles were scrutinised using inclusion and exclusion criteria and checked to remove duplicates. This resulted in 25 articles final articles (Fig 2.4). These were checked against the 10-point checklist offered by the CASP tool kit.

Table 2.2 – Systematic search for Qualitative research publications on dental implants

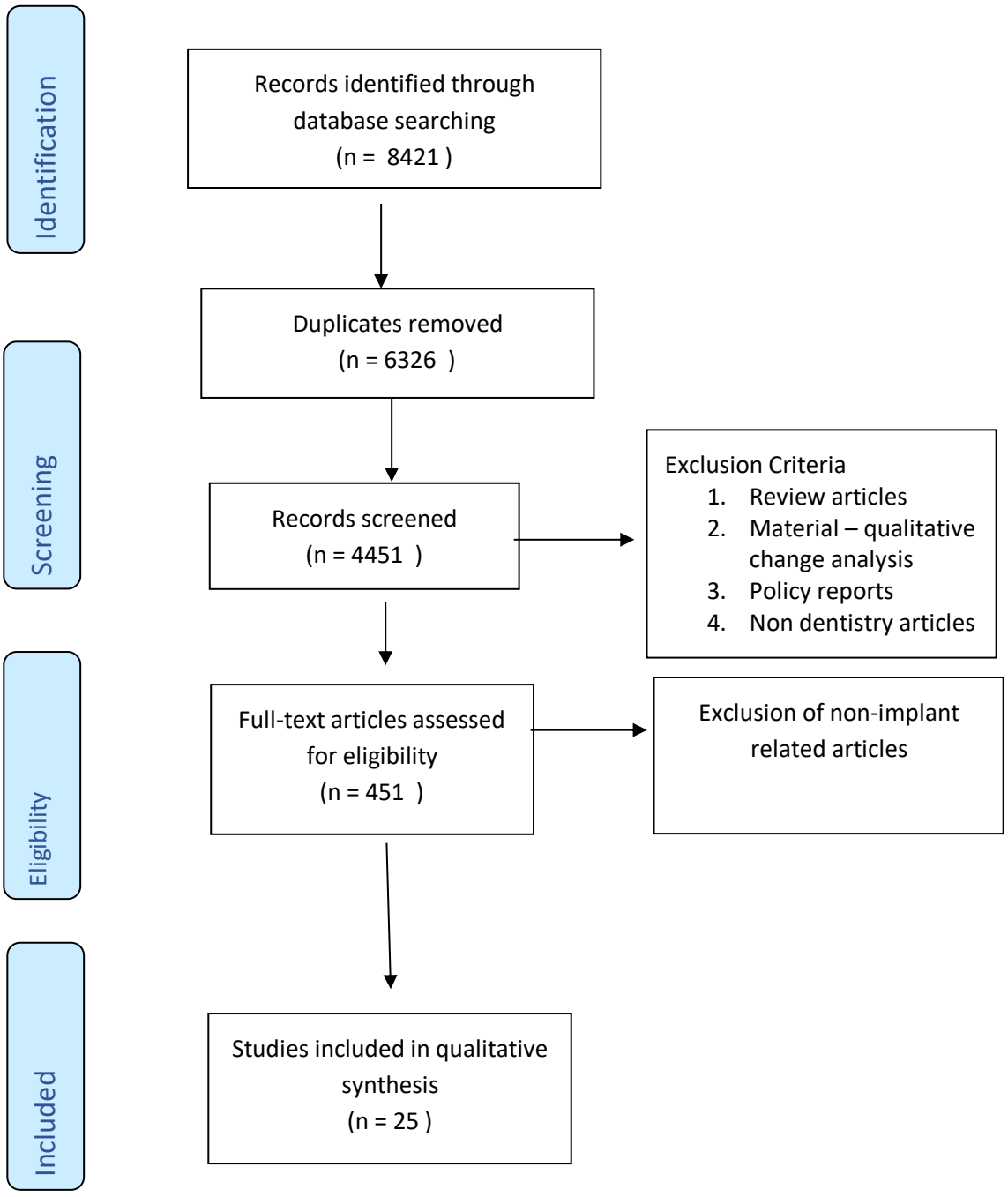
	Search Terminology	Results				
		Medline	SCOPUS	Web of Science	ASSIA	Cochrane
1	Qualitat*.mp.	281686	842121	596557	112755	14388
2	(Focus Groups or "focus Group*").mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	49198	331313	360607	102107	14173
3	interview*.mp.	375437	752424	550084	431221	33374
4	observation.mp	306143	2001426	1472929	180523	40572
5	("reflective diary" or "reflective diaries").mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	97	605	206	46	6
6	narrative.mp.	35196	182015	165003	108315	1610
7	(Conversion or discourse or documentary or text or textual).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	298460	1540549	1357410	570680	16854

8	quality of health care.mp.	141678	517230	104080	90127	6894
9	("Attitude to Health" or "Attitude of Health Personnel").mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	196270	254272	1125	11777	5704
10	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9	1459288	4932349	4176491	1466674	118179
11	(dent$ not dentigerous).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	568489	683980	747984	1522019	42407
12	(endodont$ or "root canal" or periodont$ or prosthodont$ or "filling material$" or "oral surg$" or "oral health" or "oral hygiene" or caries or carious).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	224061	289514	182991	25718	13781
13	exp Oral Surgical Procedures/	68037	30900	11130	1154	3671
14	exp Dentistry/	402356	129688	646065	28895	14166
15	exp Dental Implants/	23651	49273	46749	4804	2714
16	exp Dental Implantation/	21891	31375	7170	547	1339
17	exp Radiography, Dental/	21899	33342	6556	863	1147
18	exp Anaesthesia, Dental/	11162	17445	4184	1628	2780

19	(implant$ or amalgam$ or composite$ or compomer$ or restoration$ or restorative or anesth$ or anaesth$ or sedat$ or radiog$ or radiol$).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	2025537	5782428	2507729	518021	75195
20	(tooth or teeth or molar$ or incisor$ or canine$ or cuspid$ or bicuspid$ or premolar$ or maxillofacial or maxilla$ or mandib$).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	514916	911642	568267	84149	26949
21	19 and 20	130756	227295	86425	9002	7430
22	exp Dental Caries/	45693	121725	37854	4859	5255
23	Caries.mp.	58664	128831	42077	5310	6355
24	11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 21 or 22 or 23	724455	1363853	848435	163147	48239
25	10 and 24	38288	87694	48529	7549	2855
26	animals/ not humans.mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	4584642	3950056	899200	433017	22
27	25 not 26	35942	82081	47021	7376	2854

28	(dog or dogs or cat or cats or minipig$ or monkey$ or macaque$ or rat or rats or mouse or mice or rabbit$ or "animal stud$").mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	4122053	9638863	4010110	503477	13095
29	27 not 28	35388	69618	41818	7249	2837
30	limit 29 to English language	31728	61301	41142		
31	limit 30 to yr.="2006 -Current"	18557	38089	31134		2116
32	(dental implant or implant* or implantation or osseointegration or osteointegration).mp. [mp=title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	497750	163827	327211	105917	34379
33	31 and 32	1941	3319	2639	259	263

Fig 2.4 Systematic selection of articles - Dental Implant – Qualitative research publications (Adopted from PRISMA guidelines)



2.7.3 Results of the systematic search

All the 25 articles met the initial requirements of the CASP tool, i.e., the research aims, and their relevance were adequately described in the articles. The majority of the research was focused on understanding patients' views, and four of them assessed the dentists' view, and one article investigated the value of YouTube patient testimonials (Ho et al., 2017). The reports evaluated the patient feelings on losing teeth (Meaney et al., 2017, Parahoo et al., 2019), their impaired function due to tooth loss (Lantto and Wardh, 2013), their demands towards dental implant treatment (Abrahamsson et al., 2017, Atieh et al., 2016, Boeskov Ozhayat et al., 2019, Cronin et al., 2009b, Grey et al., 2013, Johannsen et al., 2012, Kashbour et al., 2017, Kashbour et al., 2018b, Narby et al., 2012), their views towards private implant treatment (Exley et al., 2009), their quality of life changes with dental implants (Gatten et al., 2011, Hyland et al., 2009, Nogueira et al., 2019, Osman et al., 2014, Rousseau et al., 2014), and why some patients decline dental implant treatment (Ellis et al., 2011). General public views on dental implants were analysed by one article (Wang et al., 2015). Dentists' views on implant provision, the future needs, how do they make decisions on dental implant provision were also evaluated (Exley et al., 2009, Kashbour et al., 2018b, Vernazza et al., 2015)

2.7.4 Qualitative Synthesis of results

While accepting that the observations from their small sample size cannot be generalized, Grey et al reported that the patients see tooth loss as a deviation from normality (Grey et al., 2013). Dental implants allowed the patients to regain this normality by restoring their confidence and the ability to taste food (Narby et al., 2012, Nogueira et al., 2019). However, there were mixed levels of acceptance for dental

implants. Patients' age and where they are from i.e., rural, or urban background, and the cost of dental implants were the major influencing factors. Older age groups (>70 years) were reported to decline dental implants due to their concerns about the surgical procedures and the fear that they will have to cope with something they have never come across. Horror stories from friends and family about pain with dental procedures were the additional influences reported (Ellis et al., 2011). Patients from rural backgrounds were not fully aware of dental implants and their demand was less than patients from urban backgrounds. Due to the reduced demand, dentists in their community did not provide the same level of dental implant care as their urban counterparts (Boeskov Ozhayat et al., 2019).

Patients who are aware of dental implants and the stages involved in the treatment process were content that the higher treatment costs were justifiable (Abrahamsson et al., 2017). However, it is not appropriate to generalize the views about the cost based on these reports. The majority of the reports were from studies conducted in hospital-based treatment centres where the cost for the patients was either nil or subsidized.

The reports highlighted the importance of how the information received by the patients influenced their decision-making and their experience with dental implants. Plenty of information is available for potential dental implant-seeking patients from the internet resources. They also learn from the experiences of their friends and family (Kashbour et al., 2018a). Reports have highlighted patient testimonials that state "dental implants can be better than natural teeth" and recognised that this could be misleading and dangerous. Despite this, researchers have reported that patients valued the information received from their dentists above other sources (Kashbour et al., 2017).

The information can be from the dental team members or from learning materials the patients see while they were attending for other dental treatment (Wang et al., 2015).

One study identified that the main reason for dental implant referrals was that the GDPs were not performing dental implants, not due to the fear of difficulty (Narby et al., 2012). Two other studies noticed that the dentists appreciated the importance of continued learning and specialist training in dental implants (Cronin et al., 2009b, Afshari Prof et al., 2014).

In summary, the search concluded that the frequency of qualitative publications in dental implants is still low compared to the total number of publications in dentistry. However, the quality of the publications was adequate and met the CASP requirements. The content of the publications highlighted that patient information or education remains the key factor related to patient satisfaction. This eliminated the misbeliefs patients received from non-dental resources about dental implant treatment and related expenses. In addition, concerns from the dentists about lack of guidance were identified.

The literature search indicated that the information synthesised from the existing research is of good quality, but there are not many qualitative methodologies used in dental implant research. This observation supported the decision to use in-depth interviews, focus groups and qualitative surveys as data collection methods for the research in this thesis.

CHAPTER 3

MATERIALS AND METHODS

The research involved multi-methods, systematic literature review, quantitative - questionnaire study, and qualitative interviews and focus groups. University of Birmingham Ethics committee guidelines were followed, and necessary approval was obtained before the start of the research. The methods involved in the literature review were discussed in the previous chapter. Therefore, this chapter describes the materials and methods of the further stages of the research.

3.1 Questionnaire analysis

3.1.1 Participants

The general dental practitioners that participated in the questionnaire survey all worked in the West Midlands participated. This practice group had around 100 dental practices in the county of West Midlands, and a majority of them provided general dentistry through mixed funding (both through NHS and by collecting a private fee for non-NHS-based treatments). A wide range of clinicians from different educational backgrounds worked in this group.

Originally, 101 clinicians were contacted through e-mail with a request to complete the questionnaire. Nine of them responded that they were hygienists or therapists. They were excluded from the study as the focus was only on the GDPs. One dentist left the practice group and responded that he was not interested. A total of 87 dentists responded out of the 91 dentists (response rate of 95.6%) (Jayachandran et al., 2015). The dentists were 26 local graduates (who graduated from Birmingham), 11 from the teaching Institutes in the London area, and at least two were from each university in the UK. This list constituted the major number of respondents. The

remaining dentists were trained in European countries such as Portugal, Germany, and non-EU countries such as India and Pakistan.

3.1.2 Research Tool

A structured questionnaire was developed and piloted, adhering to basic principles of questionnaire design (Rattray and Jones, 2007). There were three sections in the questionnaire. The first part was focused on the participant's background, including age, year of qualification and educational background. The second part explored their clinical practice and their involvement in dental implant-related practice. The third part involved the questions regarding their dental implant training and a section on the list of barriers to implant provision. The questionnaire ended with an empty segment for them to provide their opinion about the current implant education in the UK.

The questionnaire included a mixture of open and closed questions. The closed questions were made with tick boxes or 'yes or no' responses. This made it easy for the participants to respond and skip the questions not relevant to the respondent. The open-ended questions and the empty spaces allow the respondents to express their views and reflections about essential issues.

Appendix 1 shows a sample questionnaire.

3.1.3 Pilot Survey

The pilot survey, more appropriately termed as small exploratory study, involving a convenience sample (Connelly, 2008) was limited to five dentists as the anticipated sample size was less than 100, and the area of research was quite focussed. The

dentists provided feedback on the strategy and pattern of the questionnaire along with the actual response to the questions. Dentists felt the length and content of the questionnaire were adequate. However, two dentists felt few questions were too long and could be made shorter. The inclusion of tick boxes was one of the improvements made from the recommendations from the pilot survey.

3.2 Interview Study

3.2.1 Participants

The sample size for a qualitative study is a complex area to understand for a quantitative researcher. A true qualitative study does not depend on the sample size but the quality of the obtained information and its saturation (Mason, 2010). Qualitative research aims to obtain the meaning of the research rather than proving a hypothesis. Quantitative researchers often find it difficult to grasp these aspects. Marshall 1996 (Marshall, 1996)discussed three sampling methods (Table 3.2.1)

Table 3.2.1 Sampling methods for qualitative research- adopted from Marshall 1996 (Marshall, 1996)
1. **Convenience sample,** which is selecting the most accessible subjects. This is least advocated as it may result in poor quality data. 2. **Judgment sample,** or purposeful sample. This is the commonly used sampling method involving a framework of variables with available knowledge and selecting subjects to satisfy all the variables. **3. Theoretical sample** involves building theory with the research and extending sample size to elaborate the theory.

The study adopted a methodology that overlapped all three methods. Our research aimed to obtain opinions from participants who come from different dental school backgrounds. At the same time, we wish to limit the objectives of the study within UK dental practice. In the UK, dentistry is performed by dentists qualified from different Institutions within the UK and other European and non-European Universities. Therefore, a framework of variables to include the diverse backgrounds such as age, year of qualification, School qualified, the post-graduate learning experience was created. Specific codes were given to participants for identification e.g GDP1, ID1.

The interviews were started with immediately accessible dentists. The research aimed to reach at least two participants to represent the defined variables. The data was analysed alongside, and the sample size was extended till we achieved a saturation of information.

At the end of the twentieth interview, we recognised that we were reaching information saturation. Two more interviews were continued to confirm saturation, but they did not generate any new information. The sample size was concluded at the end of the 22nd interview. The original Concept of saturation of information advocated by Glaser & Strauss was adapted in the study (Glaser et al., 1968) has been challenged by many researchers e.g., Morse 1995, Bowen 2008 (Bowen, 2008). Therefore, it was also aimed to adhere to the guidelines recommended by Guest et al. which suggested fifteen is the smallest acceptable sample for any qualitative study (Guest et al., 2006).

A total of twenty-two dentists were interviewed. They were 13 male dentists and nine female dentists. They were from different educational backgrounds from different dental schools in the UK, from Europe and India. All of them are registered in the dentists register in the General Dental Council and currently practicing as general dental practitioners in the UK. This was to get diverse opinions from participants from different dental school backgrounds and, at the same time to limit the objectives of the study within the UK dental market. The participant lists were described as per experience in table 1; their educational background in table 2 and their institutions in table 3.

Table 3.2.2 Participants' Experience

Experience in years	Number of Dentists
< 5years	7
6-10 years	4
11-15 years	4
16-20 years	2
>21 years	5

Table 3.2.3 Educational Background

Educational background	Number of Dentists
BDS	15
Postgraduates (MSc, Diploma)	4
Others (Specialists, 1 previous specialist trainee)	3

Table 3.2.4 Academic Background (Geographical)

Academic Background	Number of Dentists
Birmingham	9
London	4
Manchester	1
Newcastle	1
Bristol	1
Asia (India, Pakistan)	2
Europe	3

3.2.2 Interview Protocol

Two pilot interviews with the GDPs who participated in the questionnaire study were conducted. This allowed the researcher to familiarise himself with the interview process and the questioning techniques. Then the other participants were contacted to arrange for interview appointments.

3.2.2.1 Duration of interviews

The anticipated time for interviews was around 1 hour. The participants were informed before the meeting about the duration of the interview. However, the actual average time of the interview was around 22 minutes, ranging from 17 to 43 minutes.

3.2.2.2 Interview venue

Participants were encouraged to choose the venue and time. This allowed them to express their views in their own surroundings and put them at ease. All the participants chose their surgery or a quiet room in the surgery as the venue. Also, they preferred non-clinical hours such as before the start of the day in the morning, lunch time, or at the end of the day. Most of the interviews were conducted at lunchtime or the last half an hour before lunch. This time was considered ideal, as the early mornings and end of the day sessions may have left the busy practitioner anxious about the waiting patients or wishing to rush back home.

3.2.2.3 The structure of interviews

As our research theme is specific to dental implants and our study group focusses on dentists, semi-structured interviews were planned. Semi- structured

interviews are conducted using ‘ a set of predetermined open-ended questions, with other questions emerging from the dialogue between interviewer and interviewee/s’ (DiCicco-Bloom and Crabtree1, 2006). Therefore, it was possible to tailor each interview based on how the information was pooling. This technique is considered effective and result in a piece of true and accurate information from the interviewee (Gratto & Jones, 2010)

The topic guide (Figure 3.1) was prepared based on the themes that emerged from the previous questionnaire. The general outline included the introduction of the interviewer, the research group, the objective of the interview, including the data handling and the interview. It concluded by thanking the participant. Specific care was taken not to limit the discussion or participants’ view but only to direct it within the general context of the discussion.

The following approach to the interview is described. The questions were probing and open-ended questions. Any prompts such as GDC quotes were used as signposts. Sample scenarios were also used as ice breakers and/or signposts. This approach facilitated the interviews and allowed the participants to express their views while keeping the context within the area of interest. Pauses and occasionally closed questions were also practiced. Every attempt to allow the participant to relax and speak in an open manner was made as there was an element of anxiousness about giving wrong answers, which was kept to a minimum.

3.2.3 Analysis of interview data

The interviews were recorded in an encrypted digital recording device and then transferred to an encrypted storage area (The University of Birmingham's secured virtual space). The interviews were transcribed verbatim. The researcher transcribed seventeen interviews and five were transcribed using an outsourcing company. The transcripts from the company were reformatted to be in uniformity with the remaining transcripts.

As a triangulation process and to validate data credibility in the drafts, five of the randomly selected transcripts were sent to respective participants. Minor changes were made, and some areas were improved with further clarifications made. The process has been described as member-checking in the literature by Lincoln and Guba,1985 (Candela, 2019).

Then the transcripts were organised using NVIVO software for coding and framework analysis.

3.2.3.1 Coding

Coding is the analytical process of identifying and recording the distinct ideas within the interview data (for this study). Open coding was started, having the terminologies of the topic guide as a backup to name the nodes. Additional nodes were created as needed. This resulted in an initial broad node classification as spread out in Table-4. As the search context is precise, most of the information could easily fit into the existing concept terminologies. However, there was also additional information pooling which were not considered in the previous part of the research. These contributed to forming additional nodes.

Therefore, theoretically, the research started with “concept-driven” coding, but “data-driven” coding took over as the process continued.

Table 3.2.5 Interview analysis- Initial Coding Classification

The initial Code Classification
Background
Graduation
Post-graduation
Unstructured Learning
Teaching experience
Clinical experience
Practice type
Implant practice
Implant experience
Future plan
Implant patient
Case selection
Referral process
Maintenance and review
Dentists' Opinions
Controversial
Factors affecting implant in general practice
GDC regulation
Interests
Current education
Undergraduate
Postgraduate
Implant practice
Clinical practice
Referral
Recall and Maintenance including hygienist role

The broad node classification is edited to reduce overlapping similar themes. This is to make the analysis process easier and delve into the depth of the subject logically.

3.2.3.2 Data Analysis

A framework method was used in this thematic analysis (Gale et al., 2013). The analysis was done in four major areas to make it readable.

1. Background analysis
2. Implant practice
3. Confidence
4. Opinions

The framework matrices were created using the NVivo software version 11, and the same researcher did the individual analysis. The themes developed have been listed in the results section.

3.3 Focus group and qualitative survey

Themes developed from the questionnaire, and the in-depth interviews were presented to the dentists through the focus groups and qualitative survey to evaluate their response. Originally three focus groups were planned. However, the COVID19 pandemic and the subsequent lockdown restrictions disrupted these plans. The first focus group was conducted just before the first lockdown in March with foundation trainees in general practice. This was conducted in a conference room of a dental practice following social distancing regulations. After this, strict lockdown restrictions were implemented. Therefore, the study

design was modified after confirmation from the Ethical review committee. The second focus group was conducted using the online telecommunication app Skype (Skype Technologies, Luxemburg, and Palo alto ©Microsoft 2021) with the general dental practitioners (GDPs). Private dental practices were financially affected by the lockdown restrictions. Practitioners were anxious about the available clinical time due to confusion about surgery timing between treatments and reduced patient attendance. It was not easy to approach them to participate in the focus groups. Therefore, the third focus group had to be changed to a qualitative survey through the online platform Survey Monkey.

3.3.1 Participants

The first focus group involved seven foundation dentists. They are the recently qualified dentists registered in the GDC to practice dentistry in the UK, but in training to obtain their performer number which allows them to work independently in the NHS general practices. Three were female dentists, and 4 were male dentists. Two of them were qualified in the UK, two from India, one from Pakistan and two from the EU.

Five GDPs participated in the second focus group. They work in the general practice in the UK, providing both NHS and private care to their patients. Two dentists had qualified in the UK, two from India and one from the EU. They were in the age group of 30 to 45; four male and one female dentists.

Nine dentists participated in the qualitative survey. This included two female dentists and seven male dentists. Two were GDC registered specialists in periodontics, and two were registered prosthodontists, and three dentists

worked in specialist implant referral practice. The final two worked in general dental practice and were involved in dental implant provision. Three were qualified from India, one from Hungary, and the remainder were UK trained.

Table 3.3.1 Participant description (Focus group & Qualitative survey)

Participants	Attributes	Number
Foundation Dentists (n=7)	Male	4
	Female	3
	UK qualified	2
	Overseas Qualified (Non - EU)	3
	EU qualified	2
GDPs(n=5)	Male	4
	Female	1
	UK qualified	2
	Overseas Qualified	3
Implant dentists (n=9)	Male	7
	Female	2
	Age 35-45	6
	Age 45-55	1
	UK qualified	5
	Overseas Qualified (Non - EU)	3
	EU qualified	1
	Specialists	4
	PG qualified	3
	With no PG experience	2

3.3.2 Mode of conduction of focus groups

The themes that emerged from previous research were used to form the topic guide for the focus groups and the survey questions. The principal researcher convened the discussions. The topic guide is listed in Appendix A4.

The first focus group took around 46 minutes and the second around an hour. The dentists were allowed to discuss the topics one after the other and the moderator was present to record the discussion. The discussion was conducted as open conversation. Interruptions were done only to signpost when the discussion focus was diverted. The participants appeared to be relaxed as there were no time restrictions due to clinical practice.

The questions listed in the qualitative questionnaire are listed in appendix A5. The questionnaire was sent to the dentists through a cloud-based survey tool SurveyMonkey (Copyright © 1999-2021 SurveyMonkey).

3.3.3 Data analysis

The survey responses along with the focus group transcripts were exported to NVIVO software for coding data analysis. Framework analysis was again used. The themes emerged are discussed in the results section.

CHAPTER 4

RESULTS

4.1 Questionnaire study

The questionnaire was initially sent to 101 practitioners. However, the number was later reduced to 91 dentists. This was because one dentist had left the practice and the remaining nine practitioners were dental hygienists. Out of this, 87 dentists responded, which left us with a response rate of 95.6%.

The data was uploaded to SPSS software (IBM SPSS Statistics Version 23) for statistical analysis. Continuous variables were presented in the form of descriptive statistics, and categorical variables were presented in the form of frequency and percentages. Chi-square test was chosen because independent categorical variables such as age, dentists' experience in years, whether PG qualified or not, etc., were cross referenced. P value of <0.05 was considered as statistically significant difference.

4.1.1 Dentists' age Vs. Implant practice

Over seventy-nine percentage of respondents were aged 40 and under. The data confirmed that nearly 90% of them did not provide implant treatment. However, 10% of them had considered providing implants only after a certain period of clinical practice (around at least after their 30s). Table 4.1.1 shows that the dentists who placed and restore implants were in the age group above 30 years, and this number was highest in the age group of 30-40 years (p-value: 0.042, Degree of Freedom: 3).

Table 4.1.1 Dentists Age vs. Reported implant practice – Chi-square analysis

		Surgically Place/ Restore Implants		Total
		yes	no	
Age	25-30	0	31	31
	30-40	7	31	38
	40-50	1	14	15
	above 50	1	2	3
Total		9	78	87

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.178[a]	3	.042
Likelihood Ratio	10.398	3	.015
Linear-by-Linear Association	3.052	1	.081
N of Valid Cases	87		

4.1.2 Geographic Distribution

Eighty percent of the respondents had graduated from UK Universities. The remaining were from European countries such as Portugal, Hungary, and Germany and non-EU countries like India and Pakistan.

4.1.3 **UG Learning Vs. Implant Practice**

Seventy-seven percent of the respondents mentioned that they received some implant-related teaching during their undergraduate period. However, they all mentioned that they learnt only the theoretical aspects of dental implants during their undergraduate training. This was concerning dental implants and implant-supported overdentures. However, comparison of this learning to their implant practice statistically inferred that the dentists who learnt to place and or restore dental implants in their undergraduate course were providing the management 9.2 times more than those who did not learn. (p value 0.05, Degree of freedom 1) (Table 4.1.2)

Table 4.1. 2 Implant learning during UG and the implant practice

		Place/ Restore implants		Total
		yes	no	
Learn implant during BDS	yes	7	59	66
	no	1	19	20
	not sure	1	0	1
Total		9	78	87

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.288[a]	2	.010
Likelihood Ratio	5.289	2	.071
Linear-by-Linear Association	.303	1	.582
N of Valid Cases	87		

4.1.4 PG learning Vs Implant Practice

Different levels of postgraduate training courses are available in the UK. They are NHS-funded Continuing professional development courses (formerly known as section 63 courses), commercial courses which range from one-day courses to six months of mentored training, and University-based certificate, diploma, and master-level degree courses (Eaton et al., 1992, Meli Attard et al., 2022). Nearly half of the participants (48.3%) mentioned that they did not receive any post-graduate dental implant training. Analysis of these variables showed that the frequency of dentists who placed and restored dental implants with PG learning was around five times more than those who did not have any PG learning. (p-value -0.031, Degree of freedom:1)

Table 4.1.3. Postgraduate training vs Implant practice

Implant Training		Number of dentists	Response rate (%)
Learnt	CPDs	31	36.6%
	Commercial courses	10	11.5%
	Certificates	4	4.6%
Did not learn		42	48.3%

Adopted from authors own article attached in the appendix (Jayachandran et al., 2015)

Table 4.1.3.1 Analysis of postgraduate learning vs dental implant practice

		Surgically Place/ Restore Implants	
		Yes	No
Dentist who had training during PG Learning	Yes	8	37
	No	1	41
Total		9	78

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.553[a]	1	.018		
Continuity Correction[b]	4.017	1	.045		
Likelihood Ratio	6.299	1	.012		
Fisher's Exact Test				.031	.019
Linear-by-Linear Association	5.489	1	.019		
N of Valid Cases	87				

4.1.5 Cost of Learning as barriers for implant provision Vs PG Learning

On analysing the barriers preventing GDPs from undertaking post-graduate learning in dental implants, the cost of learning (51.7%) was identified as the main reason. This cost was related to the actual cost of the training courses and the cost related to taking time out of practice.

Table 4.1.4 Cost of Learning as barriers for implant provision Vs PG Learning

		PG Learning		Total
		yes	no	
Cost of learning	yes	17	28	45
	no	28	14	42
Total		45	42	87

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.261 [a]	1	.007		
Continuity Correction [b]	6.150	1	.013		
Likelihood Ratio	7.370	1	.007		
Fisher's Exact Test				.010	.006
Linear-by-Linear Association	7.177	1	.007		
N of Valid Cases	87				

4.1.6 Cost of Treatment as barriers for implant provision Vs Restore implants

Majority of the dentists regardless of whether they place or restore dental implants did think cost of treatment as a barrier (p value: 0.05, Degree of freedom -1).

Table 4.1.5 Cost of treatment as a barrier Vs Implant practice

		Place/ Restore implants		Total
		yes	no	
Cost of treatment	yes	6	26	32
	no	3	52	55
Total		9	78	87

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.856[a]	1	.050		
Continuity Correction[b]	2.555	1	.110		
Likelihood Ratio	3.701	1	.054		
Fisher's Exact Test				.070	.057
Linear-by-Linear Association	3.811	1	.051		
N of Valid Cases	87				

4.2 Interview study

4.2.1 Background analysis

Quantitative description of the participants' details in terms of age, experience and geographic distribution has been shown in the tables 3.2.2 to 3.2.4. Continued qualitative analysis of participants' dental implant-related experience, undergraduate and postgraduate learning, and interest in implant dentistry resulted in the following themes.

4.2.1.1 Dentists' Responsibilities

Dentists demonstrated their understanding of providing extended restorative treatment options to their patients. They also recognise the importance of continued learning to update knowledge to satisfy the patient needs, competitive peer pressure, and the regulatory requirements.

> *' there is someplace- because as we go on, people are gonna need better replacements for teeth and dentures. people expectations are much higher, so more and more people will be placing implants…'the specialist can look after the implants he placed, but I don't think he needs to; that can be done at the general practices; it should be quite routine like anything else'* ***GDP1***

> *' they (implants) are developing really well, and they (implants) are becoming a lot more popular. And a lot of patients are now I noticed, since I qualified up until where I am now in my career, I have noticed in the past couple of years, patients are a lot more interested in implants and they are becoming lot more well-known; there is more interest amongst patients and dental professionals, regarding implants…it's my duty to look after the implant and to make sure there is no disease around it'* ***GDP3***

*‘it’s not just for specialists to take care, they should take more responsibility of any complications of doing the implants, if it does fail, but the general day care the implants not need alternative care, alternative options; to professional, dentist with dentistry skills should manage’**GDP5***

During the discussion, a potential theme came up that dentists who do not have implants as an available option, may be disinclined to suggest it to the patient, and even considered referring the patient out.

*‘I've gotta keep it clean as well, so I would have to clean around the implant. If we don't, we're doing a lot more harm, if we don't touch it, than compared to if we do’ **GDP22***

*‘if you are not able to offer it, if you are not able to offer something, you are more likely to sway the patient toward what you can offer, which, in many ways as restorative consent is concerned’**GDP9***

On exploring the dentists’ competencies in dental implants, it was reflected that all of them were confident at their experience level. Experienced dentists also thought that current graduates are competent in this aspect.

*‘(Will you be confident, in doing these things as a general practitioner) For sure. Yeah, yeah. (When you graduated?) think so because a lot of this theory, and it's I think most dentist would know. You know because I think everybody has the bread and butter. So, I think all dentist I would say would be, should be competent with that, and probably would be competent with that’ **GDP20***

‘I did meet, not couple, many of freshly qualified, I can see most of them explain very comfortably, you can’t just take the tooth and send the patient then the patient says, “what? I have a gap”, you know

what that meaning; we had a couple, I can see they comfortably explaining things, I don't think this is the problem' ***GDP16***

'I feel they are competent enough, really. Most graduate dentists know the advantages and disadvantages and all the risks and benefits of implants. They can discuss that with the patients. I think they are fairly competent enough. I have not had a new graduate who cannot discuss that with the patients' ***GDP7***

'I think for undergraduates it is adequate, to fulfil the GDC option yes definitely' ***GDP3***

At the same time, dentists expressed the view that dental implant provision should be done at specialist practice.

'I'm happy to do anything. But do I believe that I can place implants straight away? I ain't got ... No, no chance at all. You know, I know how to physically do it, but I wouldn't deem myself in a position, even though I'm very experienced, to do that. I don't think that- that's what's in anyone's best interest' ***GDP15***

'I personally believe implant work should generally be done in a specialist setting because I think the setup is geared up to give the dentist enough time to gain all those factors correctly…. if I rephrase that question and ask my patients, which I have done on numerous occasions, exclusively, all of them would rather I do the work. But equally, I have ... I perceive I ... I believe I have to do what is in the best interest and if I was having an implant, I would see a specialist. So, I- I extend the patients that courtesy as well… now, if the patient asks me what will give them a better percentage success, whether I do it or whether a specialist does it, well obviously a specialist is gonna be better, statistically speaking; may be in my competency, quite easily, but uh, put a- a specialist, statistically would get a higher rate of success' ***GDP15***

There was frustration that they had not learnt much about implants at undergraduate level. Almost all of them said that their learning was theoretical based and given through lectures.

> *'it's a very alien topic only few lectures and theory- would better if it's more of implants, especially restoring implants'* ***GDP1***

> *'It was covered in our prosthetic module, where we did implant retained dentures and we did a few lectures on implants, how they were placed. But it was just covering the basics to give us an overall idea. It was covered in areas such as periodontics about how to clean them, how to manage them. But it was just very touch on surface'****GDP3***

> *'So, we had about three lectures or four lectured in content hours. Ah, and that was just talking about implant'****GDP13***

*Wh*en it comes to implant practice, they also expressed concern that the new graduates are either not confident or do not know the subject. New graduates should not provide dental implant treatment without adequate experience, is one of the views that arose from the interviews.

> *'So, what may have been undertook by a graduate say, 10 years ago, compared to what might be undertook by a graduate today… a vast difference in what they're willing to do and what they've been trained and how competent they leave the dental hospital…new graduates qualified, I don't think have enough experience, and…They feel less confident to take on work. So once the work is in front of them, they almost, on occasion, talk themselves out of it'* ***GDP15***

> *'I think Dentists should have a lot more experience of crown, bridge work, before they can do implants with occlusion and problems*

related; How much they understood about the long-term possible complications of implants I'm not really sure; They shouldn't be, the same as you wouldn't expect a VT to suddenly do a multi-unit bridge. You need to understand a lot more about occlusion, about the problems, what they're doing could cause longer term effect, it's not something you can just ... an amalgam, oh yeah you can just do that now. There's a lot more in it, going into it' ***GDP10***

4.2.1.2 Postgraduate learning Opportunities

Postgraduate training in implant dentistry was available for all the participants. Dentists admitted that they did not use those opportunities. They talked about their interest or lack of interest in the subject, and other outside commitments. Some of them did not give valid reasons. The dentists indicated that they were kept busy by their non-implant treatments, and there was no need or driver to learn this additional skill, their anxiety about complications or failure, and the difficulties in obtaining mentoring support Dentists who did do implants mentioned that they have moved away due to managing time.

'I wouldn't trust myself, it's not my area, I don't ... I think you need to have experience, supervised experience, before you start doing something around whatever that might be, and implants unless you've trained with an implantologist' ***GDP10***

'Yes, the practice offered that implant mentoring…I think they offered me to come and see the implants being placed, but I didn't go down the route (responded that she got busy with regular dentistry)' ***GDP17***

'the problems that I found with implants was having the time. As the practice got busier with the referrals, I didn't have the time to carry on doing this. I felt that the way forward was really to let other dentists in the practice who wanted to do implants to do it, and I concentrate on

my oral surgery skills' ***GDP7***

'I find that is inhibiting me is the time I would need to take out from my day-to-day practice, in the sense I'm very busy' ***GDP15***

Recent graduates showed interest towards dental implant learning. They even identified informal ways of learning about the subject. They utilized the opportunities which their senior colleagues had missed at the same time of their career.

'*I am restoring implants with the help of an implantologist, that I go and shadow" "I do the all the work, he supervises me…I have done 4 or 5 cases now. So, I am little more confident'* ***GDP1***

'Yeah, obviously, this is the practice already has an implantologist, who was practicing implants, for 20 odd years. It was quite reassuring for me… if I have any problems, I can easily go to' ***GDP9***

*'I've started doing my masters in implants last year and I've done my first year, placed a couple of implants now'****GDP19***

The theme of Cost came up with the analysis subheadings, the actual cost of the treatment, and the cost for the dentist such as the cost of learning, the cost of time out of the surgery, the cost of equipment, and the cost of indemnity.

'But very expensive I think…one is that the course itself is expensive and being part time taking time out of practice. The quality is good, but it is expensive' ***GDP1***

'it's not that easy for a general dental practitioner to be trained in providing dental implants to their patients without investing significant amounts of money on certain courses or qualifications, so again that can also limit how available this is as an option for patients and that limits how practical it is…'I think equipment as well is another issue. Sort of having the right equipment available, how easy is it to

ascertain and how expensive or cheap is it to get as well. I don't know. That could be another issue I for see' ***GDP12***

'Aha! The cost…cost is the difficulty, and you know taking time of your surgery to do it. You are losing money within the practice, plus paying - more money going out' ***GDP2***

'first of all, it's quite expensive to do the course, from what I have gathered, I have not researched properly; at the moment for myself is time, because I am full time and also I have family life as well. To commit to a course, I will have to take time off work or do it outside the work hours, which might be difficult with juggling family and work' ***GDP3***

Some dentists talked in depth about the cost and mentioned that they did not proceed to implant learning on a cost versus incentive basis.

'For me to take out the amount of time that I would need to be appropriately trained to do implants isn't actually feasible at the moment, in terms of a cost/risk benefit ratio. Uh, I don't think it weighs up for me to do it' ***GDP15***

'But I think, probably the most is I didn't have enough incentive I think' ***GDP21***

Views about Cost factor from the patient side have also emerged from the responses.

'I think the main practical obstacle for off patients is the cost, so I think that's the first thing I would say. For a lot of people who are interested in having a dental implant, for most of them the biggest, uh, inhibiting factor is that they cannot afford dental implants. Although there are options like finance available, it can be spread out over multiple months, for some its still remain unaffordable' ***GDP12***

'Mainly because of the cost. They can't ...The demographics are such is that they can't really afford that. They just chose extraction and dentures' ***GDP21***

When patients are referred to the specialist by GDPs for implant treatment, they pay a fee and attend an initial consultation. On some occasions, they are sent back to the GDP if they are not suitable for dental implant treatment, such as advanced gum disease, or complex anatomy requiring invasive surgeries. This results in patients questioning the ability of the referring dentist to identify the issue at the beginning.

'a consultation with that private practitioner before dental implants will be provided and that can be quite costly. The outcome of that consultation may be that we can't provide you dental implants or, well, you can have dental implants but that's incumbent upon you stopping smoking or having a bone graft. I think that can also be another issue that can put patients off or prevent them from having dental implants provided' ***GDP12***

In addition, paying for a treatment makes the patients slightly different, especially in the UK where NHS provides majority of general dentistry at a subsidised treatment cost.

'I don't think the problem is that the dentist can't explain this, even newly qualified dentists, I think mainly it's the patient can afford it or not; and another thing for the dentists, I think, is the cost of the training as well, frankly' ***GDP16***

'(Does it make them any different from the regular patients that you see) It makes their (patient's)... mindset is different' ***GDP 20***

Another area of concern was the Cost related to recall visits

'at the end of the day, there is an important element, what the patient wants; sometimes you recommend to see the patient every three to six months or whatever, and the patient say, sorry I am a paying patient, I can't afford this' ***GDP16***

4.2.2 Implant Practice

This part of the interview was focused on understanding the participants' level of engagement with implant-orientated practice. The discussion was around how the dentists manage their implant patients. This is related to the recruitment of patients, the referral process, and what happens once the treatment is completed. This includes reviews and long-term maintenance.

4.2.2.1 To or not to take responsibility for others work

Dentists are keen to maintain dental implant patients regardless of who performed the dental implant provision. However, they hesitate to deal with problems associated with the implants. Patients who had treatments within the UK are in a better place, where they can easily access their implant dentist.

'I would not ignore the implant thing at all, as not a job I have done, you know, if I had a crown done by another dentist, and I come to you for general check-up, I expect you, as my dentist to look after the crown, isn't it?' ***GDP16***

The patient population in England is multicultural and from all over the world. It is not uncommon for general dentists to review patients who had implant treatments overseas. Dentists expressed that they are nervous about treating these patients, with one of the reasons being difficulty in retrieving treatment records from overseas.

'I just treat them as normal patients six monthly recall, unless until I have an issue with the implant, and I do, do tell them, that see, I have no idea what the pre-treatment things were and what system they have used. If you got the details, you can bring it to us,…and if there is a problem, then we will deal it' ***GDP19***

'The problem that I've had is 1 or 2 patients that come with implants from abroad and they're failing. And it's been too much for me to take on… got to see a specialist to fix this. But he didn't want to pay to see a specialist to fix it' ***GDP21***

4.2.2.2. Post-operative maintenance and continued care – need for a standard protocol

Dentists were happy to monitor the implants and wanted to refer as the problem arose.

'I think the maintenance can be done in the general practice, as long as we know what we are looking for; I don't think there are lots of information out there about guidelines saying this is what you should be doing in general practice about implants… I take an x-ray of the implant one year, 2 years and five years stage and make them follow implantologist's information about how to keep it clean; any issues refer them back to the implantologist'- ***GDP1***

'normally I take a follow up x-ray, the first time they seen me the year after then I just send that back for their opinion to make sure it's okay' ***GDP2***

'Well, they usually send me a letter to say it's been done. They're happy with the result, and can you please X-ray and probe and make sure the patient is all right and it's good' ***…****'If I notice something going wrong, then I'd refer back'* ***GDP11***

'I look after the implant as if it's a tooth' ***GDP4***

'I am happy to do the maintenance, and obviously, if there would be a problem and if the implant is going to fail, I will refer them back to the practice where the implants were placed' ***GDP17***

However, during the interview, without further probing they mentioned about " if any problems" and without further questions confessed that they would refer the patient back to the person who placed implants. This theme appeared earlier in the post graduate learning area, that the dentists were anxious about complications and possibly compensating sums of money to litigious patients.

'I think it's just more dealing with the complications afterwards; Or the other complications that you face from when your routine treatment hasn't gone properly' ***GDP14***

'I think you have to be varied about doing dental implants. You see a lot of things can go wrong with implants' ***GDP2***

'I would like to think if there are any problems with the implant which I wouldn't be suitably trained to correct ***GDP10***

Many of them directly or indirectly expressed that they are comfortable receiving communications from the implantologist. They look for guidance on how to look after the implant. This indicates that there is an underlying unease/fear about the management, especially if there are no standard protocol post-implant maintenance,

'(from the initial survey, we learnt that there is no standard recall protocol) I think that is absolutely fair comment; equally so, you should know what to do, whom to refer, and which patient to refer? Shouldn't the general dentist, for example in orthodontics have the knowledge of IOTN, what come with the NHS, the timing, at what age should they refer, and I think its everyone's right. If the patient and some needs to be referred, then they should have the right, Political

issue going into, they want to limit the funding; but it's the patient's right' ***GDP6***

'lot of the things I've learnt about the guidelines are very much word of mouth' ***GDP12***

Many of them confirmed that they will be comfortable to carry on with dental implant management if there are clear guidelines available.

'there should be a maintenance programme with the actual providing dentist. It is their duty of care'…'I feel that there should be a maintenance programme with the dentist that provided the implant, because they got all the records, the x-rays, they did the procedure, they know what went wrong, what was difficult and what were involved. So, I think they should have the maintenance programme, I think it would be fair' ***GDP3***

'I would probably want to know from the correspondence what the implantologist's follow up; how he be gonna following the patient up, is it going to be 12 months' time or 6month time or he gonna be regularly seeing them' ***GDP4***

'make them (patients) follow implantologist's information about how to keep it clean, being careful' ***GDP1***

However, there were views against adopting to a team approach. There were difference of opinion ranging from "not willing to involve at all" to "do all the treatment by oneself".

*'my knowledge on maintenance of implants is quite limited; No, I don't involve in anything (related to implant maintenance)'****GDP2***

'I have on the go are the patients who I have originally treated. I want to maintain them (my implant patients) myself' ***GDP7***

4.2.2.3 Role of hygienists

Participants of the interview recognised the role of hygienists and encouraged their involvement in maintaining oral hygiene, and dental implant maintenance.

> *'(Role of Hygienists) I think it is quite important,… they (patients) spend lot of money for the implants, and patients get reminded by somebody other than dentist (hygienists)' GDP9*

> *'I use the hygienists to do the routine maintenance, but I do go in and check on the implants to make sure I am happy'* ***GDP7***

> *'I think dental Hygienists are good generally, …they did a really good job. They took a lot longer than I probably would to explain'* ***GDP10***

> *'as long as the hygienist is appropriately trained, well they should be trained, then why should they just clean the teeth only? should they be cleaning bridge abutments? Should they be cleaning implants? Yes, they should, absolutely, I mean hygienists should be appropriately trained, they always come across patient who had implants placed, you can't just ignore them. Hygienist should be confident in all aspects'* ***GDP6***

4.2.2.4 Referral Process – requirements for Protocols?

Appropriate referral for specialty management is an ethical requirement for any dentist and a regulatory requirement for those dentists practicing in the UK.

> *"You should only deliver treatment and care if you are confident that you have had the necessary training and are competent to do so. If you are not confident to provide treatment, you must refer the patient to an appropriately trained colleague. Standard 7.2.2, Standards for the dental team, GDC" (GDC, 2013)*

Dentists mentioned that they give patients options for replacing missing teeth in a general treatment plan discussion. Additional details are given to those who are keen (or those who do not want to go ahead with the available options) and are referred to a dentist specialising in implants. The respondents did not provide clear details as to what additional records they send with the referral letter.

> *'a patient who's got good oral hygiene, probably good bone levels, would be a good implant case and seriously wanted it then that's the kind I'd refer, if they inquired about it and wanted it done. I'd normally send an OPG occasionally, not every time, but some of them or a PA of the area involved'* ***GDP10***

> *'just the referral letter; Like X-rays and stuff? No, no nothing; I think they can do their own'* ***GDP11***

> *'Basically, I will tell my practice manager to call the other practice and book an assessment, end of. That's it, it's as simple as that; and the way that's done is the referral is done over the phone, uh, if I think a referral letter is required, I will do a referral letter'* ***GDP15***

> *'I don't think I sent any x-rays, I can't remember'* ***GDP17***

> *'if the patients that want to go for implants, then we write a referral letter. we have the pre-made form… No (Diagnostic aids), I just send the letter'****GDP21***

> *'Usually no, usually no (diagnostic aids)'* ***GDP6***

Dentists providing dental implants in their practice mentioned the referral process, what do they need to know from the GDP about the referred case.

> *'And as I'm planning to make a referral form and speak to dentists about, like what kind of cases and what, what they need to send me.*

Like if they take any OPG or X-rays or things needs to be done; some big boxes and you know, some things that they need to let me know before I start with the case, yeah' ***GDP18***

There is a mixture of referral patterns and implant practitioners were disappointed as the detailed referrals are rare.

'Sometimes some of them do send some x-rays. And, uh, they just put other, all of the details of the medical history and what's the status being, especially for failures. They send me the BPEs. They send me the pocket charts and the x-rays. And the tell me that, you know, it's, if it's improving or not improving. How the patient compliance is? Is he maintaining oral dental hygiene or not. And all that, yeah' ***GDP18***

'I just literally write the dental history completely, and the perio history and everything, their dietary habits, their uhm smoking, alcohol drinking etc., Anything which may affect the prognosis or the reason for them to qualify for an implant, basically I'll just go through that sort of stuff with them' ***GDP20***

'a lot of the time the referrals are quite vague; Very few actually provide radiographs to see whether they assess the quality, height, depth of the underlying bone. None of them have ever indicated whether there's enough mesio-distal width or if there's enough interocclusal space. There's been cases that have been sent it and they're still smoking, or they have active periodontal disease which are inappropriate referrals' ***GDP12***

'One of the cases I was sent, was for premolar space management. No models or records were sent. On assessing the case I realized that there is no space as teeth have moved. This could have been easily informed by the dentist, which wasted my time' ***GDP6***

Availability of suitable implant dentist was also recognised as an obstacle.

‘there is a sizable majority of practices that don't provide dental implants and not a lot of them know very easily where to refer a patient to, to have a dental implant. I think that's another obstacle’ ***GDP12***

One controversial theme about the experience of the implant dentists based on their learning came up.

‘I saw an implant once I in hospital worked, I found one that worked in the hospital, they just work in with GA, it was not a big thing it was like three implants even with the stent, the stent to position the angle of implants. The thing was that he was struggling to place the implants for first few times, the guy was a consultant, restorative consultant, he is quite a young guy, hardly ever worked in general practice, he did undergraduate, MSc and specialty training, so he was like uni, uni uni and uni and then out and he got the consultant position. So, his clinical work, it like, he didn’t have the experience in the clinical side, but the theory behind it, he probably better than anybody. Which one do you prefer, you like one with hands on it right’ ***GDP5***

> *‘no one refers to me as I don’t hold specialist qualifications as such’****GDP9***
>
> *‘I do question some of these dentists who grab, and they do these courses,, short courses and then they think they could do implants, just as I question people who done, let’s say a short course on six months smiles, and then they think they can do braces.,, hmm they can! But only on simple cases, for example anterior crowding something going to do with dental stripping, and they are not necessarily gonna be needing extensive orthodontic work. So I view implants in the same way I view the orthodontic work done in general*

practice by non-specialists , which is,.. it can be done but has got limited scope, I think' ***GDP4***

4.2.2.5 Confidence in dental implant patient management

There was an overlapping theme that arose from the interviews. The general view from the GDPs who do not provide dental implants was to leave the responsibility to somebody else.

'it was an easy option to refer should any came; it was more referral to specialist option' ***GDP10***

'No I don't involve in anything; Usually, I will tell the patient, "look we are referring off you now, the implantologist will look after you' ***GDP2***

'Or, um, there are different oral surgeons available at hand and anaesthetists and things like that. Which does come handy' ***GDP18***
'I wouldn't trust myself, it's not my area, I don't ... not from a practical point of view, no' GDP1

'Usually, I will tell the patient, "look we are referring off you now, the implantologist will look after you' ***GDP2***

'I don't know about the full range of implant options, Umm' ***GDP11***

*'my knowledge of implant dentistry when I finished university was very limited'****GDP12***

*'Just don't want to deal with that, to be honest. Just could be ah safe'****GDP14***

'We just refer all the time, like, to-to a person. It wasn't within the practice…No chance (at graduate level)' ***GDP15***

Even experienced dentists who have been practicing general dentistry more

than 10 years expressed hesitation about dealing with dental implants.

> *'(Do not deal with implants) Just could be ah safe; It's still a bit of a surprise to see somebody with an implant'* ***GDP14***

> *'I'm happy to do anything. But do I believe that I can place implants straight away? I ain't got ... No, no chance at all. You know, I know how to physically do it, but I wouldn't deem myself in a position, even though I'm very experienced, to do that. I don't think that- that's what's in anyone's best interest'* ***GDP15***

> *'Just don't want to deal with that, to be honest'* ***GDP14***

> *'No, not really, not at my stage in the career. No'* ***GDP11***

The knowledge base of new graduates was questioned. One experienced dentist who has been a University teacher, VT trainer and still involved in policy makings for NHS mentioned that,

> *'So what may have been undertook by a graduate say, 10 years ago, compared to what might be undertook by a graduate today, I- I perceive there's a vast difference in what they're willing to do and what they've been trained and how competent they leave the dental hospital; So I think there are two things, I think new graduates qualified, I don't think have enough experience, but also from like, from what I've seen, they're less ... They feel less confident to take on work. So once the work is in front of them, they almost, on occasion, talk themselves out of it'* ***GDP15***

> *'I think Dentists should have a lot more experience of crown, bridge work, before they can do implants with occlusion and problems related; How much they understood about the long-term possible complications of implants I'm not really sure; They shouldn't be, the same as you wouldn't expect a VT to suddenly do a multi-unit bridge. You need to understand a lot more about occlusion, about the*

problems, what they're doing could cause longer term effect, it's not something you can just ... an amalgam, oh yeah you can just do that now. There's a lot more in it, going into it' ***GDP10***

Dentists also recognised the need for appropriate training in a supervised environment.

*'always get opportunity to provide the treatment in practice- don't necessarily feel confident although I am interested and hence why I am doing MSc, by being provide patients as well, will be good I get some practice and the implement in practice'****GDP1***

'I think you need to have experience, supervised experience, before you start doing something around whatever that might be, and implants unless you've trained with an implantologist, so many sessions or chosen to spend more time with any of that I don't think you should do just on a, say just I have a certificate, I've been on a course for two days' ***GDP10***

'But I don't think I'd jump into doing one before I start the course and learn more about it. Um, and learn more about the science behind it; I think it just, it's al-always going to be difficult to start something new' ***GDP13***

'I would not place a single implant without having the training, ; I know lots about implants, I am interested in doing this, personally, with the fear to do the best for my patients, I would not do it for my patient without postgraduate course' ***GDP 16***

'I think they are quite complicated; the surgery as well, maybe I think lack of training' ***GDP17***

'to be honest my surgical skills, is the area which I feel needs lot more improvement; I am not confident in doing surgical extractions at the moment' ***GDP3***

'I will need to additional training, or I wouldn't come forward to do implants. I want to significant training requirement down it' ***GDP4***

Dentists felt confident in dealing with dental implants if additional training or mentoring was provided. Even the presence of an experienced dentist in the surgery building made them comfortable when managing implant patients.

'at first, I used to be very apprehensive about cleaning around it and everything like that. But to be honest not really now' ***GDP20***

'my implant patient out to local practitioner who hold my hand through the restoration side of it, that's when I started placing implants, short course with specialist …Yeah, obviously, this is the practice already has an implantologist, I mean Mr XXXX was practicing implants, for 20 odd years. It was quite reassuring for me, that I have got a chap downstairs, if I have any problems, I can easily go to' ***GDP 9***

'I have never restored any implant as an undergraduate; I have had practiced at restoring implants but never placed an implant; At the moment I am restoring implants with the help of an implantologist, that I go and shadow ; at first it was completely new, but in fact, I found that it actually easier than restoring teeth with crowns, you know the impression and stuff. There is less that can go wrong. Yeah , enjoying it' ***GDP1***

4.2.3 **Present Status of dental implant training**

Dentists realized the need to learn about dental implants. The reasons mentioned were, to meet the raising patient demands and to be competitive with their peers who perform dental implant treatment.

> *'It's a vast area. We get a large number of patients referred to us, especially with the waiting at the hospital is now increasing' …'I think getting undergraduate dentists to start with ah,.. placing implants or restoring implants is beyond their scope of practice at the beginning.* ***GDP7***

> *'you don't want to start getting students to run before they can walk.* ***GDP12***

> *'I don't think we can go ahead and place implants without some formal qualifications, at least to show them that we had the training'****GDP1***

> *'But I don't think I'd jump into doing one before I start the course and learn more about it. Um, and learn more about the science behind it'* ***GDP13***

> *'I definitely think, yes even though I have just come out of dental school, whatever I have learnt from the last year, which is mainly theory based and on phantom head based; I know my dentistry and knowledge has improved. You know I mean, I would always encourage any dentist, if they were considering or not, that you know you need to continue learning'* ***GDP2***

> *'I would like to feel that I have done this and have gained extra skills to make obviously stand out of the crowd'* ***GDP20***

> *'I went on a course at city hospital last year, that's when it came to light that implants are not for ever, they said an average 10 years'* ***GDP17***

On exploring, it was found that there are gaps in both the undergraduate teaching curriculum and in postgraduate teaching programmes. To simplify, the themes around existing problems and suggestions to improve the curriculum are listed as undergraduate and postgraduate programmes separately.

4.2.3.1 Undergraduate programmes

The main issue identified was the lack of space in the curriculum for teaching the subject. Dental implant management involves adequate planning, the surgical placement, prosthodontic management, and periodontal maintenance. These aspects need to be taught by the respective faculties.

> *'I don't think they have time; I think the hands on is difficult anyway because, to be fair, we did have Astra-tech came and they also gave us the plastic mandibles to practice using and preparing the site for an implant placement. I think that's as probably as good as we are going to get. I can't complain about practical understanding of implant dentistry aside from maybe getting more observational sessions.; I think fitting into the curriculum is difficult. I found that my curriculum over five years was very full. There was a lot going on, a lot to cover and a lot to understand…It's really important to understand the basics of assessing edentulous space, assessing that in relation to the whole mouth, the whole patient, the whole tooth, consider abutments. Understanding the principles behind removable prosthetics and fixed prosthetics and actually learning those to a good standard, I feel, is more important than understanding the in's and outs of implant dentistry. However, and it still is an importance to understand what we've already covered regarding implant dentistry. Although there isn't a space to fit it in, there surely must be way to try and fit that in, in a way that is beneficial as well. Without compromising other teaching'* ***GDP12***

'I understand why less time is spent on implants (in University teaching), because other skills that need more time like prosthetics, general dentistry skills, perio, restorative, cons, you need them skills lot more' ***GDP3***

'I don't think, um, you know, the training at undergraduate level is not all that good, uh, regarding implants. That's what I feel. Because even, even, if I remember myself as an undergraduate, I don't think we were trained enough for implants. Not, not really. We only knew the process and we only knew how it's done. But we were never told about implant maintenance, or the risks involved and things like that. Which it, it needs to be included more in the curriculum, I think. ***GDP18***

4.2.3.2 Suggestions to improve Undergraduate teaching of dental implants

Dentists suggested to change the curriculum to include diagnosis, case selection, clinical rotations and to maintain dental implants.

'if you had, uh, hands-on models and to practise on. It would be. Or even if you had somebody, a tutor, demonstrating on a model or we could watch. That's probably useful; Some, uh, can have some postings, like other- other department. can have some posting. Uh, can actually put their hands on real patients and try to learn something' ***GDP22***

"yes, I think that's been taught. I think it's fairly basic; not from a practical point of view, no.; there should be an implant clinic; if there is an implant clinic we should be shadowing those clinics actually to see what is involved in implant placement and in implant treatment; should also be for example special implant study module students can select to study that; I think more focus on implant module - can be optional' ***GDP1***

'But I do think a basic understanding of implant systems and the types of favourable factors should be explained to undergraduate level' ***GDP10***

'what may have helped if there were actual clinics where consultants saw patients that had implant then, implant dentistry uses part of their treatment plan and students could be rotated on to that clinic to observe and see what the treatment involves or see what a pickup impression looks like or see what a finished overdenture that's implant in looks like. And actually, seeing all those things might actually make you more prepared for what the outcome could be at the end and what the limitations and risks of the treatment are as well' ***GDP12***

'at the undergraduate level if, if, um, you know, it's a bit more elaborate and not about just about implant designs and implant placements, but also about peri-implantitis and you know those kinds of instruments. If they get to use them actually or actually see them at undergraduate level, then it will be helpful as a GDP, I think, rather than exploring it, once you pass out, as in your practice, then you're exploring the whole new things. They'd rather have like a base in undergraduate level. But otherwise, it become really difficult to not to go back to it, and learn from scratch; See, we were just taught about osseointegration and the implant designs, and you know, how they are threaded and all that, the bio-compatibility aspect. More than that, um, it needs to be more clinically oriented. It was more of, um, or histology things and you know and all that. More than that it needs to be more clinical. And say if you have clinics like perio postings, they need to include some implant demonstrations or maintenance things, how it needs to be done. Because we won't, we've never attended an implant surgery or, um, implant maintenance as such in our undergraduate level; Practically, you know, looking at it and

*seeing cases really helps. Rather than just, you know, studying how the bone is formed and all that'**GDP18***

*'I mean there should be at least there should be 2 or 3 lectures, at least on implants; Whether it is perio lectures or prosthodontics lectures- does not matter. You know how they are assessed; you know, high risk patient or low risk patients, ah, how they are assessed for different types of bone, where the placement, different procedures like grafting, and sinus lifts is and also how to restore them. At least 3 or 4 lectures; People should be able to actually to see an implant being placed; I think it is more important for the dental student to see at least one implant being placed; And the clinical aspect, as in theory as well, also they should be able to see the procedure being done, carried out; You may not have to do it, but it's good to know that; You know you are completing the outcomes for the GDC better and you are more confident saying, yeah I came out of that Uni and know more about implants' **GDP2***

'I think it should be more as well as just lecture based. Because ours was fully lecture based. We should see some more hands on. Because we had no hands-on experience, they should have some, just even on some phantom head, to see the implants or watch them being placed. It was totally lecture based, few lectures, may be a video and some photo slides. But I think it will be more practical may be just have one session to see the implant done or on a phantom head'GDP3

*'I wouldn't really make any changes to the undergraduate curriculum. I think the most important part is, is letting them learn the skills how to communicate with patients, you know develop their manual dexterity and the, you know the team working skills' **GDP7***

'I think it would be nice in Uni, if they are taught you, not more like how implants are placed, but more general practice side of it. How

would you approach it if someone wanted an implant, just generalized rather than specific? Even we did implants, they went into the specifics about healing time and integration, so much of the. Yeah, at that time when you graduate, none of us were going to place implants immediately, they talked about loading, early loading, grafts, explained everything, we understood at that time, but they didn't teach you the 'pre' side of it? You know just in general practice, I think that would be a course, its good, good subject' ***GDP8***

'But I do think a basic understanding of implant systems and the types of favourable factors should be explained to undergraduate level…How much they understood about the long-term possible complications of implants I'm not really sure' ***GDP10***

4.2.3.3 Postgraduate programmes

Dentists mentioned the amount of information that was given to them during the course. They thought that they were not involved in all the clinical stages. For example, importance was given to surgical placements and the immediate post-operative aspects. Critical stages such as treatment planning, occlusal management and post-operative maintenance are taught in a couple of theoretical days. They also talked about the lack of uniformity in the postgraduate curriculum.

'The case selection was done by somebody else (in the courses) ***'GDP19***

'some of them are,, they give the impression that you can go to a course for a week and then do implants. I don't agree with that, Mmm I don't think you can get sufficient experience with that and to be competent, so' ***GDP4***

'there is no uniformity, you know, what is the right badges to have, defining the branches to the level of equivalence. There is nothing out there yet, that says, look here is the list of what is appropriate qualification, you need all the advantages, but who looks after the governance and check whether this course is suitable to have that, and exam ……To become tier 2 The governance has to. And there are so many different ones down there, it's some over-arching whether be the faculty or be another body or the combination of, to assess and to say, yes, ….You should be capable at, and you have got the knowledge and suitable training to start off and and and that is another issue. There is no uniformity to decide which course is good enough' ***GDP6***

*'the majority of courses provided will allow practitioners to become competent at providing a dental implant in clinically low risk situations or situations that, um, are fairly simple… you'll be able to manage after doing these courses, but these courses will not allow you to manage cases that are a bit more complex,… From my understanding these courses don't provide training in that respect and I think if you want to become proficient in dealing with those cases, you may be more appropriate potentially doing M Clin Dent in prosthodontics or periodontics and that might give you a more rounded approach to the whole process… exactly. Very expensive'****GDP12***

4.2.3.4 Suggestions to improve postgraduate courses are,

Dentists have recognised the aspects that need to be given importance. Communication with the patients, team working, case selection, hands on training, how to manage implant complications, implant related medico-legal issues and mentoring were discussed.

'I think the most important part is, is letting them learn the skills how to communicate with patients, you know develop their manual dexterity and the, you know the team working skills. I think that those are the skills most important than anything else' ***GDP7***

'function wise, implants are doing the work, but when it comes to aesthetics, implants,.. to be straight forward, implant might not be just the answer. There are few other surgeries involved in it, and that needs to be told to the patient in the first place. The other option, other is ... The compliance, patient compliance' ***GDP19***

'when you learnt in Uni, I mean anything you learn is the scientific way, not the way you can explain it to someone, in the VT year we learn to explain all of it all of it to the patient without making it sound tough ***GDP8***

''Hands-on is really important, I think… Not just being lectured…it's still hands-on, and if somebody's watching you, well, that's important 'cause then you know where exactly you're going wrong or going right … supervised. Smaller groups… (about mentoring?) That's a really good idea, That would be really useful. Because if you have any questions later on, uh, especially if it was a specific case, 'cause that's probably where you'd get stuck, then you've got somebody you can ask' ***GDP22***

*'Uh, to be honest I want to know more about implant complications and how to manage them. With straightforward things you can do it. But when some complications, you know, happen, how to deal with them. You know, I am more interested in that actually …medico-legal courses, if they are available; I'm not so sure of them yet, but implant related, medico-legal issues and how to handle them and what precautions to take, you know, things like that'****GDP18***

'in terms of shadow through clinics, I think that will be very helpful, because it's a lot of interaction between specialties; but I don't know

how that will necessarily be useful in general practice, because you wouldn't have access to those who are in specialties, as you are close to working with them in the hospital' ***GDP4***

'I would definitely go for some more heavily hands-on base course, even if it meant I left the UK…We have courses around the world, I can go in a week and place sort of 30 implants, I personally think I would gain more out of that…I think the theoretical side, I could sit and read you know, all day myself…I think the crack to where I believe is through education, pacing and- and a- and a heavily mentored approach, I believe. So, I believe, you know, you've got to do the education, you've got to place the implants, but then you have to have regular access to mentoring throughout to help you or help you not make mistakes. That's what I think is the best way forward…No, I don't think one year's enough by any stretch. No way, no- not at all, I don't think…I- I look at it, not actively, if, for instance, when we get ... Read uh, a dental journal, if the course is in there, I'll obviously, I'll look at it, but I'm not actively researching it…appears to be the most expensive' ***GDP15***

'I think, initially when you want to practice implants and if you are on your own it can be quite difficult, one to get you confident, your confidence there, and also if you haven't got the support, where if there was a mentoring, I think that would really a , allow, I think I would probably go down the route, may be placing implants, then getting the qualification to do that,.. To be honest, mentoring is important' ***GDP17***

There were suggestions to make the postgraduate curriculum uniform. One suggestion was to encourage the funding organisations (NHS trusts) to set the curriculum and to recognise dentists who spent their time learning this additional skill by fulfilling the curriculum needs (e.g., Tier 2 accreditation). This will necessitate the course providers to adhere to this curriculum.

'And there is no recognition yet, certainly no recognition by NHS England, or the commission to know what is an acceptable postgraduate course to doing whatever postgraduate to do tier2 level whether it is restorative, periodontology, settings, none for so ever. And the specialists may argue, oh I mean the specialists , my argument tier2 is not that all. It is the competency level. You don't have to be a specialist to make a chrome denture, or a four-unit bridge or to do root canal on a lower 6' ***GDP6***

Another suggestion was to extend the mandatory postgraduate training period. For example, in the UK, the graduation dentists enter a year of foundation training before they become general dental performers.

'well you can more and more I think, certainly with foundation training, I think can be looking at more and more in the future may be 2 year post graduate training. I think, there need to be more competency, how you define someone's competent, in in in in doing something. Yes, it can be educational, but you need the practical, how you can start doing implants. I started doing, a senior colleague who I was in partnership with who had some form of back on. On doing that some form of mentoring, that form of feel safe is so vital, and yeah, you can teach them all with tricks and trades and well, but you physically got to do. Aren't you? And you need to have somebody there to help, to hold your hand since your first case and you learn from your experience, don't you? We all have gone through things like that, yeah have you got your Bio-Oss and bio guide, or equivalent equipment, there handy, you must have. So, I think mentoring is vital, absolutely vital' ***GDP6***

Continued learning is the key and dentists have recognised that more involvement in managing implants gives more experience and confidence.

'And the underlying problem is if you don't do the work, you ain't gonna gain the sufficient experience to actually do the work predictably in the future' ***GDP15***

*'I think the most likely possibility the reason being is that they don't need to coz they don't do them, you know you have to do specialist training to do your implantology'****GDP2***

4.2.4 Divergent cases:

1. While most of the dentists were agreeing with the importance of continued learning, and the mentored training, at least one dentist said

   'Well, that's really ... I've never heard of that (mentoring) GDP 22.
2. one other dentist felt that the hospital infection control is incomparable to general practice; however, this was queried in the further interviews and been reflected as,

   ' I don't know, I worked here and there, in my opinion, infection control, is infection control' GDP16

   'Hmm. I think it is (infection control at practice vs hospital) alright, yeah' GDP18

   'yes, we are meeting the infection control'GDP19

4.3 Focus group & Qualitative Survey

The outcomes of both the questionnaire and interview studies to the GDPs of different experience levels are shown below and the following responses were obtained.

4.3.1 Reasons for not involving in dental implants are historical

Earlier questionnaire and interview studies identified that general dentists are not comfortable managing dental implants. When we presented this observation to the current participants, mixed views emerged from the participants.

4.3.1.1 Hesitations in seeing new patients who had implants elsewhere

Foundation dentists were comfortable seeing patients who had already had an implant restoration or who wished to explore dental implant options.

> *'I've seen a patient, a lady who had implant done 15-20 years back and she just came for a routine check-up... she was quite happy…So I just did my exam. Absolutely fine. She just wanted to know whether she needed any cleaning or if everything was fine in that case. It was all fine'* ***FD4***

> *'you have a duty of care to patients… whether they're private or NHS. But it's in everyone's competency to use ultrasonic or hand scalers to remove any biofilm which is on implants. As long as you don't scratch the implant or damage, the threats should be fairly okay'* ***FD1***

> *'we should…tell the patients how to maintain, cause it's the common problem…the implant failures are generally a common problem. So, GDP should be in a position to tackle a few things. The basic things'* ***FD1***

Foundation dentists were keen to learn and follow the recommendations and guidelines provided by the implant dentists regarding dental implant maintenance.

> *' a discharge letter saying these and probing gaps after placements, I'll put them in my records and then I'll regularly check probing. That's just to make sure no periimplantitis. I'll keep looking for periimplantitis'****FD1***

GDPs encounter implant restored mouths when they see new patients for examination in their routine general practice. While they continue to provide

general care, they were still not comfortable dealing with the implants. In particular, they were relating their experience with patients who had dental implants placed overseas.

> *'I'm not putting any opinion on a patient flying somewhere else done by somebody else. No'* ***GDP2***
>
> *'Yes, of course (I will send to someone else)…That's what I've been trained to do'* ***GDP4***
>
> *'can diagnose a problem…We know it's something wrong. We can maintain. But they can't expect us to fix these issues with implants'* ***GDP 3***
>
> *'if I know the guy who's done the implants. If it's my referral, I know how he works and how is the follow up of him with his patients, then fine. We can work with that specialist as a team. But if the implant was done in Turkey or let's say somewhere else in UK, I do not know this guy himself, for I don't know how they deal with the implant patients… So, I would rather straight say, listen, get your implant checked. I'm not going into this area…Even though I might be able to diagnose it…my statement to the patient is this is beyond my skill. It's not beyond my skill. But for that patient, it is beyond my skill. The patient doesn't know now that the dentist treating has got a MSc or diploma. What he came for a dental practice. Same thing is with non-carious total surface loss. Why don't we do full mouth rehab'* ***GDP2***
>
> *'UK is all about lack of ownership, isn't it? First, there is no win, no fee'* ***GDP1***
>
> 'I am not responsible, and I will tell patients that' **ID4**

Implant dentists who specialised in their placement slightly differed from this view. Except one dentist as mentioned above, all of them were comfortable seeing new patients who also had dental implant restorations.

'I think it's ok as long as you have referred to them, so your relationship is good. If there are problems, you can call the implant dentist. Now if it's another case that's from someone you don't refer, I would send it back for them to deal with. One of the problems I see is some implants dentists will blame the dentists for issues causes I completely disagree with this as it's still the implants dentist's responsibility especially if for their reputation' ***ID1***

'I have no problem about it. Happy to take on the case with the correct consent and patient understanding and remuneration' ***ID2***

'The patient should be made aware that implant requires constant review appointments and maintenance…that in case any problem or failure of implants, the patient should approach the dentist who initially placed the implants to get it sorted.
It should be made clear to the patient the role played by your practice in maintenance of implants **ID5**

4.3.1.2 Reasons for inadequate knowledge or experience

Many of the GDPs considered their training in implant dentistry is not adequate.

'We never had normal training…just as simple as giving just some information we just should learn, self-learn about implants' ***GDP3***

'implant is completely alien to me. I'm not going to be in charge, because we're not being given proper training, you know, in the graduate level with implants. So, to be honest, I know personally speaking and I don't know anything about implants' ***GDP 4***

'When you see multiple crowns in the mouth... We don't actually panic, but you see with implants immediate thing that comes to mind is this is not my problem. Same like a complex crown and bridge done at hospital or in private practice, patient problem and the very first moment you put the drill, you start to own the problem' ***GDP2***

Many reasons including lack of time in their busy schedule and wishing to spend more time with their family were mentioned in the earlier research why dentists did not wish to learn more about dental implant treatment. When this item came up in discussion, foundation dentists and GDPs expressed several different viewpoints on the issue.

> *'you can always make time if you want something in life… We always have time to sit, sit in the evening and watch television or go on Netflix on holidays. So, they're not having time is not as nice an excuse. There's no reason why you can't do this'**FD1***
>
> *'Patient appointments won't be affected by dentists taking time off for learning' **FD3***
>
> *'You take a bit of a financial hits spending that extra time. But in the long run, you can be able to upskill, gain more experience and then make a return on whatever investment you've done'**FD1***
>
> *'If you are very busy, you can always know you've got a fairly stable patient list in terms of the workload…. And if the patients can wait because there's not much active caries, you're not doing root canal treatment, periodontal disease, it's fairly stable, then taking a week off for pay for you to do a course or a couple weeks or a day here, day that it's not really going to affect the patients'**GDP1***
>
> *'Oh, we have few dentists in the group who already have double MScs, so I think this is not a valid say. **GDP 5***

Implant dentists were satisfied that they had done the necessary additional training and implemented the correct protocols for dental implants in their practice. They were happy and willing to learn more. They were also enthusiastic to get more involved.

'I love it. To be able to reconstruct bone and to place an implant. To help change a patient's quality of life when they have had a lose denture for years and now, they can eat steak make me enjoy the job more

*Positive - I like surgery'**ID1***

*'It's here to stay and At times is the only option for the patient as a treatment modality' **ID2***

*'definitely would like to keep updated with different aspects of implants to improve my skills and confidenc'**ID3***

Furthermore, they were in support of the General Dental Council recommendation of acquiring knowledge and working within one's limit.

*'Every dentist should know the capabilities when placing implant and should definitely work within the limits and skills' **ID7***

'To work only in the limits of your acquired skill and knowledge'ID9

*'That's dentists should know to what extent a case is too complex for them to take on for treatment' **ID3***

*'If you've been trained to do complex cases then of course you can do more. I feel training will be the deciding factor for a dentist to work within his limits'**ID1***

*'Not all missing teeth can be restored with implants' **ID2***

*'the General Dentist who are referring for implants should definitely understand the limitations of implants and what can be the complexities on referring to implants. So basic knowledge on these aspects are needed'**ID5***

4.3.2 Preparedness towards dental implant practice

4.3.2.1 Possible reasons why implants are not common in general dental practice

Those dentists who practice dental implants, listed many factors why the provision of dental implant treatment is not commonplace in general practice.

' It's costly to set up. Training is important. Education is important too' ***ID1***

'It has always been in the hands of private practice under highly skilled individuals and never a common treatment option, so infrequently encountered - especially since the NHS has had a dominant role in dentistry in the UK. But since 2016, there has been a huge increase in patient demand and likewise training of dentists and more and more it's commonly going to be encountered in GP. So, for now it's a historical reason' ***ID2***

'The skill of the dentist…practice should have implant armamentarium to deal with implants…Sufficient staff straining is needed for the whole Dental team to deal with implants' ***ID5***

'But if you mean maintenance of implants, it's because dentists feel that it isn't their responsibility if they haven't done the work' ***ID6***

4.3.2.2 Dentists' Frustrations

As an extension of the previous mention, the GDPs are not comfortable dealing with the implant restored mouth. One of the reasons that surfaced was their emotions towards not being appreciated. The appreciation was not only monetary, but also in terms of recognition of hard work from the patients and the general practice system.

As NHS dentists, they are remunerated for maintaining the general dental health of the patients. They do not receive any additional incentive to provide advanced care or to provide care for the patients who had advanced restorative treatments.

> *'And then, you know, two years of foundation training. He will be a better dentist. No, I'm not joking, man. This is not a joke. Just think about it. That's practical and practical dentistry. What do we do? You get you get it, and you focus the energies dentistry dream. Yes. You should just open up hospitals and start treating with big. According to them. They can ask any monkey to do the NHS dentistry. Just look at ourselves in this group. People are more experience. Some people are new graduate. Some people are just. And everybody is same in the eye of NHS. You will be paid the same'* ***GDP2***

GDPs were also annoyed as some patients were not maintaining adequate oral hygiene after their advanced restorative treatments. They recognised this attitude of the patients as ignorance and in terms not appreciating the treating dentist's hard work.

> *'As a we have a duty to inform them. And if we don't inform them, I mean, when it's implant or any other and then they it fails and it comes back, and say my dentist never told about it'* ***GDP3***

> *'I would still inform them; I would not hide it. The problem is this is the problem. Faced with implants done with someone you don't know, or you didn't refer'* ***GDP2***

One GDP spoke about how stressful the general dental practice cane be. He showed an example of a GDP who changed his career due to this stress.

> *' there is a dentist who worked 20,25 years as a principal, who changed to do Amazon Med house admin like simply a man who can get packaging. I*

*read it in an article. He says by the end of the shift," I was having pain in every joint in my body, but the only thing I was relaxed was I was mentally at peace. Because I was not having those anticipations of having nervous patients complains I'm handling". So, this is his wording…and he's actually done it. He said, so people then then you realize that half of the time you stress about what? Have all the time, what are you setting out at most? And what industry? I'm not stressing about class 2 amalgam gone right or wrong. I am stressed about if the patient is happy, have I met her expectation?... for example, gum bleeding – patient says I brush 3 times a day, you show anything like Te-Pes, floss they say I use them …ah you know not actually… but they say. Now it's come to a point where I don't even try to explain to them. OK, OK. It's always been the case or probably in the family. That's it. Because the moment you start telling them, listen, this is your problem. You are not brushing your teeth. They are not gonna open it up. And then suddenly it becomes the dentist's problem. Oh, I was not told bla bla bla. No, no, that's right' **GDP2***

4.3.2.3 What is needed in Practice

General Dental Practitioners expressed their concerns that the practice set up does not support them when providing dental implants to patients

*'We don't have the setup to help us... no auxiliary staff to help us… You don't have this approach... in a normal general practice sector, I don't. So, we can really do it's justified for the dentist to be held responsible in any way for managing, in some cases just a routine dental care. Just to just check them like any other to its there's a problem. You tell them to inform them…But as I said, I think that our level of that what we need to do is just to inform them and maybe a simple scale and what we can do around manage simple, small things, but nothing more than that' **GDP3***

While many of the GDPs were not comfortable dealing with dental implants, the dentists who wanted to be involved said that they did not have the necessary equipment. They also admitted the difficulties in investing in that equipment for occasional patients.

> *'A patient lost a healing screw and needed to do that. He did. It was, I think, the smallest thing I did for someone to implantologist. And you could see, you know, the top part of the implant inside the tissues. But obviously I couldn't help because I didn't have the right equipment. So, I think that's the smallest thing'* ***FD5***

> *'even if you are a specialist, but in your normal dental practice capacity, you need to work within that limit! Do we have the implant kit or even if you want, how are you expected to have the kit for the implant patient is having,… if at all we know what implant company it was…also how can I ask my principal to buy a kit for that one patient '* ***GDP5***

4.3.2.3.1 Rewards- Appropriate remuneration for the service

Monetary compensation for the time and advanced care above the level of dental implant care repeatedly appeared in the discussion. Though the dental care provision comes under health service, GDPs who are in this service provision for a considerable period hinted that this is also a trade for their living.

> *'it depends on a few things; it depends on the support and the level of auxiliary stuff training you have depended on the equipment you have depends on the capitation. Well. How are you getting paid for it?'* ***GDP1***

> *' when you do the NHS, the expectations of the time and everything constraints are there. So, this becomes a specialist sector when you are talking about managing on that. So, this needs to be dealt in totally*

different way. And all these factors, what just as you said, are the ones which dictates how trade, isn't it?' ***GDP5***

'you should be learning as well and not see there's no monetary or no time on those things back again'. ***GDP3***

Implant dentists charged their patients for their service, and they were clear that dental implant provision and maintenance should remain private in the sector. They were worried that the responsibilities from both the clinician and patient might dilute if there is no fee involved.

*'I feel if a patient pays privately for an implant, then they should pay privately for maintenance care'****ID1***

*'Yes, or should be included as an incentive to motivating dentists - but the complexity of responsibility makes it difficult to delegate and/ or share - as it's always a private treatment modality and so funding for management on the NHS proves a difficult argument to defend - however conversely Perio tx works like that '****ID2***

'Implants even though not a specialisation by itself, does require separate training and skills. Especially implant maintenance is the key for the longevity of the implants.

*So, I feel that some amount of remuneration should be given and patients can be charged privately but not under NHS funding'****ID5***

*'Implants in NHS should be left in hospital setting . Those that get implants are often deserving'****ID6***

4.3.2.3.2 Rewards- Possibilities of developing Special Interest Dentists (DWSi)

Previous research indicated the development of DWSi in dental implants. When

this subject was introduced in the discussion, the participants were aware of the availability of DWSi in other fields of dentistry. The idea of developing this status in dental implants was well appreciated. However, they did not know how a dentist can become eligible for this position and how the remuneration works.

> *'I am doing this (general dentistry)for 20 years, now I'm bored… I don't want to open a private practice as I am stuck with management issues…that in-between system (DWSI) is actually very good… but having spent time in MSc, and taking up more risk…will it ever match a private… it can give you a bit of a balance that you want to give a bit more work…And over time, I want to go into private… I don't know how it would look monetary… there's there has to be standardization and there has to be a simple like… It needs to be really a proper board, which everybody is a matter of... people can actually choose to stop training a little bit more specific things and reduce the load to hospital… but I'm increasing my legal, you know'* ***GDP3***
>
> *'how will they determine who is dentist with special interest? Will there be somebody testing it? Because I know many dentists who are not specialists in ortho have the orthodontic contract. Some of them are not even doing very good on this. They just have contracts and they become DWSi just because they continue to hold the contract, I feel they are just lucky'****GDP4***
>
> *'don't know how it works, but in different special cases, … You have to submit the portfolio, etc., and you need to get approved. So, I think it varies between different specialties as well'****GDP5***
>
> *'Shouldn't happen. Implants is a private treatment and should not change. Why don't people get face lifts on the NHS? You can't it's a private thing patients' choice'* ***ID1***
>
> *'I think it should be available much like with other fields e.g., endo and Perio'* ***ID2***

'It is good to have Dentist with Special interest in Dental implants and again it depends on the funding for dentistry under NHS. Secondly the remuneration for DWSi in implants should be decent enough and not a meagre amount' ***ID5***

'No as this would imply implants done out of hospital in NHS setting. I don't favour this as my experience with special interest dentists isn't good. I have heard stories of messed up ortho and surgeries, and I have personal experience too. This endo special interest dentist, I don't wanna mention the name, had few failures with my patients. You know, he charged privately!... one patient the RCT I did on one lateral incisor is still okay after many years and the other side, I had to remove due to the mess he made. Patient had paid him for one endo, he did that again, around six visits… imagine a middle-class earning man spending six hours and then was told he needs apicectomy!
I felt that I should have sent the patient to a proper specialist! After all it's the patient who pays isn't ! he wasn't cheap too (laughs)'. ' ***ID6***

4.3.2.4 What is needed in Implant Education

When the subject of current implant education discussed, dentists in general voiced that the UG curriculum needs revising. They reflected that they spent more time in learning some subjects, which were not useful in their practice.

I think the undergraduate curriculum needs revising…we do a whole module on things like embryology, etc., That doesn't make you a better dentist. ***GDP1***

*they (FDs) can do two years of foundation training if they want to but then reduce one year in their undergraduate. It's no point. Five is what's the point? I don't see a point. We actually waste one year, full, complete one year in the undergraduate... c*arbohydrate cycle… protein cycles hasn't helped me yet ***GDP2***

*I think from what I've heard is that the current dental legal climate, everyone's getting taught theory how to defend yourself from litigation and claims more checkbox exercises rather than actually focusing on practical hands on anticipate some things that would be beneficial.**GDP3***

4.3.2.4.1 Dentists' Opinions on Extending foundation training

Previous questionnaire and in-depth interviews revealed that the dentists favoured extending the foundation training period from one year to two years to include advanced training including dental implants. When this was discussed with the current group, they responded with mixed views. To make it easier to read, the opinions are tabulated as follows,

Table 4.3.1 Opinion from the dentists about extending foundation training period

Advantages	Disadvantages
It's a good idea as your working under some supervision with a free mind? … Definitely at the end of year you will learn something new, and you will have much more experience than you are going to have this year. I think it's a good idea. You will get paid to learn and don't have to spend thousands for courses' ***FD3*** *'a good idea as long as they're not penalized financially as in huge increases in indemnity culture. If they'd get a chest indemnity or*	*'No, I think one year is good enough. But they should have a set number of cases to be completed. I don't think so. They have it at this point of time. I don't know what to do to have a set number of cases to be completed during the day'* ***GDP3*** *'there's no point making training longer or including more parts of training like we are talking on the implant sort of thing. What's the point of making it even more complicated?*

something that would be more beneficial, a bit more of an incentive for people to stay on, maybe get training and actually do research just based on the UK dental practice' ***FD1*** *'Everything matters. So, you can actually approach each and every person. And you have definitely a good staff of specialists who can actually help you a better way than over your left and on outside in the practice. You can tell a good communication, get that idea new. So, it's better to have it in the school you're done or not done than you are. I would say a lot of experience around so you can pick up many points when you are doing some good things'****FD4*** 'Great idea! If you've had very little real-world dentistry at dental school I think 2 years would get them up to speed' **ID1** 'It can be increased to 2 years provided advanced treatments are included. This should be viewed with caution as we need resources and need to make sure sufficient places are available for all FD 's. We have to	*These are routine dentistry. The trainees are struggling to get their confidence up. So that needs to be more standardised, and it should be more like actively checked actually that that it's actually being held properly or not'****GDP5*** *'No, I think one year is good enough. But they should have a set number of cases to be completed. I don't think so. They have it at this point of time. I don't know what to do to have a set number of cases to be completed during the day'****GDP2*** *'if we had to if you had a two-year foundation program whereby one year was done in practice as it is, and then one year in hospital and it loses a two year post, the second year in hospital focused on different speciality. If you spent some time in the department, say, for example, getting specialty implants, you know that that would be beneficial some time oral surgery departments on wisdom, teeth, et cetera, then you wouldn't have a DCT three or so now, but they did do this at least one year anyway'* ***GDP1*** *'I don't think that is essential*

see the future workforce for dentists. Extension of foundation training by 1 more year can affect the skilled workforce for dentists, bearing in mind there are shortage of dentists currently which can make it worse'**ID5**	*There are so many disciplines in dentistry including communication - that require initial experience and training on but,* *A basic understanding of knowing where it will benefit as an option and how and where to refer to as well as general maintenance are more important to learn at that level.* *After which postgrad learning is best pursued for this discipline'* ***ID2*** *'No . Up to dentist if they want to do. Who would do training ? Against this idea'* ***ID6***

Without restructuring the UG curriculum by removing the subjects that are not relevant to general practice and including a strong foundation of dental implants extending foundation training will not be helpful, in the GDPs views.

> *'more than the FD, the foundation is really important. What's being done for the past 3 to 5 years? You mean like the one year of FD is not gonna make a big difference if you don't have a solid foundation. The undergraduate and training, mentoring education, everything is more important that's more relevant to their career than being that one year'* ***GDP 4***
>
> *'as an undergraduate, It's is neither here nor there. You don't have the clinical skills to actually do anything. It's only, I think, I think, beneficial*

after you've done a year of FD where you can actually do some dentistry' ***GDP1***

*'they can do two years of foundation training if they want to and then reduce one year in their undergraduate. It's no point. Five is what's the point? I don't see a point. We actually waste one year, full, complete one year in the undergraduate'****GDP2***

However, foundations dentists' and implant dentists' views were different to that of GDPs'. They indicated that implementing an intensive implant training in the UG curriculum will divert the focus away from teaching basic dentistry

'don't necessarily think students need to learn how to place implants because that's not the mainstream of dentistry, actually. I don't believe general dental practitioners need to learn that…. However, if there is an optional module on implant maintenance, maybe a bit on implant restoration troubleshooting with problems with implants that would be more beneficial for them once they leave foundation year or stop practicing afterwards' ***FD1***

'I think if you heavily start teaching student implants, you kind of start moving away from classic dentistry, prosthetics the bridges and then you kind of start moving away and stop teaching students dentistry' ***FD7***

'Implant is a very vast field to be covered in UG courses. Basic implant skills like case selection and maintenance of implants can be included in the curriculum. I think implant is right to be a post-graduation course' ***ID4***

At the same time, one foundation dentist who qualified overseas, mentioned about his UG experience of students involving in dental implant treatment

'don't think it's impossible because I'm from abroad, from India and we had in our curriculum , the implants in third year. So, I have seen people

placing implants from third year onwards ! So, I think if you make a curriculum with implants, the students will adjust to it, they learn it, they get enthusiastic to learn something new, which I guess they aren't doing it. Then make time for the internship aspect of running properly and they can find the phase, in the curriculum' ***FD2***

4.3.2.4.2 Implant training in PG

Implant trained dentists felt that the formal postgraduate training is important.

'This is a must' ***ID1***

'As all university postgraduate degrees offer varying clinical skill and patient numbers - I find it very hard that every postgraduate degree has any value - conversely the cost involved for a full 'hands on' course are immense - a balance would be good As some form of postgrad education is better than nothing at all' ***ID2***

'Ideal, Implants seem to have a big role in future' ***ID3***

*'Should be necessary to have the higher understand and training in the field'****ID4***

'There should be some benchmark and prerequisite to place dental implant, so I would say a PG degree through university or distance learning can be taken as a foundation on which the dentist can develop further skills for dental implants' ***ID5***

'I think it's a way forward' ***ID***

They also felt private courses also play an important role.

'Not the best as you should have a university backed training. Ok some private courses allow you to place implants in real patients but so do university courses' ***ID1***

'All are well intended generally run by respected highly skilled individuals who set them up when the commercial companies were pushing the

training - even now days where there is a commercial interest, they still have the kudos to being in well-respected leaders in the profession on implants to speak and train in these courses . It's an essential aspect to help bridge the knowledge and training' ***ID2***

'They are very variable in quality and now we have far too many, it has become a business rather than good quality training' ***ID4***

'Private PG courses are fine provided strict guidelines for implant training placed by GDC are religiously followed and the PG courses should be accredited by GDC. I think this is very much essential to prevent mushrooming of lot of private PG courses' ***ID5***

The dentists also mentioned about what do they look out for from postgraduate courses.

'Implants teaching location, but the primary factor was the amount of hands-on teaching, hands on practical experience. It's effectively unlimited number of cases that they provide. So you get lots and lots. And they provide the patients. You do the cases under mentoring. So, I went with xxxxx University' ***GDP1***

' people who teach the reputation, the experience, their backgrounds… you don't know when you get to open days, etc., you know they're trying to sell the cause to you. So it's important to speak to people who've been on the course because then you get the real feedback' ***GDP2***

'And you know who the staff are in terms of who does the teaching, you know, if they're the reputation, etc.,' ***GDP4***

'who is teaching? How many cases you have done? Some trainings are even without patients; just on evidence that they don't do any justice... there should be some standardization of the. I think more or less like the institute MScs , they have a standard curriculum to train in a certain pathway' ***GDP3***

'my inclination for my particular university, which is was because they were providing the patient themselves'. ***GDP7***

'To have placed implants under mentor ship and to know how to seek out the latest evidence and understand the information out there' FD1

'Any PG course should lay strong foundation on the Knowledge and science behind implants, case selection; Skills acquired; Most important is it should provide confidence when placing implants' FD3

'More important than the course is what happens after the course . They need help and support' FD6

4.3.3 Role of hygienist

The role of dental hygienists have been recognised and encouraged

*' they work under your prescription… You can always refer your patient, but ultimately the responsibility is with yourself as a dentist to make appropriate diagnosis'****ID4***

'Very important as they can identify disease early. They can help manage and maintain the disease too' ***ID1***

Positive, should be very possible ***ID2****, can work on private basis ,With basic knowledge or CPD* ***ID3***

'It is good to utilise Hygienist services in dental implant maintenance as they have more time to explain different methods to maintain OH around the implants. A short course on Implant maintenance can help' ***ID5***

CHAPTER 5

DISCUSSION

In the United Kingdom, around 85% of dentistry is provided by high street general dental practices (Gulabivala, 2018). The majority of dental services are provided by either National Health Services (NHS) funded providers or private providers who charge their fees directly from the patients (Hancock et al., 1999). Patients who cannot be treated at general dental practices are referred to either community dental services; or specialist hospital care and teaching institutions. Dental implant provision under the NHS is available only at the secondary care level or above. Patient selection for dental implant management in a hospital situation is at the discretion of local purchaser-provider policies and available funding (Field et al., 2009). General Dental Practitioners working as clinical assistants under the direction of specialists and consultants have limited decision-making in this setup. Those dentists may participate in the treatment plan discussions, but the final decisions are made or approved by the consultant responsible for the patient's care (Butterworth et al., 2001). In

contrast, the General Practitioners working in primary care are more independent. They are relatively free to perform implant provision and management, depending on their interest and experience.

In general practice, the demand for advanced restorative dentistry has increased. The raise in litigation for advanced care including implant treatment (Palmer, 2010)proved that there is some supply to meet the demand. It would be interesting to learn about how dental implant provision is managed at the general dental practice level and its issues. However, available literature has only focussed on getting feedback from those dentists who attended specific courses or those patients who received specific treatment (Gibson and Barclay, 2006). Therefore, the current research focusses on practicing general dentists' views to reflect why they do or do not practice dental implants.

5.1 Questionnaire analysis

To understand the nature of the problem, a questionnaire study was planned to develop a baseline reference on the learning and clinical practice experiences of GDPs in the UK. Conducting a questionnaire study amongst busy dental practitioners does have its challenges. The examples were, the survey had to be short and easy to complete without missing any vital information, and the participants needed to be constantly reminded to complete the survey. Data collection and recording of the number of responses were managed with the help of the management team of a large group of practices in the West Midlands, UK. The respondent group comprised a wide range of age groups from recent graduates to close to retirement dentists. Most of the respondents were under 40 years, graduated after the late '90s and were providing general

dentistry under NHS regulations. In addition, the owners of the dental group confirmed that their contracts with the associates were tailored for individual dentists' needs and experiences. The management did not restrict the manner that the associates perform dentistry if the legislative requirements are followed. Therefore, the responses can be referred to as the voice of the young dentists who will and can influence the future of dentistry in the UK.

The results from this questionnaire provide us with an insight into the current needs and challenges surrounding dental implant education and its provision. The data revealed that many participants did not practice dental implants. They consider that their implant training does not give them the confidence to provide dental implants to their patients. Based on the comparative analyses, we arrived at three broad themes relating to the barriers to implant provision.

1. **Barriers related to the dentists' confidence**. Dentists are worried about the risk of failures (56.3%) and are not willing to undertake procedures with increased risk complications (65.5%). Dentists understand their statutory responsibilities, yet they are not comfortable in dealing with dental implants. They received dental implant training during their UG training (77%), but this was only theoretical and not adequate to implement in practice.
2. **Cost-related barriers to implant provision**. The cost of learning (51.7%), and the cost of treatment (36.8%) are the frequent causes that prevent dentists from providing dental implants. However, the dentists who underwent implant training through post-graduate learning argue that such costs had a major influence on their future ability to provide dental implants. It was mentioned that the defence union membership fee, which is a

statutory requirement, impeded provision. The defence union membership fee is higher for implant practitioners, and it proportionally increased with the amount of involvement in this specialist field. The fee is decided on a formula that includes the number of implants placed or the number of hours of implant related practice and the level of complexity involved. Complex treatment will include procedures such as surgical involvement of the maxillary sinus or the inferior dental nerve.

3. **Maintenance requirements for patients with implant restorations**. Dentists do not have an explicit knowledge about who is responsible for the maintenance of implants and the management of their patients after implant provision. The general dentists think that it is the responsibility of the implant dentist who placed the implants. On the other hand, the dentists who do place implants do not have a transparent recall system. Some of them delegate the maintenance part to the hygienist or therapist. Fifteen percent of the respondents selected dental implant maintenance as one of the barriers to implant provision. However, the chi-square test of the correlation between UG and PG learning with this barrier revealed that the dentists who received some learning (UG or PG) do not consider this factor as a barrier.

The outcomes of the questionnaire study created several disagreements. A few examples are,

1. Dentists claim that their training was not sufficient, but did they have a choice to learn more, or did they miss the available opportunities?
2. The identified barriers are acknowledged by some and not others.

3. Is defined guidance related to dental implant referral and dental implant maintenance available? if available, are they universally agreed?

There were no opportunities with the questionnaire study to explore such matters further. This required a methodology that can allow dentists to express their views with less signposting that occurs with a questionnaire. Therefore, the research question was expanded using a qualitative methodology.

5.2 Qualitative methodology

As this is a relatively new approach to research in this area of implant dentistry, another literature search was conducted to understand if the research questions had already been answered using qualitative methodology. One similar search report published in 2011 revealed the reports till 2006 were meagre (Masood et al., 2011). The current systematic search revealed that the number of dental implant publications using this methodology from 2007 to 2020 was still lower than the total number of publications. The quality of the published articles appeared to be adequate and had improved over the previous decades. Twenty-five articles were selected after a systematic selection process. Most of the articles were related to patient experiences, and four of them explored the dentists' views about their dental implant learning and practice. Our review identified that the quality of available patient information resources could be misleading. Examples of patient testimonies recommending extraction of sound

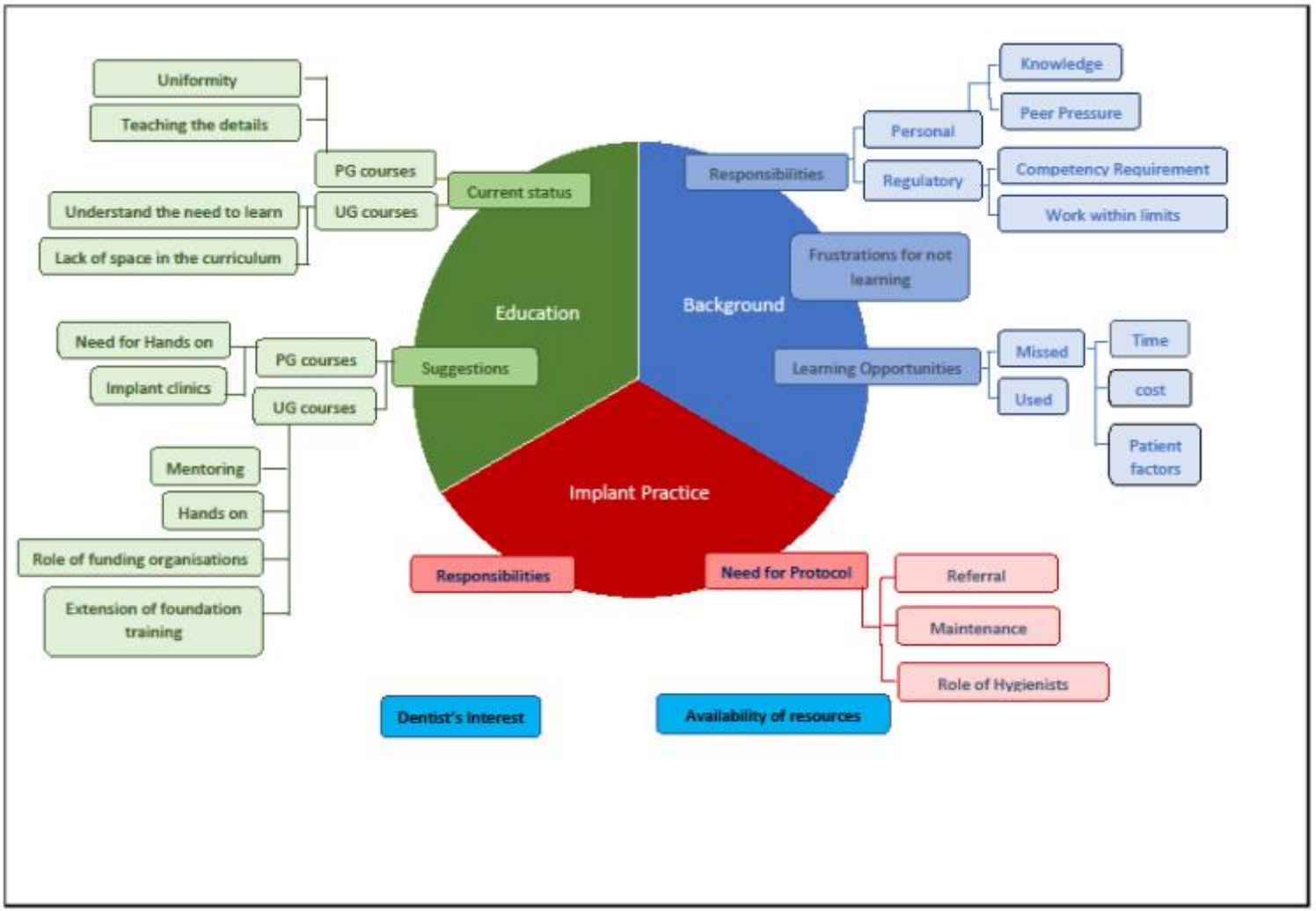
natural teeth to have dental implants placed as they are superior to the natural teeth have been quoted in the articles. The review also highlighted how the dental team could provide better information so that patients can be better informed. In addition, the search revealed that the available guidance for dentists is outdated. One typical example is the success criteria for dental implants. The original criteria based on the survival rate of dental implants was published in 1986 by Albrektsson. The recently available revision of this criteria was published in 2009 (Papaspyridakos et al., 2012). There is no recognised update available after this period. Patient-centred care has become the focus of health care in the modern era (Starfield, 2011). Therefore, any criteria should consider the patient views and satisfaction with the treatment and follow-up care. For example, the NHS has already recognised this with the introduction of PROMs i.e., patient-related outcome measures (Ramani et al., 2020). These may be adapted for their use in dental implants.

Qualitative research helps the researcher to identify hypotheses in the subject of research. These theories are then evaluated for their validity using quantitative methods. Our systematic review revealed that there were not many related theories or hypotheses available for evaluation in dental implant research. Therefore, we decided to continue the research by exploring dentists' views using qualitative methodology. The patient's views were beyond the scope of this research work but are a natural follow-on for future research in the area. The qualitative research involved twenty-two in-depth interviews, two focus groups, and one qualitative survey. In-depth interviews were conducted to explore dentists' views towards dental implant practice and the role of education

in their provision. As a follow up of the interview analysis, the observations were used to develop the topics for discussion for the focus groups and subsequent qualitative survey. The themes developed from this qualitative research are valid as all the participants are practicing in the UK with experience levels that range from recent qualifications to those dentists with over 20 years of clinical experience post-graduation.

The themes that emerged from the qualitative data analysis obtained from the interviews, focus groups, and qualitative survey, converged under two major theories. These were the dentists' interest in the subject and the resources available to them (Fig 5.9). Interestingly, this observation has been a deviation from the previous questionnaire analysis. In the questionnaire study, dentists responded that they did not have the opportunity to learn, so they were not confident in dealing with dental implants. In-depth analysis of the dentists' views reveals that there are opportunities, but it was their decision to use or not to use them.

Fig 5.1 Themes developed from the qualitative analysis



5.2.1 Dentist's Interest in Dental Implants:

Dentists who participated in the qualitative research demonstrated their dental implant-related knowledge by discussing various aspects of implant practice. In contrast, they claimed that they were not confident in dealing with dental implants. Further analysis of the data identified three groups of dentists. The first group was trained in dental implants and actively practicing in the area, the second group was formed by the experienced GDPs (in the middle or towards the end of their career). This later group who do not place or restore dental implants. While showing frustrations for not learning about dental implants, this group clearly demonstrated that within their everyday clinical care, they prioritised to other general practice activities. The third group was formed by GDPs in an earlier stage of their career. This group had learnt to critically analyse their SWOT (strength, weakness, opportunities, and threats), demonstrated critical thinking, and prepared themselves for future needs, including dental implants. For example, they were looking to get experience in basic surgical skills and prosthodontic skills.

Using qualitative methodology to understand the dentist's view is relatively a new approach, and therefore not many theories are available yet. Hence, we decided to use the Theoretical Domains Framework (Atkins et al., 2017) (TDF model) to ensure completeness in the analysis. This framework was developed by behavioural scientists and implementation researchers. TDF was originally devised to identify theories to be used in implementation research i.e., to relate the influence of behaviour to the implementation of recommendations in the health profession. Still, many theories listed in the

framework could be related to our research. The domains of motivation and goals, social influences, and emotions that influenced dentists' beliefs could be included in the existing broad themes.

The goal of learning a subject for a novice learner is to become competent in the subject and to practice the learnt discipline independently (Chambers, 1998). The learner undergoes different learning stages to achieve this competency (Anderson and Sosniak, 1994). Once received the necessary knowledge, the learner understands the subject, then applies the knowledge to become competent in the subject. The teacher or the mentor plays a role in providing and testing knowledge at different stages and providing responses. The learner continuously analyses the process and, depending on how he/she adds value to the learning, will either advance to become proficient in the subject or discontinue at any stage of the learning process. While this is the universal learning process for any new discipline, dental implant learning can have a few additional influences.

The analysis revealed the negative influences

- Lack of clarity from regulatory organisation i.e., General Dental Council
- Risk of Litigation
- No additional remuneration
- Raise in indemnity fee

In the UK, the GDC recommends that dentist have additional training and CPDs, with additional indemnity cover for placing and restoring dental

implants. The GDC recommends that practicing dentists maintain the health of peri-implant tissues (GDC, 2009). Maintenance of the dental implant includes a range of procedures from patient education to active surgical reparative procedures. Patient education involves motivating the patient towards oral hygiene measures, and to be aware of attending regularly. At the surgery, the dentist will examine the tissues and dental implants, which will include any components including the intra and extra oral prosthetic work. Finally, dentists will provide oral prophylaxis that will be complete patient care orientated. This latter procedure may be delegated to a dental therapist/hygienist. Advanced management can involve surgical procedures or explantation or appropriate referral to specialists or implant practitioners (Matthews, 2014). However, the GDC does not provide dentists with any guidance on the detail required for their maintenance programme. Such knowledge must be gained by educational or specialist organisations.

In addition, while there is no additional remuneration for undertaking these procedures under NHS (Field et al., 2009, Steele, 2009), there is a pressure of litigation if there is a shortfall in the clinical care provided to patients who have received dental implant work. Traditionally, patients had limited resources to learn about various dental treatments. Dentistry related information was spread through “word of mouth” from friends and families who had experienced dentistry. Dental patients now have the benefit of rapid access to information through various internet and social media resources. They have the choice to review the available options before attending the dentist. Still, many patients consider the information from their dentists or

dental practice websites valuable (Rehman et al., 2021). Similarly, the opportunities to complain about poor treatment and to arrive at a resolution have also been raised. There is a phenomenal rise in the number of “no win no fee” slogans by law firms (Westgarth, 2019), and correspondingly, this is matched by increasing defence or indemnity costs for dentists. When a complaint from a patient arises, depending on how severe the issue is, the process can result in considerable mental and financial stress to the dentist. This was identified under the TDF domain of social influences.

GDPs reacted to these negative influences by avoiding managing dental implant patients. Senior dentists viewed this as unnecessary pressure, as they can earn more than an adequate salary by practicing traditional general dentistry alone. These dentists said they would prefer the following options ‘it is easy and safe to refer ‘ or ‘ leave the responsibility to the others’.

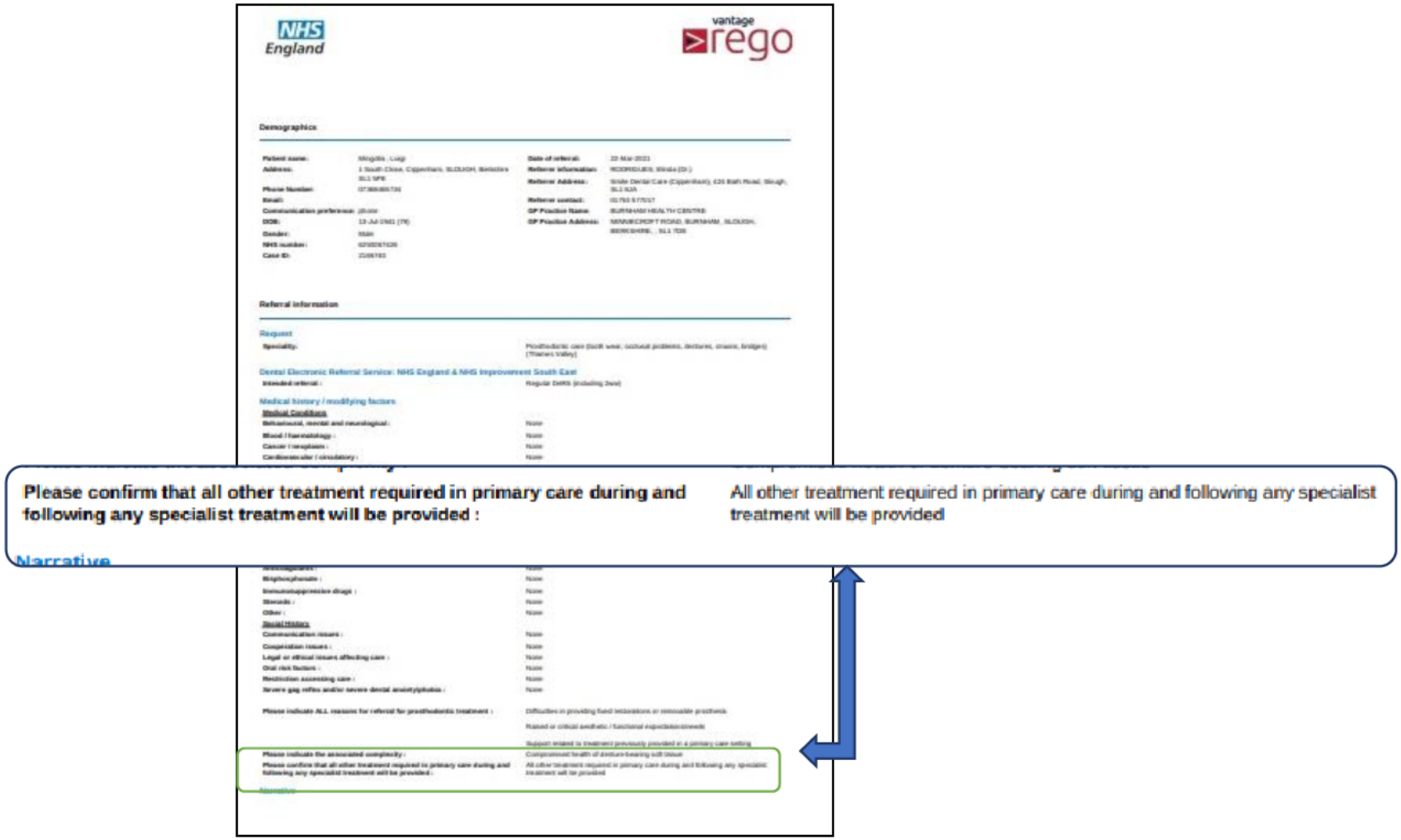
One reason they highlighted was when the patients had implants placed with a different dentist. Due to the diversity of the UK population, it is not uncommon for the GDP to see patients who have had dental implant patients treated by different dentists both from within the UK and from outside the country. As to the latter, there is little information or government recorded figures available about patients whose dental implants were placed overseas. Most GDPs wish to be involved with any clinical care from the beginning and therefore are reluctant to get involved with another dentist’s case. Almost all the non-implant practicing GDPs were against taking over implants that had been placed overseas. Interestingly, the implant trained dentists took such situations as a learning opportunity. Those patients who had dental implants

overseas understand that when problems arise, they do not have many choices available to them other than returning to their original dentist. When the implant dentists offer to help them, these patients appreciate this and agree to the proposed specialist management.

Discussions on remuneration revealed that GDPs did not mind providing continued dental care and maintenance to their patients following advanced restorative procedures such as crown and bridge work that had been completed by a specialist dentist. An example quoted was the management of non-carious tooth surface loss (tooth wear). These patients are managed with multiple direct and indirect restorations. Many of these patients will need to be seen and managed more frequently than patients with dental implants in their mouth. Some of the procedures involved in maintaining the health of these patients require additional postgraduate learning. For example, dentists undergo CPD programmes to understand occlusal concepts and learn how to construct long-term stabilization splints. The participants in the research agreed that GDPs provide maintenance care for the patients who had advanced restorative care with no additional remuneration. In addition, assurance from the referring practitioner that they will continue to provide maintenance care is a mandatory requirement in the NHS secondary care referral forms (Fig 5.2). This may be because the restorative procedures, including occlusion, are taught in the undergraduate training. They are familiar with the procedures and perform these procedures within their competency level. For example, making multiple crowns with changes in occlusion is complex and done by specialists. However, if one of these crowns fails, this can be redone by the general dentist. Similarly,

many restorative procedures are classified based on the complexity levels and defined which of the procedures can be undertaken in primary care. Therefore, earlier introduction of dental implants in the undergraduate training will make this subject familiar to the dentists. It will eliminate the fear of the unknown. Another aspect is the availability of appropriate materials and trained staff, which is discussed later.

Fig 5.2 Dentists agreement for post restorative treatment highlighted



Further analysis under the TDF domain social influence identified that the younger dentists understand the need to be competitive and react to the increasing expectations of patients. They were clear about their aims, set themselves achievable goals with a suitable time framework, and committed to continued learning. There were several examples given during the interviews that demonstrated this organisation and clinical commitment. Foundation dentists are happy to have their training extended to include advanced restorative procedures. The younger practitioners talk about strengthening their general surgical skills through courses before embarking on any dental implant learning. They were confident that with adequate knowledge and training they can safely practice dental implants and can defend themselves during any mishaps. The Dunning-Kruger effect is a cognitive bias wherein unskilled people mistakenly assess their ability to be much higher than is accurate (Kruger and Dunning, 1999). This effect was suspected during the questionnaire study when the younger group sounded confident. However, the qualitative analysis showed that this is not the case. The dentists clearly showed that they are confident within their competency level, and they are comfortable seeking help when needed. The GDC, by doing additional training in implants mandatory requirement, and by recommending dentists to refer for procedures beyond their competency, allows the dentists to stay within their competencies. This can be re-read as the dentists can be confident within their remit and not allowed to be overconfident.

On analysing the views wearing an optimist lens, the practising restrictions in the UK, i.e., GDC regulations and raised indemnity cost, may be seen as

positive influences. Despite being mandatory, adhering to learning requirements and having appropriate defence cover put the dentist in a safer position to practice implant dentistry. A dentist with adequate learning, and defence cover, will have the knowledge to work within his/ her limit. If there are any mishaps, he/she will be supported by the defence union and the GDC.

These factors point us towards the dentists being either interested or not interested in learning and providing dental implants. If a dentist is interested in learning the subject, this learning process will occur through formal University-based training or informal means. The latter appeared to be promising from the focus groups. The implant practitioners favoured informal mentoring, and the foundation dentists showed a positive attitude towards this informal learning method. For example, the referring practitioner is encouraged to attend the referral practice to watch and assist the specialist during the procedures. Implant dentists confirmed that whatever reason provided, not learning about dental implants was a myth and are positive towards providing informal training for other practitioners. As a part of growing their referral base, implant dentists will even offer the facility for the referring practitioners to come and watch the procedures. The implant practitioner provides learning opportunities for the dentists to perform some of the procedures under their supervision. Surprisingly, very few of these dentists used the opportunity to learn and enhance both their knowledge and practice. However, others just missed the opportunity knowingly or unknowingly and remained quiet on the subject. This has contradicted our

original conclusion of cost as a factor. The factor influencing the learning here is **interest in the subject**. Only with adequate interest, can one seek knowledge and gain confidence to proceed to understand and apply the knowledge acquired.

This area requires further investigation and may be explored by the various teaching institutions; and regulatory and defence organisations improving their quality standings. Opportunities and rewards can be set to encourage dentists to increase their knowledge base on implants. If adequate and clear guidelines and learning requirements are provided, GDPs will consider this their opportunity to learn. Their motivation will be increased with such additional rewards. An ideal reward for the enthusiastic dentist is recognition for their effort. This recognition can be from a patient with realistic expectations and from the regulators. Dentists who receive additional training in the specialist subjects such as orthodontics (not the training approved for specialist entry) are given a Dentist with special interest (DWSi) status. With this accreditation, they can provide primary care level orthodontic treatment within NHS and receive additional remuneration. This can be implemented in the field of dental implants as well.

5.2.2 Available Resources

5.2.2.1 **Knowledge resources**

Competency requirements for practicing dentists are set by the regulatory organisations such as the General Dental Council in the UK, and its European and American counterparts FEDCAR (Federation of European Dental

Competent Authorities and Regulator) and ADA (American Dental Association). Even though Universities have a quality control framework to set teaching standards, they design their teaching curriculum to satisfy the competency requirements set by regulatory bodies. The GDC's recommendation for the practicing dentist is only to "Recognise and explain to patients the range of implant treatment options, their impact, outcomes, limitations and risks" "Describe the risks related to dental implant therapy and manage the health of peri-implant tissues" (UK). This is the recommended knowledge that a dentist should be competent to manage dental implant patients in general dental practice. However, McGill and York consensus confirmed that implant supported overdentures to be the minimum standard for managing lower edentulous ridge. This treatment, or any simple implant treatment will include planning and surgical placement of dental implants and construction of functional prostheses on the implants. GDPs in the UK are not expected to perform such dentistry without being appropriately trained. The GDC's scope of practice (GDC, 2009) document lists this knowledge as additional skills, which need additional training based on the FGDP's training standards (Martin, 2006). When such organisations define such standards, then they often become the minimum expectation from the regulatory organisations. This opens the dentist to litigation if those standards are not followed. Therefore, to practice dental implants in general dental practice, the defined standards are the required knowledge.

The dentists in their undergraduate training receive only the **recommended knowledge,** which the GDC believes to be adequate, and not the **required**

knowledge to match the raised minimum standards. Table 5.1 lists the current requirements from the legislative organisations and the recommended learning in relation to dental implants. During the qualitative research interviews, the dentists demonstrated a clear understanding of their responsibilities. They are aware of the regulatory requirements, which recommend that they operate within their competency level. The requirements also advise that dentists refer patients for any treatment procedures that they are not within their skill set. The GDPs keep refreshing or updating their general practice requirements through continued learning after their university training. They attend CPD courses and supplement their learning through journals, audits, and peer reviews. Therefore, there is a limitation in knowledge provision for implant-related management in the undergraduate training; but it is mandatory that all dentists must continue to learn after graduation. Such lifelong learning allows dentists to be competent concerning the recommended contemporary knowledge.

Table 5.1 : Recommended knowledge Vs Required knowledge

Recommended Knowledge	**Required knowledge**
General Dental Council in the UK and the Association of Dental Education Europe are the bodies that provide the training recommendations for practicing dentists in the UK and other European countries respectively. GDC recommends that dentists should "Recognise and explain to patients the range of implant treatment options, their impact, outcomes, limitations, and risks" "Describe the risks related to dental implant therapy and manage the health of peri-implant tissues" (GDC 2015) GDC also lists Surgical placement and restoration of dental implants as enhanced skills and recommends additional learning conforming to FGDP training standards document (	Mc Gill and York consensus statements confirm that the implant-supported overdentures should be the minimum standard for managing lower edentulous ridge Training standards document classified implant management as straightforward and complex. Similarly, the International Team for Implantology (ITI) categorised implant cases as Simple, Advanced, and Complex cases in their published SAC classification for implant dentistry document. A beginner should be competent in managing straightforward or simple cases. The classifications were based on the factors such as aesthetic risks, medical risks, anatomic risks, bone loss, periodontal maintenance, and related risks. An overall review identified posterior edentulous spaces with adequate bone levels, and lower completely edentulous arch rehabilitated with two

recently changed to College of General Dentistry) (GDC 2015). Students must provide patient care only when they have demonstrated adequate knowledge and skills. For clinical procedures, the student should be assessed as competent in the relevant skills at the levels required in the pre-clinical environments prior to treating patients. (GDC 2015) ADEE published extended requirements that the graduating dentist should have adequate knowledge in diagnosis, planning, surgical and prosthodontic techniques in managing dental implants, and limited clinical experience in performing those procedures.(Sanz & Saphira, 2009)	anterior implants and locator abutments retained complete dentures are classified as simple cases. Therefore, the required knowledge for a beginner should be that they are competent in the assessment of edentulous space for risks, assessing patients' medical history, planning, and managing to complete implant treatment, and maintain dental implants and restorations. They should be able to identify and manage (Place, restore and maintain implants) simple cases and refer complex/ advanced cases.
Current teaching: Supervisors must be appropriately qualified and trained. This should include training in equality and diversity legislation relevant to the role. Clinical supervisors must have	Recommended teaching: Recent guidelines on mentored training and creating a portfolio of evidence have also been published listing out the requirements of a mentor, mentor-mentee agreement,

appropriate general or specialist registration with a UK regulatory body. (GDC, 2015) University teaching mostly credit-based modular delivery, basic science subjects in the first two years moving to clinical practice in the subsequent years. Restorative dentistry is mentioned in clinical practice, and students chosen advanced specialty training. This is assumed to include fixed and removable prosthodontics, endodontics, periodontics, and advanced general restorative dentistry.	number of cases to be completed and assessments to be included in the portfolio (CG Dent, 2022) Integration of implant dentistry at the earliest opportunity such as implant related anatomy, bone physiology, occlusion in the preclinical teaching and extending the dental implant applied teaching to the clinical teaching in prosthodontics, surgical and periodontal training

5.2.1.**2 Material resources**

Whilst the initial in-depth interviews highlighted the non-availability of materials within general practice, further analysis of the focus group and the literature review identified that this scarcity has been extended to the non-availability of trained supporting people and motivated patients. The participants were aware of the need for special equipment to provide dental implant treatment and maintenance. The foundation dentists described the situations when they had to refer the patients for simple remedial treatment. An example that was given was when the dentist did not have a suitable implant screwdriver available to tighten the abutment. The non-availability of plastic scalers for the regular continued maintenance of peri-implant tissues was raised by several dentists. Interestingly a few of them were aware of the debate on metal vs, plastic scalers on implants and highlighted that there is no official guidance on this. Such instruments are not readily available to general dentists, either because they are expensive or because of the variations in their designs. These examples highlight the potential difficulties of maintaining implants from the viewpoint of dentists. Such specialised equipment is not required for other advanced restorative or prosthodontic care mentioned earlier, i.e., to maintain or provide remedial treatment for multiple crowns.

On further discussion, the dentists highlighted the importance of a supporting clinical team that would allow for a seamless running of the practice. Examples were given where dentists became stressed due to the non-availability of specialist materials or equipment. This stress was aggravated

further when the nurse did not understand what the dentist was requesting. Interestingly the training of staff is also the responsibility of the dentist. If the dentist wished to continue with the care, they would have had to liaise with the practice management to upgrade the skill set of the dental team. Many dentists reflected that the easier option was to refer the patient to a specialist when considering such factors.

Experienced dentists in the focus group mentioned a lack of suitable patients as non-available resources. GDPs were concerned that they come across many patients who have been provided with dental implants without being adequately informed about the procedures that had taken place. Dentists have examined dental implants placed in mouths where there is active periodontitis. Such patients were poorly motivated. Other patients were not aware that their dental implant required to repair or maintenance. This resulted in tension as any work required an additional investment from the dentist. One of the recurring themes is that patients had been misinformed that dental implants are the same as natural teeth implying that no extra effort was required to look after such complex restorations.

5.2.3 The Subject areas that need further exploration

5.2.3.1 Lack of dental implant related standards and guidance

Restorative dental treatments demand constant monitoring by the dentist and life-long maintenance by the patient. Regular dental visits and home care oral hygiene methods are required to maintain the restored dentition and the hard and soft tissues around them. Research work has improved our understanding

of dental implant materials and tissue responses. The main conclusions are that the diseases related to dental implants are the same as those that involve natural teeth. New terminologies have been derived to describe these conditions. Gingivitis around the dental implants has become peri-implant mucositis, and periodontitis has become peri-implantitis. The management strategy for dental implants and teeth is similar. When this aspect was explored in the interviews, many dentists were happy to monitor the implants and wanted to refer only when the problem was beyond their competency.

However, there was a consensus that no guidelines were available. Dentists participated in the research confirmed that they do follow the recommendations from implant dentists; however, these are explicitly provided for those referred cases and cannot be generalised. Lack of standard guidance creates a basic fear for the dentists. An example situation can be taken from a local hospital referral guideline for periodontal patients. The hospital advises the dentist to perform hygiene procedures and observe patient compliance for at least a year. This includes two courses of non-surgical periodontal management. The referral can be made for those patients who are compliant with the process and still suffering from the disease. The remaining patients will either have their problem resolved with local measures or remain non-compliant patients for whom advanced management will not be suitable. In this situation, the dentists are clear with the guidelines, and they are confident as this comes from the hospital specialist department and conforms to the standards published by the British Society of Periodontists. Similarly, there are orthodontic and restorative guidelines available. However, this is not the case with dental implants. Dentists

participated in the research confirmed that they could not find any guidelines to help them make decision on dental implant management. They were wondering to what level they can maintain or monitor a dental implant and at what clinical stage they should consider referral. They were also worried that they will be penalised if they did not refer appropriately. Therefore, they felt that they will be in a better place if they referred the patient at the earliest opportunity.

5.2.3.2 Role of dental hygienists and therapists

The role of dental hygienists and therapists as part of the dental clinical team is recognised by the GDC, and dental implant maintenance is included within their scope of practice. The participants of this research were qualified dentists, and they fully understood the role of hygienists or therapists encouraging them to become involved with dental implant maintenance. At the same time, the dentists have agreed that the hygienists do not have any role in the current NHS primary care contract set up.

5.2.3.3 **Suggestions to improve the current curriculum**

Observations from the questionnaire study raised an important debate; the current level of dental implant undergraduate training does not instil confidence in general dentists. Further exploration revealed that the undergraduate training offers only minimal training due to a lack of space in the curriculum and confusion about when and where this training should be included. Alternatively, post-graduate courses focus on surgical placement and the restoration of the implants. Postgraduate clinical study days are spent on the techniques involved, and the other important aspects of treatment planning, maintenance are completed in one or two lectures or study days. They do not include soft skills

such as patient management and communication. This may be due to the teaching structure in the UK, where these skills are already included in the UG curriculum. Dental implant management involves additional procedures compared to regular general dentistry. These need to be communicated clearly to the patients. Therefore, it is still important to incorporate these skills in detail. There appears to be pressure for the course providers to ensure that the course is valued for the fee charged. This pressure is confirmed from the qualitative survey when one experienced implant dentist recommended the postgraduate course providers to allow at least 100 implants to be placed by the student and to include major bone augmentations within the course period. While this is an exaggerated expectation, many short courses are available, allowing dentists to place several dental implants. This has resulted in the post-graduate courses not being uniform in their curriculum.

Dentists are interested in enhancing their understanding of dental implantology. They are keen to learn the overall management of the patient journey starting from pre-treatment aspects such as diagnosis, treatment planning, diagnostic aids, surgical and restorative aspects, and the post-treatment aspects such as maintenance. The focus group discussion revolved around the subject areas for dental implant training and the teaching methodology. It would have been better if the research involved the programme leads, deans or curriculum lead. This was not possible due to restrictions due to the time limit, and the COVID 19 crisis. Involving academics will be the future direction of this research if further funding becomes available.

1. Lack of space in the current UG curriculum is apparent. The focus group

and survey analysis surfaced the arguments about what year the dental implant teaching should be included, and who should be teaching dental implants. The suggestion provided was to incorporate dental implant teaching from the first year onwards. Dental implant training involves all the basic sciences and clinical sciences. This ranges from the basic understanding of the anatomy and physiology of bone to advanced clinical knowledge of occlusion. Basic science is needed to understand the scientific basis of dentistry and provide research background to the subject. If these can be included in the conventional basic sciences, students will relate dental implants to general dentistry rather than an independent subject.

2. Encouraging hands-on involvement in clinics. An earlier introduction of the subject will allow the students to explore further. Opportunities can be made available for those students who show interest in this subject, such as simply shadowing their teachers to attending specialist clinics (continued mentoring). The possibilities have been evidenced from the views of the European qualified dentists involved in this the research who have shadowed their specialist teachers in their surgeries.
3. Soft skills such as communicating with patients and other dental team members are included in the UG curriculum. However, terminologies related to dental implant treatment can be included in this training.
4. Earlier introduction of the dental implant teaching will require the involvement of all the critical faculties. Involvement of the correct specialty at the correct stage of learning will eliminate the current

confusion of which discipline should own the subject of dental implants. The dental students trained from this style will develop as dentists with a better understanding of different aspects of dental implant treatment. They will have the basic knowledge and training to simple implant procedures and know which specialist to refer a patient for specific implant problems. For example, a patient with peri-implant problems will be referred to a periodontist, and one with a fractured abutment / screw will be referred to a prosthodontist. When this attitude of wholistic involvement becomes a norm, patients will also understand dental implant management well. This will make dental implants a friendly area in dentistry for both the GDPs and the patients.

5. Another debate is whether to extend the length of foundation training. Events have taken over with the problems of Covid19 delaying or reducing the time for both UG and PG training (Hassan and Amer, 2021, Wanis et al., 2021). There are now general calls for a more extended curriculum and more clinical exposure. Younger dentists showed a positive attitude to the concept of extended training. The foundation dentist can spend specified periods on their specialty of interest, still under supervision. This will be a higher-level decision based on logistics, funding, approval from higher organisations such as the GDC and the Department of Health.

5.2.3.4 Creating Opportunities for the learners

The overall voiced opinion of the dentists made it clear that their expectations are more than just remuneration. They are looking for better opportunities to

work or learn and better rewards for their efforts. The opportunities dentists have considered valuable are,

- Uniform postgraduate course curriculum.

  If viewed superficially, one may wonder why this must be important, as selecting a course is entirely a personal choice. However, in real life, it does make a difference. The course content differs from simple online teaching to intensive clinical courses. For example, some of the course providers encourage the participants to bring their patients. This has practical difficulties, as dental implant treatment needs multiple patient visits. A motivated dentist who has patients to be treated may choose not to join this course only because he/ she lives farther away from the training place. If the course structure is regulated to be uniform across the country, the GDPs can make their choices based on their convenience.

- Reasonable learning outcomes.

  While competency-based education is accepted widely; it is reductive, i.e., only those areas that can be assessed will be assessed. This creates a discrepancy in the assessment set by different educators. Some providers assess the students by an end of course MCQ (Multiple Choice Question) examination, some by a work-based portfolio of evidence and some by an academic dissertation. GDPs raised concerns about the authenticity of these methods. Some wondered if MCQ examination is adequate, and some others wondered about the role of a research dissertation for a clinical learning course. If reasonable learning

outcomes are defined and made uniform across all the course providers, the GDPs will make an informed decision.

- Recognising the dentists for their efforts

  This was one major area discussed by experienced dentists. Dentists make a decent earning while working within their comfort zone. In addition, the regulations limit them to operate within their competency level and to refer for extended services outside their skill set. Only a few of the motivated dentists invest their time and money in learning dental implant skills. If the system wishes to encourage dentists to manage dental implants, the compensation for the dentists' effort should be attractive. If there is a time-tested career pathway, this will further motivate younger dentists. One career pathway discussed was to create adequately remunerated DWSi posts. This appeared to be feasible as these opportunities already exist in other fields of dentistry such as endodontics, orthodontics, and periodontics. Another way to recognise their effort is by creating a reasonably relaxed environment to practice. One aspect which can make practice more enjoyable is having a patient with realistic expectations. Patient education programmes need to be developed to realign patient attitudes to what is realistically possible. This will hopefully, in turn, reduce indemnity costs and the fear of litigation.

5.3 **Limitations of the research**

The limitations of this research are

1. Small sample size

   While the research attempted to be inclusive of a wider range of experience and geographical backgrounds, the sample size may be seen as small to draw rightful conclusions.

2. This research was limited to dentists' views. Views of the people on the other ends, such as academics who design/ deliver the teaching, and patients who are on the receiving end of the outcomes will need to be obtained to relate to the dentists' views.

3. Qualitative methodology

   Though qualitative methodology is a recognised research methodology, the areas of sample selection, not including statistics can be seen as a drawback by the quantitative researchers. While the research involved most of the validating measures e.g., triangulated independent analysis of data, participant verification, etc., it also enjoyed the liberty provided by this methodology, e.g., convenience sample using information saturation, combined analysis of data received by different methods.

Chapter 6

Conclusion

Patient safety and *patient- centred care* have become the ethos of modern dentistry (Cowpe etal 2010). Dentists are trained and monitored to ensure that they provide safe dentistry within their competency. While dental implant provision is clearly classified as an additional skill that requires additional learning, dental implant management remains a grey area within general dental practice. This was reflected in the conclusion of our first questionnaire analysis ‘ undergraduate training in the UK did not instil confidence in GDPs in managing dental implant provision’. While this is a generalised statement, the questionnaire responses opened up many new views from the dentists.

A background literature search also found that there were not many reports exploring dentists’ views dental implant management. The current research also proved that qualitative methods may be a valid tool in dental research. More research should be undertaken using such methodology.

Dentists confirm that they continue to manage dental implant patients regardless of their views regarding their working regulatory requirements. Dentists also expressed what would make dental implant treatment feasible in general practice. Senior dentists shared their experiences, and younger dentists shared their views from current learning. On analysis of their views from the interviews, focus groups and qualitative survey, the following conclusions could be made.

- There are perceived gaps in the status of the current learning, and available learning resources specific to dental implant management in general dental practice.

- There are perceived deficiencies in the general practice set up such as lack of specific instruments and lack of trained supporting staff
- While on a surface level GDC regulations and indemnity appear to be the barriers to the provision of dental implant management, on a deeper level they are the facilitators for the dentists to practice safely within their skill sets, whether it is basic dentistry or enhanced with additional learning.

Some suggestions to overcome these concerns are

- Dental implant teaching can be made uniform across the country by defining guidelines, regulating course structures for UG and PG, and auxiliary dental training.
- Dental implants can be introduced in the earlier stages of the UG curriculum. This will change attitudes and ensure that dentists consider dental implants in the same manner as any other primary care subject.
- If the graduating dentist is familiar with the dental implant procedures, he/ she will naturally know the instruments and materials needed. Their attitude will be different from that of the current dentists. In contrast to the current thinking that these materials are not needed in general practice, they will expect to have these instruments in their practice armamentarium. This will become the norm in the future when every graduating dentist thinks in the same way.
- When dental implant management becomes a common treatment in general practice, dentists will self- appraise their learning needs and start to update as needed. GDC's current CPD requirements recommend

dentists to update on their area of interest. In addition, if the additional /enhanced learning in dental implants is recognised by the commissioning standards, dentist may be remunerated as well, if they provide dental implant management under NHS.

- Expanding dental needs have been recognised, and the initiatives by HEE are evident. The advancing dental care reports with suggestions of flexible learning opportunities, improving support for interested dentists to enhance skills have been produced. In future these may be extended to dental implant learning. However, those trainings are aimed at DCTs, specialist trainees who are trained to work under NHS. This will create the dilemma as to what level of dental implant management be supported to be provided under NHS. For an example, primary care orthodontics is provided under Tier 2 services by dentists with enhanced skills. However, cosmetic short-term orthodontics have been developed for GDPs, but cannot be provided under NHS. Similar categorisations will need to be made by the stakeholders, so that clear definition of what type of dental implant management will be done at Tier 2 services, which will direct the dentists to develop skills accordingly

Chapter 7

Further Work

While the research evidenced the current challenges in dental implant learning and practice specific to general dental practice, there are multiple theories that evolved and are yet to be identified. Further qualitative research on a larger scale will lead to more evidence of current practice. The main areas which need to be developed are

1. To develop guidelines for general dentists related to dental implant management. The Restorative Dentistry Index of Clinical needs is one example that defines the complexity levels and guides the dentists on what they can and cannot manage. A similar complexity assessment tool related to dental implants should be developed and evaluated for its applicability in clinical implant dentistry. This will inform the dentist to perform lesser complex work before referring the patient for advanced management.
2. To define the role and responsibilities of clinicians in all aspects of dental implant care (dentist, DWSi, dental hygienists and therapists), and to explore the opportunities to reward the clinicians with additional training.
3. Dental implant referral-related guidelines on identifying suitable patients, what diagnostic aids are required, and how the referring dentists' time and cost are related to diagnostics will be compensated.
4. To explore the ways to improve patient awareness towards dental implants and to instil realistic expectations on what can be achieved
5. Fully integrating dental implants into the existing dental undergraduate curriculum, in partnership with regulatory organisations. This will require a national discussion about realigning dental courses.

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APPENDICIES

APPENDIX 1

ETHICAL APPROVAL

9/27/21, 7:13 PM [redacted]

RE: ERN_15-0721 Current status of Dental Implant Education and Future Challenges

Gemma Williams (Research Support Group)

Wed 26/08/2015 12:46

To: Damien Walmsley [redacted]

Cc: Sivakumar Jayachandran [redacted]; Kirsty Hill [redacted]

Dear Professor Walmsley & Dr Hill

Re: "Current state of dental implant education and future challenges"
Application for Ethical Review ERN_15-0721
Thank you for your application for ethical review for the above project, which was reviewed by the Science, Technology, Engineering and Mathematics Ethical Review Committee.

On behalf of the Committee, I can confirm the conditions of approval for the study have now been met and this study now has full ethical approval.

I would like to remind you that any substantive changes to the nature of the study as described in the Application for Ethical Review, and/or any adverse events occurring during the study should be promptly bought to the Committee's attention by the Principal Investigator and may necessitate further ethical review.

Please also ensure that the relevant requirements within the University's Code of Practice for Research and the information and guidance provided on the University's ethics webpages (available at https://intranet.birmingham.ac.uk/finance/accounting/Research-Support-Group/Research-Ethics/Links-and-Resources.aspx) are adhered to and referred to in any future applications for ethical review. It is now a requirement on the revised application form (https://intranet.birmingham.ac.uk/finance/accounting/Research-Support-Group/Research-Ethics/Ethical-Review-Forms.aspx) to confirm that this guidance has been consulted and is understood, and that it has been taken into account when completing your application for ethical review.

Please be aware that whilst Health and Safety (H&S) issues may be considered during the ethical review process, you are still required to follow the University's guidance on H&S and to ensure that H&S risk assessments have been carried out as appropriate. For further information about this, please contact your School H&S representative or the University's H&S Unit at healthandsafety@contacts.bham.ac.uk.

If you require a hard copy of this correspondence, please let me know.
Thank you,

Gemma Williams
Deputy Research Ethics Officer
Research Support Group
The Dome (C Block)
Aston Webb Building
Edgbaston, Birmingham
B15 2TT
Tel: 0121 414 8101
Email: [redacted]
Web: www.birmingham.ac.uk/researchsupportgroup

Remember to submit a new Self-Assessment Form for each project!

Please click Ethical Review Process for further details regarding the University's Ethical Review process, or email ethics-queries@contacts.bham.ac.uk with any queries

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From: Damien Walmsley
Sent: 21 August 2015 11:07
To: Gemma Williams (Research Support Group)
Cc: Sivakumar Jayachandran; Kirsty Hill
Subject: RE: ERN_15-0721 Current status of Dental Implant Education and Future Challenges

Dear Gemma

I apologise for the delay and we have put in a 4 week opt out clause. Please find the amended information sheet

with best wishes

Damien

From: Gemma Williams (Research Support Group)
Sent: 27 July 2015 15:42
To: Damien Walmsley
Cc: Sivakumar Jayachandran; Kirsty Hill
Subject: RE: ERN_15-0721 Current status of Dental Implant Education and Future Challenges

Thank you, Damien. Before I send this to the Chair for final approval, there's just one small amendment that needs to be made to the information sheet.

The Committee consider it to be best practice to provide a specific deadline/timescale for when withdrawal from the study can be up to, as opposed to stating it can be 'at any time', in order to avoid receiving requests once the data has been analysed or published (when it would no longer be possible to remove their data). Please could you amend the information sheet accordingly?

Thank you for your help,
Gemma

From: Damien Walmsley
Sent: 27 July 2015 15:04
To: Gemma Williams (Research Support Group)
Cc: Sivakumar Jayachandran; Kirsty Hill
Subject: RE: ERN_15-0721 Current status of Dental Implant Education and Future Challenges

Dear Gemma

Thank you for your email and in response to your questions we have provided the information as follows:-

- **Please clarify whether the dentists to be included in the study are NHS dentists, or private dentists (or both) and if any relevant Research & Development approvals have been obtained/sponsorship has been obtained (if NHS staff to be included)**

The dentists that are being interviewed are self-employed dentists who take up a UDA contract when working for the NHS or are under their own private contract. As they are self-employed, no R&D approvals or sponsorship is required.

- **Please confirm whether the students to be included in the study are University of Birmingham Medical & Dental School students, and if any relevant permissions to access the students are required**

Yes we will be informing the Head of the School of Dentistry and the Head of Education at the School

- **Please ensure that participants are provided with a specific deadline/timescale for when withdrawal from the study can be up to, and amend the participant documentation accordingly**

We have stated in the document that was sent in an earlier email the following:-

Do I have to take part in this research?
You are under no obligation to take part in this research. You can withdraw at any time without giving a reason and there will be no adverse consequences if you do so.

- **Please clarify where interviews and focus groups will take place, and ensure that participants are informed accordingly.**

Interviews will take place in the practices of the dentists. Focus groups will take place either at the group dental practice or in the dental school in the case of the students. The information sheet has been amended.

- **Please include reference to 'group discussions', as well as interviews, in the Participant Information Sheet so it is clear that the information covers both study aspects**

The information sheet has been amended

- **Please be aware of the data storage and retention requirements in the University's new Code of Practice for Research (available at http://www.as.bham.ac.uk/legislation/docs/COP_Research.pdf). In particular, please note that following completion of the research, data should normally be preserved and accessible for ten years.**

This is made clear in the information sheet

I include the new information sheet for your reference and look forward to your reply

With kind regards

Professor Damien Walmsley

From: Gemma Williams (Research Support Group)
Sent: 23 July 2015 16:29
To: Damien Walmsley; Kirsty Hill
Subject: RE: ERN_15-0721 Current status of Dental Implant Education and Future Challenges

Dear Professor Walmsley & Dr Hill

Re: "Current state of dental implant education and future challenges"
Application for Ethical Review ERN_15-0721

Thank you for your application for ethical review for the above project, which has now been reviewed by the Science, Technology, Engineering and Mathematics Ethical Review Committee.

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for your project, subject to the Committee's satisfaction with your response to the following conditions:

- **Please clarify whether the dentists to be included in the study are NHS dentists, or private dentists (or both) and if any relevant Research & Development approvals have been obtained/sponsorship has been obtained (if NHS staff to be included)**
- **Please confirm whether the students to be included in the study are University of Birmingham Medical & Dental School students, and if any relevant permissions to access the students are required**
- **Please ensure that participants are provided with a specific deadline/timescale for when withdrawal from the study can be up to, and amend the participant documentation accordingly**
- **Please clarify where interviews and focus groups will take place, and ensure that participants are informed accordingly.**
- **Please include reference to 'group discussions', as well as interviews, in the Participant Information Sheet so it is clear that the information covers both study aspects**
- **Please be aware of the data storage and retention requirements in the University's new Code of Practice for Research (available at http://www.as.bham.ac.uk/legislation/docs/COP_Research.pdf). In particular, please note that following completion of the research, data should normally be preserved and accessible for ten years.**

I would be grateful if you could confirm by email to g.e.williams@bham.ac.uk that these conditions will be met, and also provide the requested information and documentation prior to the commencement of the study.

I would like to remind you that any substantive changes to the nature of the study as described in the Application for Ethical Review, and/or any adverse events occurring during the study should be promptly bought to the Committee's attention by the Principal Investigator and may necessitate further ethical review.

Please also ensure that the relevant requirements within the University's Code of Practice for Research and the information and guidance provided on the University's ethics webpages(available at https://intranet.birmingham.ac.uk/finance/accounting/Research-Support-Group/Research-Ethics/Links-and-Resources.aspx) are adhered to and referred to in any future applications for ethical review. It is now a requirement on the revised application form (https://intranet.birmingham.ac.uk/finance/accounting/Research-Support-Group/Research-Ethics/Ethical-Review-Forms.aspx) to confirm that this guidance has been consulted and is understood, and that it has been taken into account when completing your application for ethical review.

Thank you,

Gemma Williams
Deputy Research Ethics Officer
Research Support Group
Finance Office
Aston Webb, B Block
Edgbaston, Birmingham
B15 2TT
Tel: [redacted]
Email: [redacted]
Web: www.birmingham.ac.uk/researchsupportgroup

Remember to submit a new Self-Assessment Form for each project!

Please click Ethical Review Process for further details regarding the University's Ethical Review process, or email ethics-queries@contacts.bham.ac.uk with any queries

Please click Research Governance for further details regarding the University's Research Governance and Clinical Trials Insurance processes, or email researchgovernance@contacts.bham.ac.uk with any queries

From: Damien Walmsley
Sent: 09 July 2015 08:18
To: AER Ethics
Subject: RE: ERN_15-0721 Current status of Dental Implant Education and Future Challenges

Dear Sam

We are using the same questions for the focus group

I look forward to receiving your reply as we are anxious to get started on the interviews

With kind regards

Damien

From: AER Ethics
Sent: 02 July 2015 10:00
To: Damien Walmsley
Subject: RE: ERN_15-0721 Current status of Dental Implant Education and Future Challenges

Dear Damien
Thank you for your documents, please can you confirm if you will be using the same questions for the focus group.

Kindest regards
Sam

From: Damien Walmsley
Sent: 25 June 2015 06:20
To: Samitri Kumar
Subject: ERN_15-0721 Current status of Dental Implant Education and Future Challenges

Dear Samitri

I apologise but these are the documents you are requesting for ethical review.

With kind regards

Damien

From: AER Ethics
Sent: 11 June 2015 13:01
To: Damien Walmsley
Subject: RE: Current status of Dental Implant Education and Future Challenges

Dear Damien

Many thanks for this application, which has been assigned reference **ERN_15-0721.**
Please can you let me have copies of the following documents in order to support your application.

- Interview questions
- Focus group questions / guide
- Consent form
- Information sheet

The ethics review is likely to take approximately 4-6 working weeks. However, we are currently experiencing a high number of applications and also being inspected by the MHRA, so this may be a little longer. If this will cause you any problems, please let me know.

Kindest regards
Sam

Samitri Kumar
Research Governance & Ethics Administrator
Research Support Group
Finance Office
Aston Webb, B Block
Edgbaston, Birmingham
B15 2TT
Tel: [redacted]
Email: [redacted]
Web: www.birmingham.ac.uk/researchsupportgroup

Remember to submit a new Self-Assessment Form for each project!

Please click Ethical Review Process for further details regarding the University's Ethical Review process, or email ethics-queries@contacts.bham.ac.uk with any queries

Please click Research Governance for further details regarding the University's Research Governance and Clinical Trials Insurance processes, or email researchgovernance@contacts.bham.ac.uk with any queries

From: Damien Walmsley [mailto:A.D.WALMSLEY@bham.ac.uk]
Sent: 13 May 2015 12:32
To: aer-ethics@contacts.bham.ac.uk
Cc: Sivakumar Jayachandran (SXJ319@bham.ac.uk)
Subject: Current status of Dental Implant Education and Future Challenges

Dear Sir/Madam

Please find enclosed an application for ethical review

I look forward to receiving your review

APPENDIX 2

Questionnaire

Survey of the current Dental Implant Education

Section I – About you

1. What fits your Age group

   a. 25-30 ☐ b. 30-40 ☐ c. 40-50 ☐ d. Above 50 ☐

2. Please provide the year of BDS Qualification ☐

3. Please provide if you have completed any post graduate degrees in dental implants

   Degree ☐ Year ☐

4. Further training

   a. GDC Specialist ☐ b. CCST ☐ c. Others ☐

   (If you have ticked any of the options, please go to Qn 9)

Section II – About you practice

5. Describe your practice

   a. General dentistry ☐ c. Hospital dentistry ☐

   b. Specialist referral ☐ d. Others, please specify ☐

6. Percentage of NHs Vs private

   a. 100% (Exclusively Private) ☐ d. 1- 24% ☐

   b. 75-99% ☐ e. 0% (Exclusively NHS) ☐

   c. 50-74% ☐

7. Do you place implants

   a. Yes ☐ b. No ☐ (If no -please go to Qn 16)

8. Do you restore implants

   a. Yes ☐ b. No ☐ (If no -please go to Qn 16)

9. How many implant cases you deal with in average month

   a. 1-10 ☐ b. 10-20 ☐ c. More than 20 ☐

10. Please tick the type of cases you deal with- please tick as many boxes as applicable.

    a. Single tooth implants including simple grafts –Posteriors ☐
    b. Single tooth implants including simple grafts –anteriors ☐
    c. Procedures involving maxillary sinus, ID nerve ☐
    d. Major grafts ☐
    e. Others , please specify ☐

11. Do you follow a post restoration recall system

    a. Yes ☐ b. No ☐ c. Not Sure ☐

12. How often you recall implant patients ☐

13. How do you do the maintenance

    a. Yourself ☐ c. hygienist ☐
    b. referring practitioner ☐ d. others, please specify ☐

14. Do you have protocol for implant failures?

    a. Yes ☐ b. No ☐ c. Not Sure ☐

15. If yes , what is the protocol?

    ☐

Section III- About your training

Undergraduate

16. Did you learn Implants in your BDS

    a. Yes (Please go to Qn 17) ☐ c. Not Sure ☐
    b. No (Please go to Qn 19) ☐

17. If you have answered yes, to the previous question, please intimate the level of training

    a. Theory ☐ c. restored implants ☐

b. Placed Implants ☐ d. Others, please specify ☐

18. Did you learn Implant supported over dentures

a. Yes ☐ b. No ☐ c. Not Sure ☐

Post-Graduation

19. Did you learn Implants after your under graduate course

a. Yes (Please go to Qn 20) ☐ c. Not Sure ☐

b. No (Please go to Qn 23) ☐

20. If yes, to the previous question, please intimate how did you learn implants

a. University degree ☐ c. Self- directed Learning ☐

b. Commercial courses ☐ d. Others, please specify ☐

21. How do you update yourself

a. Self-directed learning ☐ c. Others, Please specify ☐

b. CPDs ☐

22. Do you feel CPDs can help you update or learn new techniques in implants

a. Yes ☐ b. No ☐ c. No comments ☐

23. What do you think the barriers preventing implant provision

a. Cost of learning (in terms of time, money) ☐

b. Cost of treatment ☐

c. Risk of failures ☐

d. To avoid complications ☐

e. Maintenance ☐

f. Others, please specify .....

24. Your opinion about Current Implant Education

4

APPENDIX 3

Topic guide for Interviews

Topic Guide

Introduction

Self Introduction

- I am a dentist currently undertaking PhD in dental implant education.
- I am a GDP and specialty dentist

Introduce the study

- The research group is from the University of Birmingham
- The study is to learn about the current status of implant education and current implant practice
- We are talking to dentists to get their opinion. Therefore we have selected you as one of our participant.

Key points

- Purpose and length of the interview
- Voluntary participation and right to withdraw
- Recording the interview

Confidentiality & How will be reported

- Encryption, restricted access, and storage
- Anonymous –dissemination as thesis/ paper , may be quoted

Any Questions

Background details of the participant

Qualifications

- Graduation
- Post graduation

Nature of Practice

- Day to day activities

Interests (professional)

Implant Practice

- Do you practice implants?

- What level?
- Selection of patients
- Discussion with the patient
- Maintenance
- Complications
- Any suggestions which may improve

Practical Difficulties

- How did you they start with implants? (talk through the process)
- What support was offered?
    - Mentoring
    - Suggestions from friends/ seniors
- Any current supports?
- Anything that can improve?

Dental Education

Current Dental Education

(Prompt : GDC Quote)

- Your opinion
- Compare it with how you were taught
- Any suggestions which may improve

Implant Education

Current Under graduate

- Does it exist?
- Is it adequate?
- What is lacking
- Any suggestions which may improve

Post graduate

- What is your opinion

Conclusion

Thank the participant

Any questions

Do you want to be informed about the outcomes of the research? If yes e mail.

APPENDIX 4

TOPIC GUIDE FOR FOCUS GROUPS

Topic Guide

Introduction

Self-Introduction

- I am a GDP and Prosthodontic specialist currently undertaking PhD in dental implant education.

Introduce the study

- The research group is from the University of Birmingham
- The study is to learn about the current status of implant education and current implant practice; and this is the follow up of the previous interview study.

Key points

- Purpose and length of the discussion
- Voluntary participation and right to withdraw
- Recording the discussion

Confidentiality & How will be reported

- Encryption, restricted access, and storage
- Anonymous dissemination as thesis/ paper , may be quoted

Any Questions

Background details of the participant

Self-introduction of participants – their background, qualification, what type of practice they are involved.

Discussion points

- GDC's recommendation for a GDP in relation to dental implants using the GDC's quote
- Peer pressure influencing dental implant learning
- Implant related management is not common in general practice
- Appropriateness of dental implant referrals
- Funding in relation to dental implants
- Role of hygienist
- New patients if they already had implants elsewhere
- Dental implant education UG
- Dental implant education PG
- Any suggestions

APPENDIX 5

QUALITATIVE SURVEY QUESTIONS

Dental Implant Practice and Education

Dental Implant Practice and Education

Your Background

1. Your Age group o

- ◯ 25- 34
- ◯ 35-44
- ◯ 45-54
- ◯ 55+

2. Please provide your Dental Qualification o

Qualification	
year of graduation	
country of qualification	

3. Postgraduate Learning o

Degree Completed	
GDC Specialist and year	
Other	

4. Describe your practice (Tick as many as they apply) o

- ☐ General Dentistry
- ☐ Specialist Referral
- ☐ Hospital Dentistry
- ☐ Other (please specify)

5. NHS vs Private

NHS %

Private %

6. Do you place or restore dental implants

- Yes
- No

NEW QUESTION

or Copy and paste questions

NEXT

0 of 28 answered

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UPGRADE TO ADD A LOGO

Dental Implant Practice and Education

Background of existing situation

Please provide your opinion about the themes already identified through previous research

7. How does the GDC statement* "Practising dentists should recognise and explain to patients the range of implant treatment options, their impact, outcomes, limitations and risks" relate to your practice

* Preparing for practice-dental team learning outcomes for registration (revised 2015)- updated July 2019

8. What is your opinion on GDC's recommendat
peri-implant tissues o

9. how do you feel, respond and reflect when a patient queries about you not providing implant treatment while the other dentist nearby is doing? (with respect to "peer pressure") o

10. what is your opinion on peer pressure as motivation to learn dental implants o

11. what is your understanding of the GDC statement " dentists should work within their limits" with respect to dental implants o

12. how do you feel about becoming involved with implants and learning more about them? o

13. what is your say on why implant related management is not common in general practice? o

NEW QUESTION

or Copy and paste questions

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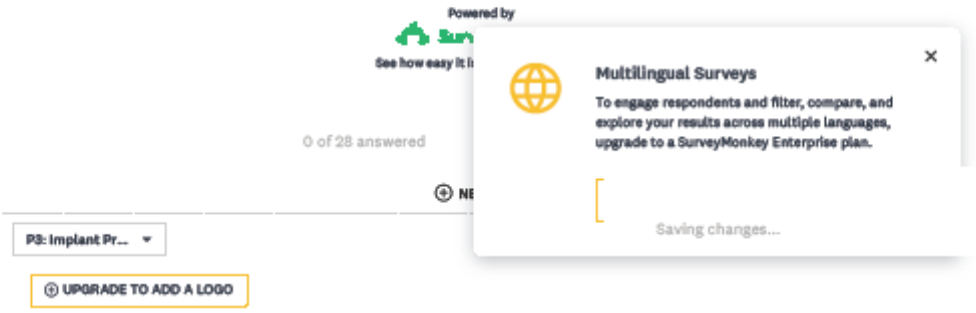


Dental Implant Practice and Education

Implant Practice

your opinion matter

14. What is your opinion on appropriateness of dental implant referrals? o

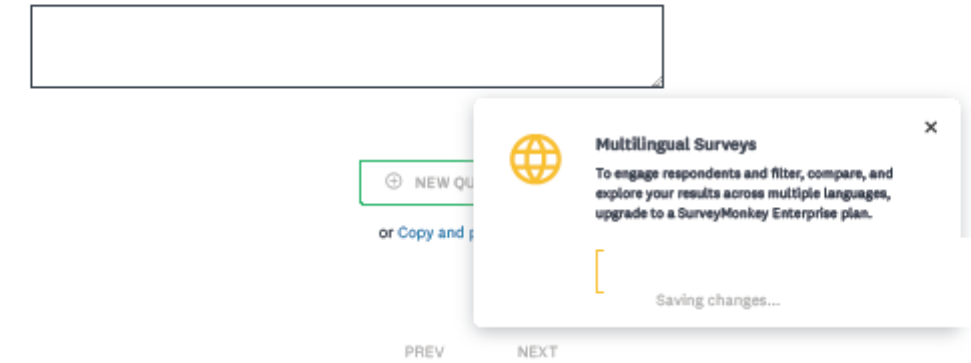
15. what is your opinion on relating (or not relating) remuneration to dental implant maintenance, specially under NHS funding? o

16. How far you can manage o

- [ ] general peri-implant maintenance - OHI instructions, and prophylaxis
- [ ] scaling around implants
- [ ] prosthetic complications- loose crowns/ fractured crowns
- [ ] manage fixture level problems- remove/ graft

17. What is your opinion on involving dental hygienists in dental implant maintenance? o

18. What is your opinion on being held responsible for maintenance of dental implants done elsewhere (other practice or abroad)? o



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UPGRADE TO ADD A LOGO

Dental Implant Practice and Education

UG Courses

19. What is your opinion on the fact that there is no space in the curriculum for implants? o

20. How does it concern to you if a dentist say "we did not do many root canal treatments in the school, still we perform a lot of this in practice. So why should not this be the same for implants?" o

21. Whats is your opinion on extending the dental foundation training to 2 years in general practice to include advanced treatments such as dental implants? o

22. What is your opinion on McGill's consensus statement " Mandibular two-implant over-dentures as first choice standard of care for edentulous patients" 0

23. What is your opinion about provision of dent
Primary care? 0

24. What is your opinion on development of Dentist with Special interest in dental implants contract for Remuneration purpose? 1

Dental Implant Practice and Education

PG learning

25. What is your opinion on University post graduate degree as a prerequisite to do dental implants? please justify your answer 1

26. what is your opinion on private post graduat

27. What will be your expectations from a post graduate training? (with respect to implants)

28. what would you expect from a mentor?

NEW QUESTION

or Copy and paste questions

PREV DONE

0 of 28 answered

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PUBLISHED PAPERS

Paper 1

Maintaining dental implants–do general dental practitioners have the necessary knowledge?.

Jayachandran, S., Bhandal, B. S., Hill, K. B., & Walmsley, A. D.

British dental journal, 2015. *219*, 25-28.

Maintaining dental implants – do general dental practitioners have the necessary knowledge?

S. Jayachandran,*[1] B. S. Bhandal,[2] K. B. Hill[1] and A. D. Walmsley[1]

VERIFIABLE CPD PAPER

IN BRIEF

- Investigates the current level of dental implant education in relation to General Dental Council and Association of Dental Education Europe requirements.
- Reports some interesting opinions relating to the current implant education.
- Identifies the barriers in the provision of dental implants in general dental practice.
- Makes recommendations for the implementation of a holistic approach in undergraduate dental implant education.

RESEARCH

Objective The aim of this study was to understand the opinion of general dental practitioners about the current level of implant education at both undergraduate and postgraduate levels. **Materials and methods** A questionnaire was sent to the general dental practitioners working in a group of practices in the West Midlands, UK. The completed responses were analysed. **Results** Ninety-one out of 101 dentists responded to the questionnaires (95.6%). Sixty-seven (77%) dentists stated that they learnt only theoretical aspects of dental implants during their undergraduate training. The majority of them stated that the training they received was not adequate. In addition, few barriers in dental implant provision by general dentists were also identified in the survey. The main barriers were risk of failures (56.3%), to avoid complications (65.5%) and the cost of learning (51.7%). The results were correlated to the implant competences set by the regulatory organisations such as General Dental Council and Association of Dental Education Europe. **Conclusion** The present study confirmed that the current implant education at both undergraduate and postgraduate levels in the UK does not instil confidence to the GDPs to provide and maintain dental implants.

INTRODUCTION

The adult dental health survey 2009, reported a 6% decrease in the average number of edentate adults in England compared to the previous surveys.[1-2] Similar statistics of increased tooth retention have been reported in other Western countries.[4,5] In addition, patient expectations have also increased with respect to aesthetics and function. Therefore, advanced treatment planning including implants has become inevitable in modern dentistry.[6] Such treatment planning challenges the general dental practitioner who has not necessarily received specialist training to deal with implant restored mouths. The need to maintain or intervene in the maintenance of implants is increasing even if the practitioner does not place or restore implants themselves. Hence, implant education that is tailored to the range of cases that a non-specialist is likely to encounter is required at both undergraduate and postgraduate levels.

The General Dental Council's (GDC) document ***Preparing for practice – dental team learning outcomes for registration*** expects the registered dentist to recognise and explain to patients the range of implant treatment options, their impact outcomes, limitations and risks. It also mandates the dentist to describe the risks related to dental implant therapy and manage the health of peri-implant tissues.[7] However, the GDC limits the UK qualified dentist from practicing implant dentistry without undertaking structured postgraduate training and assessment of competence, which relates to the ***Training standards in implant dentistry*** published by the Faculty of General Dental Practitioners.[8,9]

The Association of Dental Education in Europe (ADEE) is an independent European organisation, which contributes to implant education by organising periodic the European Consensus workshops. The outcomes of the workshop in 2008 were the ***Profile and competences statement*** for the European Dentist and the ***Competencies and learning outcome in implant education*** documents. The first document recommends a competent dentist to be familiar with the diagnosis for potential implant patients, communicating to patients about the risks, benefits and long term consequences of using implants within an overall treatment concept, and the principles and techniques involved.[10] The second set of documents set out the competences and learning outcomes for teaching in implant dentistry in undergraduate, postgraduate and CPD courses.[11,12]

The 2nd consensus workshop report confirmed the integration of implant dentistry in undergraduate education in European institutions.[13] However, the education delivery is variable in terms of the amount of information provided, the level of training and whether the course is purely theory or contains any hands on clinical component.[14] The report also identified the challenges in developing strategies and in implementing the existing competence profiles. It also considered the challenge of how much should be delivered at undergraduate level. Whilst at the post graduate level, there are many implant training courses available, there is once again a great variation in the quality of training and duration of these courses as they may range from one day workshops to degree level qualifications.[15,16]

Surveys on dental implant education are limited and those published have focused on specific areas. For example, two surveys recorded the responses from dentists who attended the continuing dental education in dental implants.[17,18] In these surveys, the respondents were mainly established private practitioners. They considered that attending those courses made them aware of their own limitations and the majority of them thought there should be a dental implantology speciality.

[1]School of Dentistry, St Chad's Queensway, Birmingham, B4 6NN; [2]General Dental Practitioner, Cradley Heath, B64 5HJ
*Correspondence to: Dr S. Jayachandran
Email: [redacted]

Refereed Paper
Accepted 28 April 2015
DOI: 10.1038/sj.bdj.2015.528
©British Dental Journal 2015; 219: 25–28

The present literature and guidelines indicate that more information is required on how general dentists encounter implants in their everyday practice to assess whether they are meeting the learning outcomes or competencies highlighted in the previous documents.

AIMS

The aim of this study is to evaluate the current level of implant experience; barriers in implant provision and opinion of general dental practitioners working predominantly within the NHS in the UK.

MATERIALS AND METHODS

A structured paper based questionnaire was developed to collect information about the participant's background, implant education and experience including their opinion about current implant education. The questionnaire included closed and open ended questions to facilitate quicker response and to allow comments and reflections at strategic points respectively. The survey was refined after a pilot response to the questionnaire from five dentists. The study was conducted complying with the University of Birmingham Ethics committee guidelines. The questionnaire was distributed to general dental practitioners working within a representative group of practices in the West Midlands, UK. The chosen group of practices have spread all over the west midlands with a mixture of dentists from different institutional backgrounds. The dentists who participated in the study were 26 local graduates, 11 from the London area, and at least two were representing each university in the UK. This formed the majority of the study group. The remaining were from European countries such as Portugal, Germany, and non-EU countries such as India and Pakistan. The response to the questionnaire was maximised by delivering to the practitioners in a range of formats including email, regular post, internal post arrangement within the group of practices and a few were hand delivered where necessary. The dentists were encouraged to provide responses using different modes such as regular post, email attachments, 'whatsapp' and multimedia messages. This was to facilitate the response rate. The digital data transmission, especially through whatsapp, has been reported and recommended in the medical field.[10]

RESULTS

The questionnaire was initially emailed to 101 clinicians. Nine of the respondents were found to be hygienists or therapists and were excluded for the purposes of this study. One dentist had left the practice group at the time when the questionnaire was sent. This reduced the number of dentists to 91. Out of this, 87 dentists responded to the questionnaire. This gave a response rate of 95.6%.

The age categorisation and year of graduation are shown in Tables 1 and 2 respectively. The majority of the respondents were aged 40 and under (79.3%), and over half of them graduated after 1990 (66.7%).

Seventy-six (87.4%) of the total respondents were predominantly NHS practitioners (Table 3), and nearly 90% of them did not provide implant treatment (Table 4). Nine percent of the dentists limited themselves to simple implant treatments such as single implants or small bridges.

Sixty-seven (77%) stated that they learnt about the theoretical concepts of fixed implants and implant supported overdentures during their undergraduate training (Table 5). However, they stated that there was no practical or clinical component provided.

Further training

The group consisted of general dentists of varied experience, including two dentists enrolled on a university-based MSc in implant dentistry, three orthodontists, two dentists holding qualifications in periodontics and two in prosthodontics. In addition, two dentists had completed a one-year certificate in implant dentistry.

Forty two (48.3%) dentists did not have any postgraduate training in dental implants (Table 6). The remaining 52.7% underwent postgraduate dental implant training through CPD courses including section 63 courses and vocational training study days; commercial courses within the UK or overseas courses. An example of the overseas country providing implant courses was Egypt. These trainings ranged from a one day workshop to a ten day course. The certificate courses extended up to 12 months, some including treatment of candidates' own patients in the training clinic at a subsidised cost. The treatment cost was in turn added to the dentist's course fee.

Recall and maintenance protocol

Those dentists who provided implants reported on a range of recall intervals including monthly, three monthly, six monthly and annually. However, there was no strict protocol mentioned for the care of implant restorations. The dentists who provide implants reported that they regularly maintain their patients. Two dentists who do not provide implants suggested the recall and maintenance should be undertaken by hygienists. Only two of the respondents considered that it was the responsibility of the referring dentist to maintain implant restored mouths, if the patient had originally been sent to a specialist for implant provision.

Barriers in provision of implants

The main barriers reported to their own personal clinical placement of implants were risk of failures (56.3%), to avoid complications

Table 1 The age characteristics of the sample of dentists

Age	Number of dentists	Response rate (%)
25–30	31	35.6%
30–40	38	43.7 %
40–50	15	17.2%
50+	3	3.4%

Table 2 Year of graduation

Year	Number of dentists	Response rate (%)
1970–80	10	11.5%
1981–90	17	19.5%
1991–2000	32	36.8%
2001–2010	22	25.3%
2011+	4	4.6%
Not specified	2	2.3%

Table 3 Nature of practice

Year	Number of dentists	Response rate (%)
Purely NHS	30	34.5 %
75–99% NHS	34	39.1 %
50–75% NHS	12	13.8%
1–25% NHS	9	10.3%
Purely private	2	2.3%

Table 4 Implant experience

Cases	Number of dentists	Response rate (%)
None	78	89.7%
Simple anteriors and posteriors	7	8 %
Complex	1	1.1%
Others	1*	1.1%

*Restored only one implant

Table 5 Implant experience during undergraduate training

Implant training	Number of dentists	Response rate (%)
Learnt	67	77%
Did not learn	20	23%

Table 6 Postgraduate training

Implant training		Number of dentists	Response rate (%)
Learnt	CPDs	31	36.9%
	Commercial courses	10	11.9%
	Certificates	4	4.8%
Did not learn		42	48.3%

Table 7 Barriers

Barriers	Number of dentists	Response rate (%)
Cost of learning	45	51.7%
Cost of treatment	32	36.8%
Risk of failures	49	56.3%
Avoid complications	57	65.5 %
Maintenance	13	15%

(65.5%) and the cost of learning (51.7%). The next level was the cost of treatment (36.8%). The maintenance aspect was not considered a major issue (15%) (Table 7).

The other barriers mentioned by the respondents were; the indemnity to cover dental implant treatment which is higher than their regular fee, with chances of increase in cost and conditions if a situation of compensation arises;[20] interest in the other fields of dentistry; and family commitments.

Opinion about current undergraduate implant training

The general opinion was that the level of current undergraduate dental implant training is poor or inadequate. It was stated that further training is expensive and not available to everyone. Therefore the dentists who completed the questionnaire suggested that implant training should be part of the undergraduate curriculum and that it should be substantial to include a practical/hands-on aspect. At least one dentist has recommended shortening the teaching of other aspects to include implants in the curriculum. Two of the senior dentists recommended that dentists should only perform such treatment by following recognised specialist training.

DISCUSSION

The study group involved dentists working in a large independent group of practices in the West Midlands. This is not a corporate chain and do not operate in the same way as a corporate. They have standard policies for the group, such as infection control and radiation protection. However, the policies related to specific treatments such as implants are tailored to the individual practice depending on how the dentists wish to work. Therefore, the results of the study are the opinion of the dentists, which is not influenced by the employment situation.

The majority of the dentists were associates, aged less than 40 years and graduated after 1990 providing predominantly NHS dentistry. The number of dentists involved in the survey may appear small; however, it does provide us with an insight into the opinions of younger general dental practitioners whose postgraduate training will influence the future of dentistry provision in the UK.

Only a few dentists in the group provided implant treatment. In contrast to the results of a previous survey conducted in 2006,[18] the majority of the GDPs did learn implantology as an undergraduate. However, the education received was mainly theoretical teaching and learning which reveals the relative shortcomings in implant education. Many have had some form of postgraduate training through section 63, CPD courses which has raised their interest in learning about the use of dental implants.

With respect to implant dentistry in the UK, the General Dental Council recommends the dentist to communicate the risks and benefits of implants to the patients and to manage the health of peri-implant tissues.[7] The number of patients presenting with peri-implant disease is also increasing.[21,22] This can be a major factor in NHS that will take up the specialist time and funding. This will in turn limit the number of new implant placements.[23] Therefore, the responsibility for the subsequent care and maintenance of the implant patient should be clearly defined and shared between the operator who places the implant and the clinician who maintains the overall dental health of the patient. However, in the current study, the majority considered that maintenance was the responsibility of the specialist dentist who provided the implant restoration.

In addition, there is no published guidance on how dental implant recalls should be structured. This is an area which needs further exploration.

As per the GDC and ADEE recommendations, the majority of the dentists are aware of their responsibility in educating patients and providing options of implants to patients. The opinion of the dentists participated in the survey has confirmed that the current implant training is deficient. Therefore, it is doubtful that they will be able to address the implant need for the appropriate patient, referral at a suitable stage and provide ongoing maintenance. The response about the current barriers indicates that their present implant education does not instil confidence in them. However, a direct question regarding the confidence in providing dental implant treatment was avoided to eliminate the Dunning–Kruger effect. This is a cognitive bias wherein the unskilled people mistakenly assess their ability to be much higher than is accurate.[24] The dentists may assume that they are confident, but they may not be competent. The majority of the GDPs considered medical litigation as a major barrier in providing implants. This may also be related to their reluctance to be involved with the maintenance of the implants. The next major barrier was the cost of learning. Dental implant training is expensive as it involves high consumables and surgical costs. This may be a factor to consider, especially in the UK undergraduate programmes as they are state funded. This may not affect the other countries as the system is not common across the whole EU.

Investigation of implant education in Europe, five years after the first implant competency document was published showed that the volume of teaching implants is expanding, in line with the demand and regulations.[25] The response to the present questionnaire also reflected this view. The majority stated that implant treatment can be provided in general practice with appropriate training. This was in contrast to the 2006 survey,[18] where the majority of the respondents recommended a speciality pathway for dental implantology.

Current implant education and clinical training should be aligned to the competences and learning outcomes published by the GDC and ADEE. However the future provision of implant education at the undergraduate level requires much thought. The main problem addressed at the first ADEE consensus was to find a space in the already crowded curriculum. Several European institutions have managed to overcome this issue which is partly related to other factors including different remuneration systems.[22] In the UK, it may be the time to consider a holistic approach. This will make dental implant education a shared responsibility between prosthodontic, surgical and periodontic disciplines. However, more research may be needed to identify the amount and nature of information and training to be provided to the undergraduate student.

CONCLUSION

General dental practitioners in the UK and Europe are expected to attain specific competencies and fulfil learning outcomes in relation to dental implants. However, the results of the present study confirmed that the current implant education in the UK does not instil confidence to the GDPs to provide and maintain dental implants. Few barriers in implant provision have also been identified. Further research may be needed to explore the needs in relation to dental implant education.

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Paper 2

Challenges in dental implant provision and its management in general dental practice.

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Challenges in dental implant provision and its management in general dental practice

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ABSTRACT

Objectives: Dental implants have become a well-publicised treatment modality in dentistry. Implants are generally placed in the private sector by dentists who have undertaken further learning. The continued maintenance of implants falls within the duty of care for the general dental practitioner. The objective of this qualitative study is to investigate the current status of dental implants in general dental practice, and to explore the dentists view on dental implant education at both undergraduate and postgraduate level.

Methods: In-depth interviews as a qualitative methodology was used in the study. The participants were recruited through theoretical sampling guided by saturation of information. Based on this, 22 general dental practitioners practicing in the UK were interviewed. Transcribed interview data were coded with NVIVO software and then analysed using a thematic framework analysis method.

Results: General dentists from different educational backgrounds, experience levels participated in the study. They highlighted that the guidelines and protocols when dealing with implants were unclear and expressed their unwillingness to treat patients who had their specialised dental treatment performed elsewhere.

Conclusion: Expensive dental implant treatment is not being followed up by the general dental practitioner due to a wide range of barriers. Unclear care paths will lead to a likely increase in problems following implant placement.

Clinical Significance: General Dentists' views of dental implants in general practice and their expectations from education providers are explored and show the need for improved education.

1. Introduction

Dental implants are a popular option for replacing missing teeth. The Adult Dental Survey UK 2011 recorded the presence of implants and implant retained restorations in 1 per cent of all those participants who were examined [1]. Similar trends of such increases in dental implant placement and their clinical management have been reported worldwide [2–4]. However, the use of dental implants in general dental practice, in particular, the attitudes of general dental practitioners (GDP) to the provision of dental implants is an under explored research subject. Questionnaire based reports are available in the literature which either report the technical details of implant placement or serve as patient satisfaction surveys [5–7]. One such questionnaire survey from general dental practitioners working in a general office reported that they do not feel that their undergraduate education instils confidence in managing dental implant patients [8,9]. Several barriers were cited by the practitioners including the cost of learning about implants, the lack of time to care for such patients and the fear of regulation or litigation [8]. Whilst this questionnaire study identified these factors and the number of dentists in agreement with them, a qualitative methodology was chosen to explore in more detail the reason for these barriers.

Therefore, the purpose of this qualitative study is to examine the current status of dental implants in general dental practice, explore the dentists view on dental implant placement, their maintenance and how education at both undergraduate and post graduate level influenced their views.

2. Methods

Ethical approval was obtained from the University ethical committee (ERN_15−0721). Qualitative interviews were conducted with general dental practitioners from different educational backgrounds. Twenty-two dentists were recruited through a purposeful sampling until information saturation was reached. Potential dentists were provided with the written information about the study, and the dentists

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Table 1
Summary of Participants (22 dentists).

Descriptor	Types	Number of dentists
Gender	Male	13
	Female	9
Age	25 to 30	3
	30–40	8
	40–50	7
	50+	4
Experience (number of years in practice)	< 5 years	7
	6–10 years	4
	11–20 years	6
	> 21 years	5
Educational Background	Dentists with BDS	15
	Postgraduates (MSc, Diploma)	4
	Others (Specialists, trainees)	3
Geographical (Academic) background	from Birmingham	9
	from London	4
	1 each from Manchester, Bristol, and Newcastle	3
	from Asian countries	3
	From other European countries	3

who expressed interest were interviewed. The demographic details of the participants are listed in Table 1.

The interviews were conducted by the first author; with an introduction of the research group, the purpose of the study and how the data will be processed. Prior informal conversations with the participants familiarised them with the interviewer and allowed them to be relaxed. The interviews were recorded, transcribed and stored in encrypted storage devices after anonymising the identity. The data is available on request. The interviews were semi-structured, using a topic guide (Table 2) which involves the key elements to be discussed with the ease of tailoring each interview based on the pooling information. Information saturation was noticed at the end of twenty interviews; however, two more interviews were conducted to ensure that the same information was being obtained. The General Dental Council of the United Kingdom provide a series of standards (Table 3) and these together with selected clinical scenarios (Table 4) were used to prompt the participants during the interviews.

Qualitative research requires a process of triangulation in order to validate the credibility of data. Therefore, five of the randomly selected transcripts were sent to respective participants. Minor changes were made, and some areas were improved with further clarifications made. The process has been described as member-checking in the literature [10].Transcripts were organised using NVIVO software (© QSR International Pty Ltd, Victoria, Australia) for coding. Initial broad coding identified 402 files with 1280 reference quotes under 31 codes (Fig. 1). The references were analysed using framework analysis method [11]. In this method, recurring meaningful data are categorised as minor themes. The minor themes are clubbed together to naturally resulting in major themes for discussion. Data analysis was independently repeated by the co-authors to confirm coherence and completeness.

3. Results

The minor themes were grouped into three major themes (Fig. 2). To facilitate the ease of reading, selected quotes from the interviews have been used to detail the themes. Participants were addressed as GDP-n (where n is their allocated study number). The analysis revolved around understanding

1 Dentists background under the themes of their responsibilities, learning opportunities and their views on cost
2 Implant practice under the themes of how they care for other dentist's implant patients, and their views of available protocols on implant treatment
3 Dental education, both at postgraduate and undergraduate level

3.1. Dentists' background

Dentists who practice general dentistry expressed details about the knowledge they received during their undergraduate and/or

Table 2
Topic Guide.

Introduction
Self-Introduction
- I am a dentist currently undertaking PhD in dental implant education.
- I am a GDP and specialty dentist

Introduce the study
- The research group is from the University of Birmingham
- The study is to learn about the current status of implant education and current implant practice
- We are talking to dentists to get their opinion. Therefore, we have selected you as one of our participants.

Key points
- Purpose and length of the interview
- Voluntary participation and right to withdraw
- Recording the interview

Confidentiality & How will be reported
- Encryption, restricted access, and storage
- Anonymous dissemination as thesis/ paper, may be quoted

Any Questions
Background details of the participant
Qualifications
- Graduation
- Post-graduation

Nature of Practice
- Day to day activities

Interests (professional)

Implant Practice
- Do you practice implants?
- What level?
- Selection of patients
- Discussion with the patient
- Maintenance
- Complications
- Any suggestions which may improve

Practical Difficulties
- How did you they start with implants? (talk through the process)
- What support was offered?
  - o Mentoring
  - o Suggestions from friends/ seniors
- Any current support?
- Anything that can improve?

Dental Education
Current Dental Education
(Prompt: GDC Quote)
- Your opinion
- Compare it with how you were taught
- Any suggestions which may improve
- Implant Education

Current Under-graduate
- Does it exist?
- Is it adequate?
- What is lacking
- Any suggestions which may improve

Post-graduate
- What is your opinion

Conclusion
- Thank the participant
- Any questions
- Do you want to be informed about the outcomes of the research? If yes e mail.

Table 3
Requirements of practicing dentists in dental implant management.

"Practicing dentists should recognise and explain to patients the range of implant treatment options, their impact, outcomes, limitations and risks"
"Describe the risks related to dental implant therapy and manage the health of peri-implant tissues"- GDC [20]
Dentists should be familiar with: (5.25) Making a diagnosis for potential implant patients... (6.48) Describing, for patients, the risks, benefits and long term consequences of using Osseo-integrated implants within an overall treatment concept...(6.51) Describing the indications and contraindications, principles and techniques of surgical placement of Osseo-integrated implant fixtures – ADEE [18]

Table 4
Example Case scenarios.

Example 1. How do you feel if one of your long-term patients, attend for an examination appointment and say that they had an implant placed recently and ask you to be careful?
Example 2. If one of your patients with edentulous spaces asks about dental implant options and queries why could not you do it?

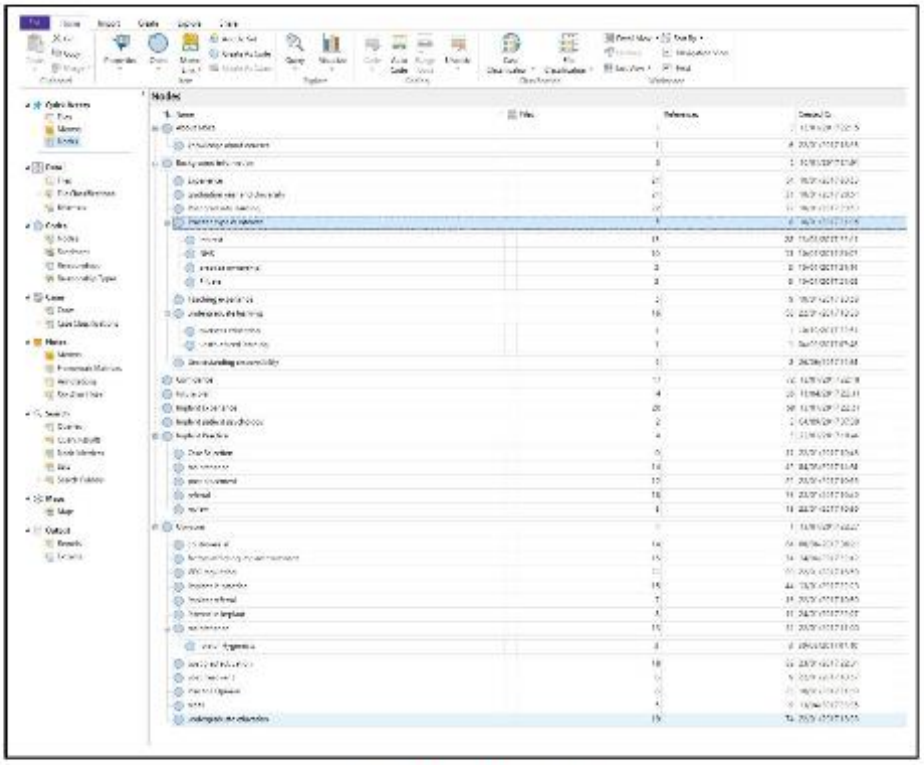

Fig. 1. Initial Coding using NVIVO.

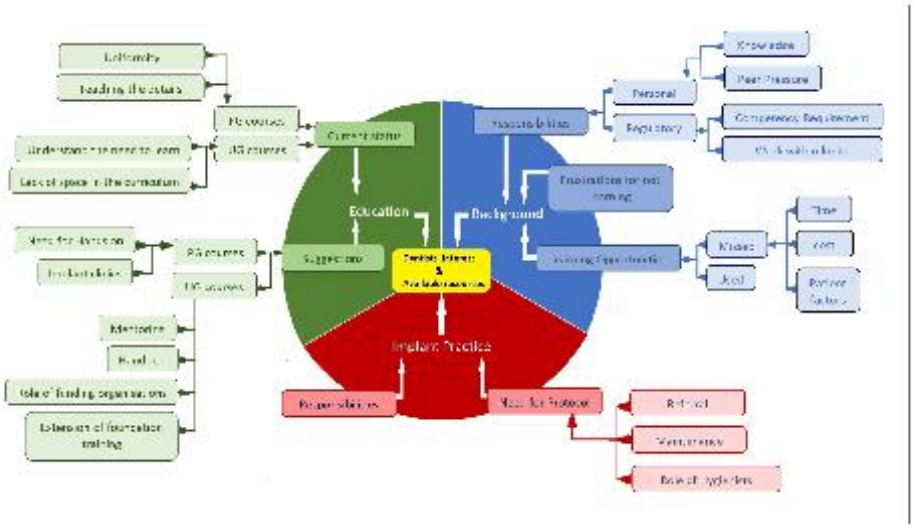

Fig. 2. Themes developed after framework analysis.

postgraduate training and how they felt about caring for patients with dental implants when using their own knowledge background. These were gathered from the following sub themes;

3.1.1. Dentists' knowledge and skills

Dentists demonstrated their understanding of providing extended restorative treatment options to the patients. They recognise the importance of continued learning so that they are equipped to satisfy patient needs, peer pressure and regulatory requirements.

'if you are not able to offer something, you…sway the patient toward what you can offer, which is…wrong as consent'GDP9
'people expectations are higher… it (maintaining implants) should be quite routine'GDP1
'there is more interest…regarding implants…it's my duty to look after the implant' GDP3
'I would like to feel that I have done this and have gained extra skills to make obviously stand out of the crowd' GDP20
'if I had a crown done by another dentist, and I come to you for general check-up, I expect you, as my dentist to look after the crown, isn't it?' GDP16

Dentists sounded confident with respect to the General Dental Council's regulatory requirements with respect to managing dental implants. Experienced dentists also thought that current graduates are competent in this aspect.

'all dentist… would…should be competent with that' GDP20
'they (recent graduates) comfortably explaining things' GDP16

At the same time, in contrast to being confident, dentists also expressed the view that dental implant provision should be done at a specialist practice.

'I know how to do it(implants), but I wouldn't…even though I'm very experienced, to do that' GDP15
'should be done in a specialist setting…statistically would get a higher rate of success' GDP15

In addition, they also expressed their concern that the new graduates are either not confident or competent, when it comes to implant placement and restoration.

'I don't think (new graduates) have enough experience, and…less confident…talk themselves out of it' GDP15
'should gain more experience of crown, bridge…before they can do implants … They shouldn't be expected to do…you wouldn't expect a Vocational trainee dentist to do a multi-unit bridge' GDP10

3.1.2. Postgraduate learning opportunities

There was frustration with many of the dentists interviewed that they had not learnt a great deal about implants at undergraduate level.

'only few lectures and theory- would be better if it's more of implants, especially restoring implants' GDP1
'just covering the basics to give us an overall idea… was just very touch on surface'GDP3
'so, we had about three or four lectures…just talking'GDP13

While postgraduate training in implant dentistry was available for all the participants, many of the experienced dentists admitted that they did not take up these opportunities. On further discussion, they talked about their interest or lack of interest in the subject, lack of time and other outside commitments. Some of them did not give valid reasons.

'I…need to have experience, supervised experience' GDP10
'offered that implant mentoring… but I didn't go down the route' GDP17
'As the practice got busier… L. let other dentists in the practice to do' GDP7
'inhibiting…the time…to take out from my day to day practice' GDP15

Alternatively, recent graduates showed interest towards learning more about dental implants. They even identified informal ways of learning about the subject. They utilized the opportunities which their senior colleagues had missed at the same time of their career.

'I…shadow (the implant dentist) …I have done 4 or 5 cases now. So, I am little more confident' GDP1
'having an implantologist…quite reassuring… if I have any problems, I can easily go to' GDP9
'I've started doing my masters…implants…placed a couple of implants' GDP19

Cost factor was referred at many instances with respect to the actual cost of the treatment, and the cost for the dentist undertaking the expense of learning, loss of surgery time, new equipment overheads and the increased indemnity fee associated with implant treatment.

'very expensive…course itself is expensive and…taking time out of practice' GDP1
'it's not that easy …without investing significant amounts of money on certain courses or qualifications …equipment as well' GDP12
'do it outside the work hours…difficult with juggling family and work' GDP3

There were attempts to justify not learning the subject, on cost versus incentive basis.

'cost/risk benefit ratio… I don't think it weighs up for me to do it' GDP15
'I didn't have enough incentive' GDP21

Views about Cost factor from the patient side have also emerged from the responses.

'obstacle for patients is the cost… there are options like finance available…for some it still unaffordable' GDP1
'Our demographics…They just chose extraction and dentures' GDP21
'The outcome of that (expensive) consultation may be against or … but that's incumbent upon you stopping smoking or having a bone graft…can put patients off against us referring' GDP12

3.2. Implant practice (professional role)

The themes related to dentists' attitude towards managing dental implant patients are discussed under this domain. Dentists expressed how they feel while seeing patients with at least one implant in their mouth, their views on the referring of a patient to an implant dentist and what happens once the treatment is completed. This includes recall appointments, reviews and long-term maintenance of dental implants.

3.2.1. To or not to take responsibility for others work

While recognising their responsibility to provide maintenance and dental care for dental implant patients, dentists also expressed anxiety about problems that may be associated with the implants. They wanted to send the patients back to the implant dentists. Pragmatic statements such as "if any problems" and "we will refer" were occurring frequently in the interviews without prompting.

'dealing with the complications afterwards; Or when your routine treatment hasn't gone properly' GDP14
'You see a lot of things can go wrong with implants' GDP2
'if there are any problems with the implant…I wouldn't be suitably trained to correct' GDP10
'if there are problems…I will refer them back'GDP17

This anxiety increased multi-fold if the patient had been provided

with implant treatment overseas.

'I just treat them as normal patients …until I have an issue with the implant…I have no idea what the pre-treatment things were and what system they have used. If you got the details, you can bring it to us…and if there is a problem, then we will deal it' **GDP19**
'I've had 1 or 2 patients with failing implants from abroad …it's been too much for me to take on…they didn't want to pay to see a specialist to fix it' **GDP21**

3.2.2. Need for referral protocols

Dentists understand that referral for specialist treatment is patient's basic right

'if some needs to be referred, then they should have the right, Political issue going into, they want to limit the funding; but it's the patient's right' **GDP6**

However, the referral patterns were inconsistent. They varied from some dentists advising the patients to find the implant practice themselves to some dentists sending detailed reports and even attending with the patient to the referred specialist practice. Dentists pointed out that the guidelines related to dental implant referrals and post-operative maintenance are lacking. They were happy to adhere to the referral practices recommendations.

'things I've learnt about the guidelines are very much word of mouth' **GDP12**
'no guidelines…I …follow implantologist's instructions…any issues refer them back'- **GDP1**
'a patient who's got good oral hygiene, bone levels…seriously wanted it then…I'd refer…send an OPG occasionally, not every time, or a PA' **GDP10**
'just the referral letter…No (radiographs)…they can do their own' **GDP11**
'my practice manager to call the other practice and book an assessment, end of…if I think a referral letter is required, I will do' **GDP15**
'majority of practices that don't provide dental implants… do not know where to refer…I think that's another obstacle' **GDP12**

This inconsistency in referral patterns was confirmed by the implant practitioners. They expressed their dismay about the variety of referral patterns where the details are only sparse or lacking.

'Some of them do send some x-rays, medical history and what's the status being, especially for failures…BPEs…pocket charts…if it's improving or not improving. How the patient oral hygiene compliance is?' **GDP18**
'referrals are quite vague…no radiographs… no indication of available space. Sometimes they send.. smokers and active periodontal disease cases without warning…inappropriate' **GDP12**
'a closed premolar space…with no models or records…straight rejection… could have been easily informed by the dentist…wasted my time' **GDP6**

However, they also understand the competitive market and were happy to accept patients with or without formal referrals. They mentioned the need to be friendly, approachable and to be ready to involve the general dentist in the implant management.

Dentists providing dental implants mentioned about what do they need to know from the GDP about the referred case.

'referral form with big boxes for them to write… things that they need to let me know…like what kind of cases…if they take any OPG or X-rays or things needs to be done' **GDP18**

Non-availability of suitable an implant dentist was also recognised as an obstacle.

3.2.3. Need for protocol - post-operative maintenance

In a similar manner to referrals, dentists pointed out about the lack of guidance on the maintenance of dental implants. They expected that they would receive communications from the implantologist and indicated their willingness to follow and involve their patients with the maintenance instructions.

'there should be a maintenance programme with the actual providing dentist. It is their duty of care' **GDP3**
'I would probably want to know from the correspondence what the implantologist's follow up; how he be gonna following the patient up, is it going to be 12 months' time or 6month time or he gonna be regularly seeing them' **GDP4**
'make them (patients) follow implantologist's information about how to keep it clean, being careful' **GDP1**

The role of hygienists in dental implant management emerged as a separate entity in the initial interviews and their involvement was found to be well accepted by the dentists in general.

'important…patients get reminded by somebody other than dentist (hygienists)' **GDP9**
'I use the hygienists to do the routine maintenance, but I do go in and check on the implants' **GDP7**
'Hygienists are good…took a lot longer than I probably would to explain' **GDP10**
'as long as the hygienist is appropriately trained, well they should be trained, then why should they just clean the teeth only? should they be cleaning bridge abutments? Should they be cleaning implants? Yes, they should' **GDP6**

On the other hand, there were views against adopting a team approach. Some dentists believed that the whole treatment and maintenance should be done by the same dentist. There were differences of opinion ranging from "not willing to involve at all" to "do all the treatment by oneself".

'my knowledge on maintenance of implants is quite limited; No, I don't involve in anything (about dental implants)' **GDP2**
'I have patients who I have originally treated. I want to maintain them (my implant patients) myself' **GDP7**

3.3. Present Status of dental implant education

To simplify, the themes around existing problems and suggestions to improve the curriculum are listed as either undergraduate and post graduate programmes

3.3.1. Dental implants in undergraduate programmes

The general opinion was that the implant training is justifiably inadequate in undergraduate programmes, so as to provide importance to learning other basic dental skills. Experienced dentists (Age 50+) could vaguely remember having a lecture on dental implants. Recent graduates mentioned that the majority of information was delivered through lectures. Comparatively, implants are mentioned more to the recent graduates; some interviewees mentioned about seeing patients treated, and had specialty modules in the subject at a preliminary level.

'I think fitting into the curriculum is difficult. I found that my curriculum over five years was very full…there surely must be way to try and fit that in, in a way that is beneficial as well. Without compromising other teaching' **GDP12**
'I understand why less time is spent on implants (in University teaching), because other skills that need more time like prosthetics, general dentistry skills, perio, restorative, cons, you need them skills lot more' **GDP3**
'as an undergraduate…not trained enough for implants… never told about implant maintenance or the risks…needs to be included more

in the curriculum' GDP18

The following suggestions also emerged during the interview discussions; the majority of dentists were happy with the information provided that enabled them to satisfy regulatory requirements. In addition, they recommended inclusion of dental implant teaching through shadowing and hands on teaching for interested students.

'hands-on models and to practice on... demonstrating on a model or we could watch...can have some postings, like other- other department... hands on real patients' GDP22
"an implant clinic... shadowing...special implant study module students can select...optional implant module' GDP1
'basic understanding of implant systems... and favourable factors should be explained' GDP10
'students could be rotated on to that (implant) clinic to observe... what the treatment involves... more prepared for what the outcome... then...limitations and risks' GDP12
'peri-implantitis...instruments... rather than exploring it, once you pass out, as in your practice... clinically oriented...seeing cases really helps'GDP18
'2 or 3 lectures, at least on implants... how they are assessed... risks...different types of bone...procedures like grafting, and sinus lifts...then, see an implant being placed...may not have to do it' GDP2
'them learn the skills how to communicate...develop their manual dexterity... and the, team working skills' GDP7
'general practice side of it. How...if someone wanted an implant... generalized rather than specific?' GDP8

3.3.2. Post graduate dental implant education

Dentists appeared to be generally dissatisfied with the cost, non-uniformity among educational Institutions, and the amount of information provided during the course. Dentists who attended the courses felt that they were not involved in all the clinical stages. They spent most of their time in surgical placements, taking impressions and delivering the restorations. They were not sure about how patients were managed in between these stages. Critical stages such as treatment planning, occlusal management and post-operative maintenance are taught in a couple of theoretical days.

'The case selection was done by somebody else (in the courses) 'GDP19
'there is no uniformity...right badges to have, defining the branches to the level of equivalence... There is nothing out...that says...what is appropriate qualification... who looks after the governance and check whether this course is suitable...to become tier 2... its some over-arching whether be the faculty or be another body or the combination of, to assess and to say, yes, ...You should be capable at and you have got the knowledge and suitable training to start...There is no uniformity' GDP6
'to become proficient... more appropriate...doing M Clin Dent in prosthodontics or periodontics ...rounded approach to the whole process... Very expensive'GDP12

3.3.3. Suggestions to improve postgraduate courses are,

Patient communication, team working skills, and medico-legal training were suggestions for inclusion in postgraduate clinical training, in addition to the existing curriculum. Mentoring was mentioned as an important theme.

'even in post grad...communication issues ...are the skills most important' GDP7
'to explain all of it all of it to the patient without making it sound tough GDP8
"Hands-on is really important... supervised. Smaller groups... (mentoring) would be really useful...if it was a specific case, 'cause that's probably where you'd get stuck, then you've got somebody you can ask' GDP22
'more about implant complications and how to manage them... medico-legal courses...implant related...how to handle...precautions to take'GDP18
'heavily hands-on base course...We have courses around the world, I can go in a week and place sort of 30 implants...I would gain more out of that...I think the theoretical side, I could sit and read you know, all day myself... and a heavily mentored approach... I don't think one year's enough by any stretch...the most expensive' GDP15

One suggestion was to encourage the funding organisations (NHS trusts) to set the curriculum and to recognise dentists who spent their time learning this additional skill by fulfilling the curriculum needs (e.g. Tier 2 accreditation). This will necessitate the course providers to adhere to this curriculum.

'no recognition by NHS England, or the commission to know what is an acceptable post graduate course to doing whatever post graduate to do tier2 level whether it is restorative, periodontology, settings, none for so ever...It is the competency level. You don't have to be a specialist to make a chrome denture, or a four-unit bridge or to do root canal on a lower 6' GDP6

Another suggestion was to extend the mandatory post graduate training period. For example, in the UK, graduating dentists enter a year of foundation training before they become general dental performers.

'may be 2 year post graduate training... need to be more competency based... form of mentoring, ... feel safe is so vital...you can teach them all with tricks and trades...to hold your hand since your first case and you learn from your experience mentoring is vital, absolutely vital' GDP6

Dentists have recognised that continued involvement in managing implants gives more experience and confidence.

'if you don't do the work, you ain't gonna gain the sufficient experience...to do the work predictably in future' GDP15
'I think the most likely possibility the reason being is that they don't need to coz they don't do them'GDP2

4. Discussion

Dental implants have become one of the popular options for replacing missing teeth in modern day dentistry. In spite of this, the role of dental implants in general dental practice is not well explored. In the previous questionnaire studies, issues such as cost and fear of implant work have been identified [8]. This study attempts to explore the issues that may shed more light on why this is a debated subject in the literature. To present the argument, the themes have been conceptually merged and discussed under the following two ideas; 1. The Dentist's interest and 2. Availability of resources (Fig. 2).

4.1. Dentist's interest

During the interviews, most of the dentists demonstrated their knowledge while discussing various aspects of implant practice but claimed that they were not confident. On analysing the data, two types of dentist attitudes were identified. The first group is formed by the experienced dentists who are in the middle or nearing end of their career. While expressing frustrations for not learning more about implants, from the analysis it was apparent that they prioritised other general dental practice activities over dental implants. However, the second group formed by the younger group of dentists understand their strength and weaknesses; set their goals (to strengthen their basic knowledge and skills) and have started to work towards rectifying their knowledge gaps by undertaking masters and/or informal learning. They

are critically analysing the course contents before choosing which path to undertake with further training.

Further analysis unwinds this aspect through the Theoretical Domains Framework (TDF model [12]) domains motivation and goals, social influences and emotions influencing dentists' beliefs. The objective of learning a new subject is to develop competency so that the learner can practice independently and take the responsibility for their professional growth [13,14]. Dentists' decision to set goals towards dental implant learning is influenced by the practice set up, rewards, regulations and litigations. Regulations recommend a practicing dentist to manage health of the peri implant tissues (Table 3). This involves regular recall, monitoring, maintaining the health through patient education and motivation and oral prophylaxis; and to appropriately refer if there are complications [15]. The majority of general dentistry in the UK is provided through the National Health Services system, and there are no clear guidelines for remuneration for dental implant management [16,17]. On the other hand, the potential spectre of litigation drives dentists into a cautious mode when they are dealing with clinical deficiencies in treatment. The end result is that dentists are not willing to deal with any clinical problems related to dental implants where they have not been involved. This is reflected in the experienced dentists' views as "fear to perform" or as "it is easy to refer or let others take the responsibility".

In contrast to their elders, younger dentists recognised the presence of competitive peer pressure and the need to satisfy patient expectations (TDF's social influence). They demonstrated the target setting, farsighted commitment towards learning the subject.

It is also surprising that there are many other specialist restorative treatments and management that are undertaken by GDPs without any regrets about remunerations. Examples of this can be, patients who had multiple direct and indirect restorations to manage advanced tooth wear; patients who had complex prosthetic managements such as obturators and overdentures. Dental implants seem to come across as a different restorative procedure that should be done by others. This points us towards the "interest" or "lack of interest" in the subject.

Informal mentoring appears to be the most promising way forward to break down barriers, as the learning trend has shifted away from a University degree to competency development. Direct learning from experts is offered for the referring practitioners and younger dentists are showing interest towards this. Interest towards the subject is the driving force here. This could be governed and facilitated by the Government regulatory bodies. For example, regulatory and defence organisations may encourage further education by setting learning requirements (opportunities) and providing incentives (rewards). This may be in the form of reassurance, or reduced indemnity fee, encouraging patients to accept limitations or even awarding trained dentists with "special interest" status.

4.2. Available resources

The General Dental Council in the UK regulates dental education and recommends that a practicing dentist must demonstrate certain skills. Similarly, other organisations including the Association of Dental Education Europe (ADEE) and the American Dental Association (ADA) provide guidelines for dental education [18,19]. Educational institutes adhere to these curricula to satisfy these regulatory requirements (Table 3).

To simplify reading, let us assume that this is the recommended knowledge. Dentists in the interview, demonstrated a clear understanding of their responsibilities, and aware of the regulatory requirements. They are confident at this aspect of dental implant management. Their competency was testified by senior dentists who have trained dentists after graduation (Foundation trainers in the UK).

However, they mentioned that they are not content with what they practice or what they were taught, in relation to dental implants. They are aware that they are not expected to surgically place and restore dental implants without developing the skills through additional training. The scope of practice from the GDC lists these as additional skills [20], and refers to the training standards recommended by Faculty of General Dental Practice, UK [21]. In contrast to this, Mc Gill and York consensus state that two implant supported overdentures have become the minimum standard for managing the edentulous mandible [10, 22]. This management should be available in general dental practice and this minimum ***required knowledge*** should be provided to the GDPs. This then raises the issue of cost and who will pay for the implant treatment. This was highlighted in the interviews. From our interviews, it is clear that the dentists receive only the **recommended knowledge** which the regulators believe to be adequate, and not the **required knowledge** to match the raised minimum standard.

These gaps may explain the generic statement why dentists are not confident in managing dental implant patients and why even some senior dentists mentioned that they were taught about dental implants and their maintenance in their dental schools, but still believed that this aftercare must be undertaken by specialists.

4.3. Guidance needed

Science continues to prove that dental implants are similar to a natural tooth in many ways. Diseases such as peri implant mucositis and peri-implantitis have their natural counterpart being gingivitis and periodontitis respectively [23]. This implies that implants require the same care and attention as natural teeth. The results of these qualitative interviews indicate that there is an underlying unease/fear about the management, as there are no standard protocol post implant maintenance instructions. The role of hygienists in the maintenance of dental implant patients and their non- availability for this procedure in the NHS set up was discussed. From the information received, we have identified those areas which need further research.

1 Role of clinicians in managing dental implants in general dental practice. This includes from dentists with or without special interest, hygienists and clinical Specialists.
2 The need to develop protocols for dental implant referrals – selection of cases, what diagnostic aids are needed (both from the referrers and the referee viewpoint) and how the GDP will be remunerated for his/her time.
3 Easy to follow guidance on dental implant maintenance – time, remuneration, and what is the GDPs responsibility or liability if they undertake problems associated with implants placed elsewhere, especially following the results of dental tourism treatment.

4.4. Improving the current curriculum

Dentists wish to learn about the wider picture of dental implants; from the pre- treatment aspects such as diagnosis, treatment planning, the diagnostic aids required all the way to the post treatment aspects such as maintenance. They have clarified that the undergraduate training has offered only minimal training and listed out the reasons such as lack of space in the curriculum. They also highlight the confusion as to which specialty faculty should teach dental implants (i.e. prosthodontics, periodontics or oral surgery). Alternatively, whilst postgraduate course providers are eager to market their course, it must involve tailoring the curriculum to meet the needs of the learner. Much of the current postgraduate providers tend to cover the treatment planning and maintenance aspects in one or two lectures or study days and allocate more clinical days for implant placement on selected patients. Other soft skills such as communication and patient considerations are generally neglected. This has resulted in lack of uniformity in the postgraduate curriculum.

Suggestions evolved from the discussion are;

1 Holistic teaching to be organised by restorative departments at a

multidisciplinary level. However, creating space in the curriculum would have to be managed carefully.
2 More clinical involvement which could include electives, special interest groups, shadowing clinics
3 Arranging assisting sessions with specialist practitioners during the undergraduate course
4 Teaching communication and behavioural science skills
5 Mentoring approach to learning
6 Employers and funding organisations may associate with teaching Institutes to offer continued mentoring, special interest groups, at a subsidised cost.

Further education in the subject should help dentists become more familiar with this treatment and remove the hesitation or fear of managing dental implant patients.

This study has explored the gaps in the education process surrounding dental implants. This is linked to the dentist's interest which in turn is dependent on factors such as pressure from regulators, patient expectations, and monetary benefits. Development of guidance and protocols have been identified. Suggestions on how to improve dental education have also emerged from this study and this analysis has opened multiple windows for further research.

5. Conclusion

Dentists, while adhering to regulatory requirement, are not comfortable in providing ongoing care for those patients who have had dental implants. Those dentists who are interested in dental implants, undertake further education in dental implants and are more willing to include a maintenance protocol in the overall care pathway in general dental practice. This in detail analysis showed that there is a *lack of interest* towards the subject caused in part by poor educational practices.

CRediT authorship contribution statement

Sivakumar Jayachandran: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization. **Anthony Damien Walmsley:** Conceptualization, Validation, Supervision, Writing - review & editing, Project administration. **Kirsty Hill:** Validation, Supervision, Formal analysis, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.jdent.2020.103414.

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Paper 3

A critical review of qualitative research publications in dental implants from 2006 to 2020.

Jayachandran, S., Hill, K., & Walmsley, A. D.

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REVIEW ARTICLE

WILEY

A critical review of qualitative research publications in dental implants from 2006 to 2020

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Abstract

Objectives: This critical review is aimed to investigate the current status of qualitative research in dental implant research and to explore the quality of available information.

Material and methods: A systematic search was done on the journal databases to identify dental implant research articles that used qualitative methodology during 2006 and 2020. The resulting articles were appraised against the checklist offered by the Critical Appraisal Skills programme (CASP) tool. Also, the theories evolved from the research were reviewed to understand the value of this methodology in dental implant research.

Results: Twenty-five (25) articles out of the 8,421 original results were identified as using qualitative methodology. The researchers have sought to identify the views of patients about tooth loss, dental implants, and the information they receive from dental professionals, and views of the dentists about dental implant practice. The review found that there were few inconsistencies in the quality of such research especially the qualitative data analysis.

Conclusions: The quantity of qualitative research in dental implants remains low; however, the quality has improved in the past two decades. Despite these improvements, there is still a lack of research in understanding both patients' and dentists' views on dental implant procedures and management.

KEYWORDS
behavioral sciences, clinical research, clinical trials, prosthodontics, public health

1 | INTRODUCTION

Qualitative research methods have a long track record in healthcare sciences (Bullock, 2010). Qualitative research outcomes are increasingly being used in policy documents and for developing clinical guidance by organisations such as NICE and NIH (Carroll, 2017; Tan et al., 2009). In contrast, the role of qualitative methodology in dental research is not well established as in other areas in medicine (Masood et al., 2010, 2011; Stewart et al., 2008). The majority of dental research is about seeking evidence, through quantitative methods such as randomised control trials (RCTs) and questionnaire surveys (Jayachandran et al., 2015; Stewart et al., 2008). Such studies identified only the number of positive or negative responses. It is not possible with such research methodology to understand the reasons behind why a particular response was made. Qualitative research offers a deeper and richer

understanding of the issues and perspectives of the individual (Sofaer, 1999).

Qualitative research helps to synthesis theories about an unknown subject by allowing unstructured investigations to take place. For example, an interview with open-ended questions will open multiple themes from the responses. Once theorised, these themes may be further investigated using structured quantitative methods. At present, healthcare researchers borrow theories from social scientists (e.g. psychology, economics and behavioural science) (Sofaer, 1999). Therefore, employing more qualitative research in health sciences especially in dentistry will develop a rich vein of independent theories.

A review in 2011 appraised the qualitative dental research published between 1999 and 2006 using the Critical Appraisal Skills Programme tool (CASP) and concluded that the quality of the literature was poor (Al-Moghrabi et al., 2019; Masood et al., 2011). This appraisal was focussed on the methodological rigour, rather than the subject of research. This approach was justified as it was argued that the outcome of the research will not be valid if the methodology lacked rigour.

The aim of this research project was to appraise the qualitative publications in dentistry in the past decade since the last review. However, research in dentistry has expanded to the level that individual bibliometric analyses are reported for different specialties in dentistry (Chen et al., 2020; Jayaratne & Zwahlen, 2015; Tarazona et al., 2017). Dental implants are one such field where the research and the number of publications are increasing. Therefore, the current review focuses on qualitative publications from 2006 to 2020, as a follow-up of the previous report (Masood et al., 2011) using the CASP tool, but limiting the subject area to dental implant research.

2 | MATERIALS AND METHODS

Ethical approval was not required for this systematic review. The methodology involved two stages adhering to PRISMA 2009 checklist (Liberati et al., 2009). The first stage was the creation of a database via an article search and secondly an appraisal of the selected articles. A systematic search of dental implant research using qualitative methodology was performed on the following journal databases: Ovid version of MEDLINE; Web of Science, Science Direct, Scopus and EMBASE. The search strategy included the terms as listed in Table 1. The search combinations were performed using AND, OR and NOT. The results were restricted to English, and the publication year was limited to 2006- current. This part of the search was independently repeated by the British Dental Association's library team to validate the search methods and the number of results. The original search resulted in 8,421 articles (Table 1).

The resulting articles were transferred to the referencing software (Endnote X7 ©1988–2016 Thomson Reuters) to remove any duplicates. The title and abstracts of the resulting articles were hand-searched using the inclusion and exclusion criteria (Table 2) to identify the number of qualitative research articles available in dentistry. This resulted in 451 articles. Filtering these to the focus of dental implants resulted in 25 articles. A flowchart depicting the workflow is shown in Figure 1.

In the second part, the resulting 25 articles were appraised against the 10-point checklist offered by the Critical Appraisal Skills Programme tool (*CASP—part of the Oxford Centre for Triple Value Healthcare Ltd (3V) portfolio*) for qualitative research articles ("Critical Appraisal Skills Programme," 2014). (Table 3).

3 | RESULTS

To provide a collective report, the results are presented under the following themes.

3.1 | Reported research aims

> CASP requirement: "what was the goal of the research; why it was thought important; and its relevance"

All selected 25 articles were graded as adequate for the CASP's requirement concerning the description of the research aims and their relevance. Seventeen articles were aimed at assessing patients' views on dental implants. The subject areas (Table 4) included patients feelings about losing teeth (Meaney et al., 2017; Parahoo et al., 2019), their experiences with impaired function following tooth loss (Lantto & Wardh, 2013), what their wishes and demands were from dental implant management (Abrahamsson et al., 2017; Atieh et al., 2016; Boeskov Ozhayat et al., 2019; Cronin et al., 2009; Grey et al., 2013; Johannsen et al., 2012; Kashbour et al., 2017, 2018a, 2018b; Narby et al., 2012), their engagement with private implant treatment (Exley et al., 2012), changes in their quality of life following implant treatment (Gatten et al., 2011; Hyland et al., 2009; T. E. Nogueira, et al., 2019; R. B. Osman et al., 2014; Rousseau et al., 2014), and why some elderly patients declined dental implant treatment even if it was available (Ellis et al., 2011). One article considered dental implant knowledge and understanding of the general public (Wang et al., 2015). This included how and where they seek out such information and their opinions on its relevance to their treatment. Four out of 25 papers focussed on dentists' views on implants. The research subjects included how dentists engage patients in decision making (C. E. Exley et al., 2009), dentists' opinion about the current implant provision, what are the future needs of this treatment regime (Kashbour et al., 2018a, 2018b), and what is their position in introducing high-cost treatment options to patients (Vernazza et al., 2015). One article discussed a new dental implant educational programme and the students' opinion of the learning experience (Fatemeh S Afshari et al., 2014). Another study investigated the educational value of YouTube patient testimonials (Ho et al., 2017).

TABLE 1 Search terminology, strategy and the resulting articles

	Search Terminology	Results				
		Medline	SCOPUS	Web of Science	ASSIA	Cochrane
1	Qualitat*.mp.	281,686	842,121	596,557	112,755	14,388
2	(Focus Groups or "focus Group*").mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	49,198	331,313	360,607	102,107	14,173
3	interview*.mp.	375,437	752,424	550,084	431,221	33,374
4	observation.mp	306,143	2,001,426	1,472,929	180,523	40,572
5	("reflective diary" or "reflective diaries").mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	97	605	206	46	6
6	narrative.mp.	35,196	182,015	165,003	108,315	1,610
7	(conversion or discourse or documentary or text or textual).mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	298,460	1,540,549	1,357,410	570,680	16,854
8	quality of health care.mp.	141,678	517,230	104,080	90,127	6,894
9	("Attitude to Health" or "Attitude of Health Personnel").mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	196,270	254,272	1,125	11,777	5,704
10	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9	1,459,288	4,932,349	4,176,491	1,466,674	118,179
11	(dent$ not dentigerous).mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	568,489	683,980	747,984	1,522,019	42,407
12	(endodont$ or "root canal" or periodont$ or prosthodont$ or "filling material$" or "oral surg$" or "oral health" or "oral hygiene" or caries or carious).mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	224,061	289,514	182,991	25,718	13,781
13	exp Oral Surgical Procedures/	68,037	30,900	11,130	1,154	3,671
14	exp Dentistry/	402,356	129,688	646,065	28,895	14,166
15	exp Dental Implants/	23,651	49,273	46,749	4,804	2,714
16	exp Dental Implantation/	21,891	31,375	7,170	547	1,339
17	exp Radiography, Dental/	21,899	33,342	6,556	863	1,147
18	exp Anesthesia, Dental/	11,162	17,445	4,184	1628	2,780
19	(implant$ or amalgam$ or composite$ or compomer$ or restoration$ or restorative or anesth$ or anaesth$ or sedat$ or radiog$ or radiol$).mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	2,025,537	5,782,428	2,507,729	518,021	75,195

(Continues)

TABLE 1 (Continued)

	Search Terminology	Results				
		Medline	SCOPUS	Web of Science	ASSIA	Cochrane
20	(tooth or teeth or molar$ or incisor$ or canine$ or cuspid$ or bicuspid$ or premolar$ or maxillofacial or maxilla$ or mandib$).mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	514,916	911,642	568,267	84,149	26,949
21	19 and 20	130,756	227,295	86,425	9,002	7,430
22	exp Dental Caries/	45,693	121,725	37,854	4,859	5,255
23	Caries.mp.	58,664	128,831	42,077	5,310	6,355
24	11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 21 or 22 or 23	724,455	1,363,853	848,435	163,147	48,239
25	10 and 24	38,288	87,694	48,529	7,549	2,855
26	animals/ not humans.mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	4,584,642	3,950,056	899,200	433,017	22
27	25 not 26	35,942	82,081	47,021	7,376	2,854
28	(dog or dogs or cat or cats or minipig$ or monkey$ or macaque$ or rat or rats or mouse or mice or rabbit$ or "animal stud$").mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	4,122,053	9,638,863	4,010,110	503,477	13,095
29	27 not 28	35,388	69,618	41,818	7,249	2,837
30	limit 29 to English language	31,728	61,301	41,142		
31	limit 30 to yr.="2006 -Current"	18,557	38,089	31,134		2,116
32	(dental implant or implant* or implantation or osseointegration or osteointegration).mp. [mp = title, abstract, original title, name of substance word, subject heading word, floating sub-heading word, keyword heading word, organism supplementary concept word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms]	497,750	163,827	327,211	105,917	34,379
33	31 and 32	1941	3,319	2,639	259	263

3.2 | Reported ethical reviews

> CASP requirement: If there are sufficient details of how the research was explained to participants for the reader to assess whether ethical standards were maintained; If the researcher has discussed issues raised by the study (e.g. issues around informed consent or confidentiality or how they have handled the effects of the study on the participants during and after the study); If approval has been sought from the ethics committee

Ethical approval has become the universal and basic publishing requirement for clinical studies. All the articles have cited their approval from the relevant ethical review committee. Only a few gave the details of consent, how the data will be recorded, stored for ethical review (Kashbour et al., 2018a, 2018b; Lantto & Wardh, 2013; Meaney et al., 2017). One of them did not mention ethical approval (Ho et al., 2017), but the research was a document analysis of YouTube patient testimonial videos which appeared to be exempted from ethical approval.

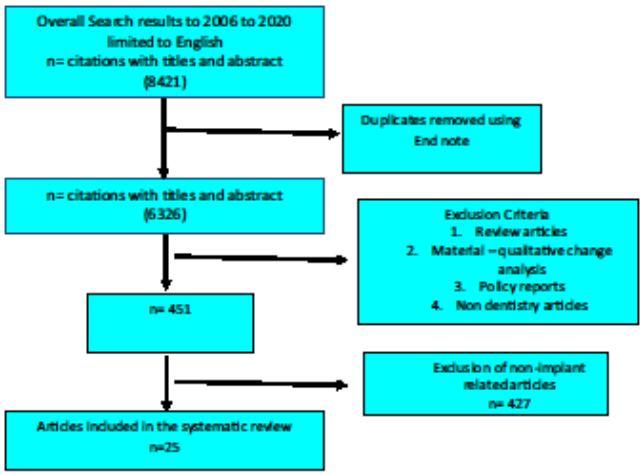
3.3 | Reasons for choosing qualitative methodology

> CASP requirement: " If the research seeks to interpret or illuminate the actions and/or subjective experiences of research participants; Is qualitative research the right methodology for addressing the research goal, if the researcher has justified the research design"

TABLE 2 Criteria for articles selection

Inclusion criteria	Exclusion criteria
1. Dental/ Implants related articles. 2. 2006- current. 3. English. 4. Predominantly qualitative.	1. Reviews, systematic reviews and literature reports and summaries of published articles. 2. Quantitative articles. 3. Pseudo qualitative. a. Studies that say qualitative but are not. b. Observation (of material properties, of implant survival, comparison of test and control groups, of mucosal changes). c. Quality of materials/ implant treatment. d. Interview studies to collect survival or success or pain or satisfaction with treatment. 4. Non-human. 5. Material Studies.

FIGURE 1 Study Identification Flowchart (Adopted from PRISMA 2009 Flow Diagram)



The researchers chose the qualitative methodology to interpret the experiences of the participants and to obtain a deeper understanding of the particular problem under investigation (Gatten et al., 2011; Hyland et al., 2009; Kashbour et al., 2018a, 2018b; T. E. Nogueira, et al., 2019). The reasons listed for choosing this methodology included exploring newly emerging trends within society (Cronin et al., 2009), and the flexibility of allowing the interviewer to explore and the interviewee to express opinions (C. Exley et al., 2012). Four of them used qualitative methods to complement their major quantitative research (Hyland et al., 2009; Osman et al., 2014; Rousseau et al., 2014; Vernazza et al., 2015). Alternatively, one author used the qualitative methodology, but expressed disagreement with the findings and recommended large quantitative studies instead (Afshari et al., 2014).

3.4 | Recruitment strategy mentioned

> CASP requirement: "If the researcher has explained how the participants were selected; If they explained why the participants, they selected were the most appropriate to provide access to the type of knowledge sought by the study; If there are any discussions around recruitment (e.g. why some people chose not to take part)"

Participants were either the patients who attended for dental implant treatment (Abrahamsson et al., 2017; Gatten et al., 2011; Grey et al., 2013; Hyland et al., 2009; Johannsen et al., 2012; Kashbour et al., 2017); or dentists who undertook either the clinical procedures or learned about the subject (Afshari et al., 2014; Kashbour et al., 2018a, 2018b). Purposive sampling was the commonly employed method (Cronin et al., 2009; Kashbour et al., 2018a, 2018b; Meaney et al., 2017; T. E. Nogueira, et al., 2019; Parahoo et al., 2019; Rousseau et al., 2014; Vernazza et al., 2015; Wang et al., 2015). Two of the studies started with an initial theoretical sampling developed from a larger group of participants of a quantitative study and then adding to the sample based on the data pooling (Lantto & Wardh, 2013; Osman et al., 2014). Snowballing was mentioned in one study, where the initial participants suggest further possible participants (Meaney et al., 2017). Inclusion and exclusion criteria were discussed in four studies (Boeskov Ozhayat et al., 2019; Gatten et al., 2011; Grey et al., 2013; Kashbour et al., 2017), to include a wider representation of variables such as age (Cronin

TABLE 3 The CASP criteria

1	Clear statement of the aims
2	Is methodology appropriate?
3	Was the research design appropriate?
4	Was the recruitment strategy appropriate?
5	Was the data collected in a way that addressed the research issue?
6	Has the relationship between researcher and participants been adequately considered?
7	Have ethical issues been taken into consideration?
8	Was the data analysis sufficiently rigorous?
9	Is there a clear statement of findings?
10	How valuable is the research?

TABLE 4 Statement of aims

Participants	Subject	Number of articles
Patients	Needs and demands	12
	Impaired function	1
	Effects of rehabilitation	1
	Experience post treatment	5
	Why dissatisfied with denture	1
Dentists	Decision making	2
	Approaches, Current situation, future needs	1
	Student needs	1
General Public	Views about implants—available knowledge	1

et al., 2009; Johannsen et al., 2012), gender, socio-economic variations (Parahoo et al., 2019; Rousseau et al., 2014; Vernazza et al., 2015) and different types of disabilities(Lantto & Wardh, 2013) such as functional, mental and elderly. Dropping out of selected participants and losing interview recordings were also reported (Cronin et al., 2009).

3.5 | Methodology, data collection and analysis of data

Details of data collection methods and the rigorousness of analysis are listed in Table 5. Eighteen studies used in-depth semi-structured interviews, six used focus groups, and one employed the document analysis method. Interview set-up such as choosing a quiet and convenient space and the use of a topic guide were discussed in all studies. Two of them modified the questions in the topic guide following the responses of previous participants (Abrahamsson et al., 2017; Meaney et al., 2017). All the interviews and focus groups were tape-recorded and verbatim transcribed. The researchers indicated that data saturation limited the number of interviews or focus groups.

Different coding methods such as line by line, focussed coding, hierarchical have been used and 13 of them used Nvivo software. Grounded theory was used by eight articles, and 21 of them used thematic analysis. Three authors have used the thematic analysis but did not state "thematic" in their description (Abrahamsson et al., 2017; Boeskov Ozhayat et al., 2019; Gatten et al., 2011).

Qualitative data analysis can be of two broad categories (Braun & Clarke, 2006). In the first category, the analysis starts with a predefined set of theories grounded from previous research. Nearly half of the selected studies have used the *grounded theory* approach to build on the theory by the constant comparison of resulting themes. The second category is the thematic analysis (Braun & Clarke, 2006), where the meanings identified from the data are thematised. In the appraised studies, the thematic methods suggested by previous researchers were used (Braun & Clarke, 2006; Miles & Huberman, 1994) which is described in Table 6. Two articles have stated that they used latent analysis methods. Inductive methods to identify themes were preferred over the deductive approach (Johannsen et al., 2012).

The use of triangulation methods to validate the study has been described in 19 papers. These methods were involving a wider team, and independent coding and analysis, conducting independent analysis by at least two researchers, peer debrief or inter-rater reliability (Burnard et al., 2008). Adherence to the published criteria (Dixon-Woods et al., 2004) and consolidated criteria for reporting qualitative research, COREQ (Tong et al., 2007), were also quoted to prove rigour (Table 5). Seven articles attempt to justify the researcher's role, and also indicate whether they were passive (Afshari et al., 2014), did not take part in active treatment (Abrahamsson et al., 2017; Boeskov Ozhayat et al., 2019; Narby et al., 2012; Osman et al., 2014) or were not part of the clinical team (Hyland et al., 2009; Johannsen et al., 2012). The results section in most of the articles were referenced with quotes from the participants.

3.6 | Content value of the research

The research aims of the reviewed articles are listed in Table 4. The majority of the articles evaluated (i) patients' views on tooth loss, (ii) how they receive information about dental implants and (iii) their experiences with dental implant management. Four of the articles evaluated the dentists' view on learning about dental implants and their opinions on dental implant provision.

Researchers observed that the patients interpreted *tooth loss* as a deviation from normality (Grey et al., 2013) as it changed their appearance and affected their eating and speech. Social withdrawal, a feeling of guilt and an enormous change in self-image were reported by the patients as the detrimental effects of tooth loss (Hyland et al., 2009; Narby et al., 2012).

Patients who lost their teeth expressed mixed views towards dental implant treatment. Some of them sought dental implants and others declined the same. Patients' decisions for dental implant treatment depend on their age, whether they are from an urban or rural background and the relative cost of implant treatment. One of the studies identified that the older age group patients (>70 years)

TABLE 5 Analysis of data

Author and year	Data collection method	Data analysis	Triangulation
Cronin M et al. (2009)	22 Semi-structured interviews	Inductive process to arrive at themes	data analysis was undertaken involving both researchers
Exley et al. (2009)	3 Focus groups and surveys (in future tense—not clear if it was completed study)	comparative method	None mentioned
Hyland R etal (2009)	66 Semi-structured interviews	Thematic Content analysis	None mentioned
Ellis et al. (2011)	Multi centre—5 Focus groups	Thematic analysis	For each transcript, at least two researchers coded and compared the data and resolved discrepancies when they occurred; thus, inter-rater reliability was established.
Gatten et al. (2011)	6 Focus groups (3 per each category)	mixed-method approach using both inductive (e.g. grounded theory) and a priori (e.g. theory driven from the literature) procedures.	All the transcripts were reviewed by two individuals
Exley et al. (2012)	27 semi-structured Interviews	constant comparative method	None mentioned
Johannsen A et al. (2012)	interviews	Conventional—latent content analysis (Burnard 1996, Graneheim & Lundman 2004) and inductive category development of meaning units (Hsieh & Shannon 2005)	All the authors were involved in analysis—till synthesis
Narby B et al. (2012)	17 Open interviews	constant comparative method described by Glaser and Strauss (modified grounded theory)	interpretation was discussed between all the authors
Grey EB et al. (2013)	Telephone interviews	Thematic—Braun & Clark 2006	thematic interpretation was discussed between all the authors.
Lantto A et al. (2013)	Open conversational interviews	Grounded theory—constant comparative method	Calibration was carried out in dialogue between the author and the co-author throughout the coding process.
Afshari et al. (2014)	Two Focus groups and survey	None mentioned Participants opinions were discussed descriptively	None mentioned
Osman et al. (2014)	In depth semi-structured interviews	focused coding (Pope & Mays 2000); says constant comparative (Hallberg 2006) once and then thematic analysis (Burnard et al. 2008) at another instance	the data analysis was validated by a third party, a process known as peer debrief or stimulate inter-rater reliability Burnard et al., 2008; Purposive sampling and multiple coding were employed to protect against bias and enhance the reliability of the research (Stewart et al., 2008)
Rousseau et al. (2014)	Semi-structured interviews	constant comparative thematic analysis (Glaser 1965, Strauss 1987)	Wider research team—involving social researchers
Vernazza et al. (2015)	interviews	constant comparative thematic analysis (Glaser 1965, Strauss 1987)	wider research team (which included a health economist, dentists, a sociologist and a psychologist)
Wang et al. (2015)	6 focus groups	Inductive method Grounded theory (Glaser 1992) Meaningful "text units" were extracted manually by line-by-line coding	thematic interpretation was discussed among and cross-validated by all the authors
Atieh MA (2016)	15 Interviews and survey	Adherence to COnsolidated criteria for REporting Qualitative research (COREQ) (Tong et al., 2007) inductive and content analysis was conducted to identify themes within the interview transcripts (Burnard et al., 2008) Thematic—(Braun & Clark 2006)	None mentioned
Abrahamsson KH et al. (2017)	15 Open-ended interviews	Grounded theory, Hierarchical Coding	None mentioned
Ho A et al. (2017)	202 You tube videos—document analysis	Data analysed statistically and qualitatively	Inter-examiner reliability mentioned for statistical analysis but not for qualitative part

(Continues)

TABLE 5 (Continued)

Author and year	Data collection method	Data analysis	Triangulation
Kazhbour et al. (2017)	38 face to face interviews	Thematic—Braun & Clark 2006	The wider research team included a social scientist, two clinical researchers; all were involved throughout the analysis process. Dixon-Woods et al.'s criteria used to monitor quality of the study(Dixon-Woods et al., 2004)
Meaney et al. (2017)	Semi-structured interviews	Five staged thematic analysis with mapping the themes Braun & Clark 2006	Analysis was done by primary author and then reviewed by the co authors
Kazhbour et al. (2018)	8 In depth semi-structured interviews	Thematic analysis (Braun & Clark 2006) Dixon-Woods et al.'s criteria followed.	multiple observers to achieve analyst/ investigator triangulation
Kazhbour et al. (2018)	38 semi-structured face-to-face and telephone interviews with 34 participants	generic qualitative approach, which is also known as interpretive description (Caelli, Ray, & Mill, 2003; Thorne, Kirkham, & MacDonald-Emes, 1997. Thematic analysis Braun & Clarke, 2006; Rapley, 2017 criteria developed by Dixon—Woods et al.	multiple observers/the wider research team is to achieve analyst triangulation and to look at the data from different perspectives, avoiding "blind spots" and enabling a more comprehensive analysis (Patton, 1999).
Nogueira TE et al. (2019)	2 or 3 Focus group	Thematic—Braun & Clark 2006	analyst triangulation (Patton, 1999)
Parahoo R et al. (2019)	15 semi-structured interviews	thematic analysis as recommended by Miles and Huberman spider diagrams and mind maps	Two researchers read the transcripts separately to generate themes
Boeskov et al. (2019)	35 semi-structured Interviews	Inductive approach of grounded theory Principles of a COREQ by Tong et al	

TABLE 6 Thematic analysis methods mentioned in the appraised studies

Braun and Clark (Braun & Clarke, 2006)	Miles and Huberman (Miles & Huberman, 1994)
1. Familiarising with the data. 2. Generating Initial Codes. 3. Searching for themes. 4. Reviewing themes. 5. Defining named themes. 6. Producing the report.	Matrices (intersection of two lists in columns and rows)and networks (nodes connected with links or lines).

declined dental implants as they had concerns about the surgery and having to cope with the unknown. The horror stories they heard about both the pain and about the procedure also influenced their decision (Ellis et al., 2011; Meaney et al., 2017). If they were offered implants, these patients developed second thoughts. They believed that either the dentist was not sympathetic about their age or that the dentist was overselling the procedure (Ellis et al., 2011). Patients were aware of the high cost of dental implant treatment and generally satisfied that the costs were justified (Abrahamsson et al., 2017). Some patients viewed implants as a cosmetic luxury as they are only available on a private basis (Exley et al., 2012). Patients also perceived implant treatment as beyond their budget, due to both the complexity and the requirement of high maintenance over several years (Nogueira, et al., 2019). Other patients were not willing to pay for an "unknown product" and wished to try the "merchandise" as they might do with other major purchases in life (Osman et al., 2014).

Patients living in rural areas had low expectations. This was related to inter-connected factors (i) lack of awareness by patients locally which led to lesser demand for dental implants, and (ii) dentists, in turn, did not provide dental implants due to lesser demand (Boeskov Ozhayat et al., 2019). Another study supported this opinion by reporting that dentists developed a pattern of providing less or giving out distorted information about the provision of advanced replacement of teeth, even when the patients wished to know about dental implant treatments available (Vernazza et al., 2015). In addition, Osman et al., 2014 identified that some patients declined dental implant treatment as they were happy with their existing prosthesis, for example patients already wearing satisfactory maxillary dentures declined maxillary implants knowing that this may improve the retention.

Information about dental implants for patients will frequently come either from social media or from friends and family (Kashbour et al., 2017, 2018a, 2018b; Nogueira, et al., 2019). Patients may not receive the correct information and will be either less informed or more likely misinformed by accessing such sources before they attend dentists for treatment. Patient testimonial videos were identified as providing misleading ideas on pain and life expectancy associated with dental implants (Ho et al., 2017). Statements such as "implants are better than real teeth," "permanent treatment that lasts for life," and a video where a patient advocates the extraction of all teeth with periodontal disease and replacement with a dental implant bridge were recognised by the researchers as not only misleading but also potentially dangerous.

Researchers noticed that the patients valued implant information most highly if it is received from clinicians (Kashbour et al., 2017). This information may be from dentists, dental staff, or from learning materials they see in the dental waiting room while they were visiting for other dental treatments (Wang et al., 2015).

Patient satisfaction was unanimously high with dental implants. The patients expressed that they regained normality of life after dental implant treatment. Normality was related to their improved

confidence and their ability to taste food (Narby et al., 2012; Nogueira, et al., 2019). Implants were seen as an integrated body parts, leading to enhanced quality of life (Johannsen et al., 2012; Lantto & Wardh, 2013). However, affordability of treatment was highlighted as important in another study (Atieh et al., 2016). Fee-paying patients recommended that if the payment was spread over a period of time, that is in instalments, this would make implant provision more accessible for a larger sector of the population (Osman et al., 2014). Hearing horror stories before treatment made patients anxious. Such patients reported that this unpleasantness was overestimated following treatment (Kashbour et al., 2018a, 2018b). Patient satisfaction was also related to the prosthesis outcome, that is ease of handling (Osman et al., 2014).

Complications during and after implant treatment can give rise to patient dissatisfaction at a later stage. Patients will have invested time and money into the procedure, will expect a return on their investment. Some patients were stressed when the problems occurred and exhibited shame and guilt. There were feelings of disappointment if they experienced problems especially if they had maintained regular contact with the dentist and the team whilst the treatment was being done (Abrahamsson et al., 2017). Researchers identified that patients who received misleading information such as "just like having natural teeth" in the treatment planning stage, will treat implants like natural teeth and therefore likely to make the mistake of not maintaining them via cleaning regimes (Grey et al., 2013; Wang et al., 2015). Alternatively, patients who were well informed by the dentists realise that they are responsible for looking after the dental implants. They understand that they may potentially be the cause of dental implant complications. They did not question the dentists' skills or management (Narby et al., 2012). In addition, if the clinician was able to solve the patient demands in a satisfactory manner, then it led to an improvement of the professional-patient relationship (Nogueira, et al., 2019).

3.7 | Dentist factors

Four articles investigated the dentists' views related to dental implant management. One study identified the major reason for referral was because the general practitioner did not perform implant treatment, and this was not due to fear of difficulty (Narby et al., 2012). Other studies recognised that the dentists recommended continued learning in dental implants (Cronin et al., 2009) and viewed specialist training as an important milestone for dental implant provision (Afshari et al., 2014).

4 | DISCUSSION

This current review analysed the qualitative research articles in the subject area of dental implants published from 2007 to 2020. The number publications still remain low during these years, in comparison with the total number of publications in dentistry. The frequency of publication ranged from 0 to 4 articles per year (Appendix A1), and 4 out of the 25 selected articles were published in non-dental journals (Appendix A2). Twenty-three articles used the qualitative methodology and the remaining two used the qualitative methodology as an adjunct to a major quantitative study (mixed methodology).

In contrast to the previous appraisal, the quality of the articles included in the current review was adequate, as many of them met the CASP requirements (Masood et al., 2011). This improvement in quality may be attributed to the demanding publishing requirements of high impact academic journals. The editorial process in most of the current journals requires a structured presentation including a statement of aim, the value of the subject, methodological rigour, and a detailed discussion of positive and negative aspects of the study. Finally, ethical approval has become a recognised standard (Newson & Lipworth, 2015). These mandatory requirements have resulted in the researchers highlighting the details of methodology such as sampling, data collection methods and triangulation. However, they fail to describe how did they do the analysis and developed the theories, which is the essence of qualitative research. One researcher stated that they used the constant comparative method in the introduction and thematic analysis in methodology (Osman et al., 2014). Conversely, the results and discussion confirmed that they used thematic analysis. While both the theories of Grounded Theory and thematic analysis may be used in dentistry, the authors should exhibit their understanding by explaining why they chose one method over the other.

4.1 | Content analysis

The cost of dental implant treatment was reported to be a major factor for patients. Apart from the two articles, all the studies were conducted on patients attending teaching hospitals, or secondary care set-ups where treatment cost was either nil or subsidised. Transferring the views of these patients to the general population who receive dental implant treatment on a private fee-paying set-up may not be appropriate (Gatten et al., 2011). One study raised the controversy of providing implants in a state-funded sector. The authors wrote that dental implants are seen as a cosmetic luxury and therefore not readily available in primary care. However, the global consensus is that implant-supported denture should be the first line of management for the edentulous mandible as it improves the quality of life overall other treatment regimes. (Exley et al., 2012). Another conflict concerns the age of patients. Contradicting views of one group of the older population accepting the status quo (Meaney et al., 2017) and another affluent group of older seeing tooth loss more problematic (Vernazza et al., 2015) were reported. This observation suggests that the age of the patient requires to be factored with the financial background while planning for dental implant treatment.

The patient satisfaction factor relates to the information received about dental implants. Misleading pieces of information from social media together with an enthusiastic dentist's overselling attitude can motivate the patients to have implant treatment without

understanding future maintenance and potential complications. In some instances, over motivated patients tend to ignore or miss the important dialogue clues from the clinician. These patients may consider dental implants as a panacea for the treatment of all cases of missing teeth (Wang et al., 2015).

Medical tourism and the associated challenge due to differing legislative practicing requirements between the patient's residing country and the country where the treatment was performed were identified in one study (Wang et al., 2015). Despite being conducted in a regional set-up, the questions raised by the researchers about the quality of service, possible risks and inconveniences are valid and can be transferred to be a global issue/problem.

The rapidly growing dental implant industry presents both opportunities and challenges (Wang et al., 2015). The review identified that all the themes revolve around the focus of patient communication and information they receive before dental implant treatment. Suggestions are provided to reduce those misbeliefs of patients generated by the information provided before the start of implant treatment. The inclusion of dental team members other than dentists is seen as a useful method to eliminate any misunderstandings.

Researchers identified the gaps in published guidance. One of these is the criteria related to the success of dental implants (Atieh et al., 2016). The original criteria were 1986 by Albrektsson et al. which was based on osseointegration and survival of dental implants. Additional factors such as prosthetic stability and absence of disease were added to this by many authors Schnitman & Shulman 1979; Albrektsson et al., 1986; Smith & Zarb 1989; Zarb & Albrektsson 1998). However, no major updates were made in the last two decades. As dentistry has become a patient-centric service, the success criteria based on technical success or survival may not be adequate. This should involve patient inputs and dentists' views in addition to the technical aspects. This will need more theories to be identified and therefore need more qualitative research. (Atieh et al., 2016). This should be facilitated by expanding opportunities for the researchers to practice truly qualitative research, that is to be rebellious not conforming to the norms or standards, and by recognising their work by making qualitative inclusive publishing guidelines.

4.2 | Strength and weakness of the CASP approach

The use of CASP tool for this study offered the following advantages and disadvantages. The tool provides a 10-point checklist to focus on the quality of the published material; however, the qualitative assessment of the actual content required a subjective evaluation.

A true qualitative researcher will not conform to any fixed guidelines due to the flexibility of the methodology. However, as health research is evidence-based, researchers should highlight the rigorousness in their methodology and take support from the previously published guidelines. This grey area influenced the review process. Also, more publications will elevate the quality in the evidence-based ladder, for example ability to undertake a meta-analysis.

4.3 | Topics for future studies

This analysis has reviewed the information that is currently available and indicated the possible future research avenues. Future studies in this area may include

- The understanding of the challenges faced by the clinicians in the learning and implementation of dental implants in their clinical practice
- How dental education courses can assimilate the teaching of dental implants in the curriculum
- How to increase the effectiveness of other members of the dental team in increasing the success of dental implant practice.

In-depth interviews and focus groups were the most used methodologies in the reported studies. While social research methods such as large ethnographic studies may not be easy in dental research, other methods such as document analysis and participant observations can be explored.

5 | CONCLUSION

The review identified the following important findings.

- While the quantity of qualitative research in dental implants remains low, the quality has improved in the past two decades,
- There is a large gap in the understanding of patients' and dentists' views on dental implant management. Few examples are the non-availability of patient inclusive dental implant success criteria and dental implant maintenance guidelines for general practitioners.

AUTHOR CONTRIBUTION

Sivakumar Jayachandran: Conceptualization (lead); Data curation (lead); Formal analysis (lead); Investigation (lead); Methodology (lead); Project administration (lead); Supervision (equal); Validation (equal); Writing-original draft (equal); Writing-review & editing (equal). **Kirsty Hill**: Conceptualization (supporting); Methodology (supporting); Project administration (supporting); Supervision (equal); Validation (equal); Writing-original draft (supporting); Writing-review & editing (supporting). **Anthony Damien Walmsley**: Conceptualization (supporting); Data curation (supporting); Methodology (supporting); Project administration (lead); Supervision (lead); Validation (supporting); Visualization (supporting); Writing-original draft (equal); Writing-review & editing (equal).

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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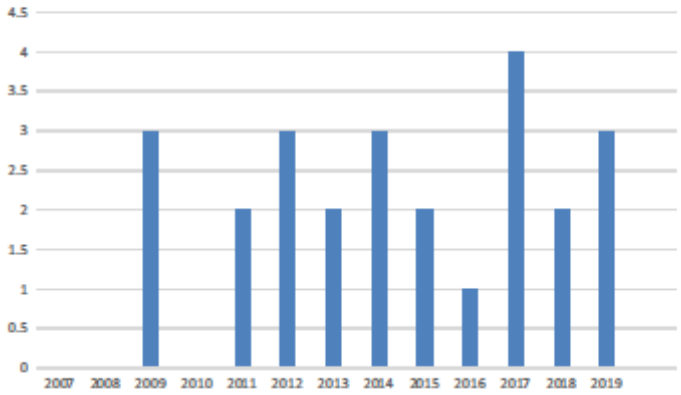
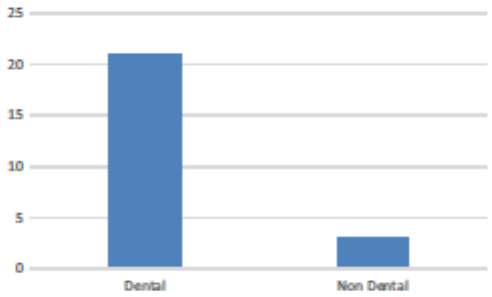
APPENDIX A1

No. of articles n = 25



APPENDIX A2

Number of Publications



Conference Paper Presentation

2020 IADR/AADR/CADR General Session (Washington, D.C., USA)

(Cancelled due to COVID 19 pandemic)

IADR Abstract Archives

Dental Implant Practice and Education-Current Status and Future Challenges

Objectives: To explore General dental practitioners' view on current dental implant practice and about the available learning opportunities during their undergraduate period and post-graduation.
Methods: A qualitative methodology using in-depth interviews was used. The sample size was guided by saturation of information. Twenty-two dentists from different educational, and geographic backgrounds were interviewed. They were from both within the UK and from overseas countries. They were also with different levels of experiences ranging from recent graduates to nearly retiring dentists. The interviews were transcribed verbatim and organised with NVIVO software. The transcriptions were coded, and a framework analysis method was used to identify themes.
Results: Analysis of interview data resulted in different themes which opened multiple areas for discussion. These included confidence of dentists in managing dental implant patients, need for guidance in relation to dental implant maintenance and recalls, current status of UG and PG curriculum. Some suggestions to improve dental implant education were also identified.
Conclusions: The study identified the reasons why general dentists are not comfortable in dealing with dental implant related managements. The educational needs both in undergraduate and postgraduate training have been identified.

Division: IADR/AADR/CADR General Session
Meeting: 2020 IADR/AADR/CADR General Session (Washington, D.C., USA)
Location: Washington, D.C., USA
Year: 2020
Final Presentation ID: 2265
Abstract Category|Abstract Category(s): Education Research

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SESSION INFORMATION
Oral Session
Beyond Dental School, Patients, Stress & Trust