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"Evaluation of clinical parameters considered to be important in the success rate of dental implants by clinicians''

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Contents

Abstract

It seems that implant therapy is a predictable and successful treatment for oral rehabilitation, thus, allowing it to gain tremendous popularity for prosthetic reconstruction in selected patients. To assess the implant therapy performance, among different measures, survival, failure and success of implants are the most common controls implemented by clinicians and researchers. There are different proposed criteria of success, which are used as guideline to evaluate outcomes of implant dentistry.

The main goal of this project conducted as an audit is to assess the compatibility of practitioners' (practicing implant dentistry) criteria of implant treatment success with agreed guideline

This project was approved and conducted at "Bart's and the London school of dentistry Implant Review Clinic" in June and July 2019. Based on population number of 20, a sample size of 15 practitioners was selected to achieve confidence level of 95% and marginal error of 12%. Data was collected with a designed questionnaire and checked for accuracy.

The proportion of participants in terms of gender was 60% for male 40% for female practitioners. The ratio of staff/student reported at ½ with average work experience of, respectively. 20% of practitioners did not mentioned any parameter of guideline. 20% of sample population noted the guideline parameters completely. 93% of participants mentioned at least one of the frequently used parameters of success rather than guideline. Aesthetic and appearance had the highest level of notation by clinicians. Small proportion of (20%) practitioners noted the same criteria of success with guideline. The number of guideline parameters mentioned by clinicians was higher among staff and female practitioners.

Appearance and aesthetic, a frequently used factor in literature, showed the highest level of popularity among the clinicians.

In conclusion, there was a poor level of compatibility between practitioners' criteria of success about an implant treatment and established guideline criteria of success. it seems that there is a need of updating the current guideline based on patient-centred approach as well as informing the practitioners with updated guideline.

Declaration

"Except for the help listed in the Acknowledgements, the contents of this thesis are entirely my own work. This work has not previously been submitted, in part or in full, for a degree or diploma of this or any other University or Examining Board."

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Introduction

This study was conducted as an audit to find out the main factors considered by dental practitioners for assessing an implant placement as a successful treatment. The primary objective of this audit is to evaluate the compliance of practitioners' criteria of success in implantology with agreed guideline. The second objective was to evaluate other parameters, which are not in guideline criteria but are used frequently by clinicians, considered by practitioners who deliver implant treatments.

To assess implant treatment performance and outcome, success and survival rates could be good measures; however, there is a diversity and lack of homogeneity in defining the exact criteria, making it difficult to evaluate successful implant treatment precisely. There are several proposed criteria of success for osseointegrated implants. In 1996, British Society for the Study of Prosthetic Dentistry adopted Albreketsson criteria, proposed in1986, as guideline criteria of success. As implant dentistry evolves very fast, it could be beneficial to update the guidelines based on current considerations and based on new scientific findings.

Chapter 1

Literature review

This literature review was done over a limited time from December 2018 to March 2019. During this period, 192 of articles, books, assays and journals were reviewed from which 93 papers were found closely related to this audit and therefore are reflected on this literature review section. This literature review aims to illustrate the importance of survival and success as main measures to assess implant treatments outcomes regarding to accepted criteria of successful treatment and associated factors. The purpose of oral rehabilitation involving implants is to restore oral function and facial appearance and form, which a result of absence or loss of teeth and associated structures and may be achieved by a collective action of different restorative procedures. Available data in arbitrated journals point out that this aim may be attained by insertion of particular implants as structures that are scientifically recognised effective in treatment plan of complete and partial edentulous patients (Misch, 2008). In 1978, the National Institutes of Health Consensus Development Conference Statement on Dental Implant Benefits and Risk concluded that, “clinically, thousands of patients have been treated with dental implants for years and there is no question that many received long-term benefits”. This concept led to evolution term of implantology or implant dentistry, the science involved in implementing and/or management of oral structures (implants) to bring back oral function and facial form as a valued addition in oral rehabilitation. To study better, professionals commenced to provide new terminologies for this science. Per-Ingvar Brånemark established the modern concept of implantology by introducing osseointegration. He used the term of “osseointegration” in 1967, however, it was

first observed, although not clearly stated, by Bothe in 1940 (Rudy, 2008). American Academy of Implant Dentistry (AAID) defined it as ”contact established without interposition of non-bone tissue between normal remodelled bone and an implant entailing a sustained transfer and distribution of load from implant to and within the bone tissue”(Branemark,1983). Osseointegration can be quantified as the amount of the entire implant surface that is in contact with bone. Over the time, the grade of bone contact may increase. However, osseointegration at a microscopic and molecular level has not been completely discovered. At molecular level, there is an intact fusion of the bone and the implant surface with a gap of approximately 100 nm in width occupied by collagen. It has been proposed that the osseointegration is dependent on the factors like Implant design and diameter, staged surgery protocols (submerged or no submerged), Bone factors, Loading settings and Prosthetic concerns(Palmer, 2011).

To analyse the outcomes of implant dentistry, some definitions and agreed guideline should be provided through the valid literature. In this field, survival and success of implants are the most common outcome measures to assess performance of treatment. Particularly, it is vital to create and assess success criteria for implants and implant systems to be tested in amenable clinical trials. Development of criteria for success of dental implants reflects the advance of knowledge of implant performance and biologic reactions to them (Chaytor, 1993).

However, a consensus especially in relation to success has not been reached a homogenous conclusion; hence, authors provide their own criteria (Misch, 2008, Carr, 2011). survival, the most collective outcome measure to assess performance in clinical reports, means whether the implant is still physically in the mouth or has been removed (Albrektsson, 1986;Misch, 2008;Cakarer , 2014) . Supporters of this method say it makes a clear demonstration of the success. Opponents discuss that implants that must be explanted because of pain, disease or excessive bone loss may be maintained and are improperly recorded as successful treatment

(Misch, 2008).The most common indicator of survival term in success criteria is demonstrated by mobility. The clinical term "lack of mobility" may be used to demonstrate implant movement, and is a clinical condition, which is dominantly used for implant integration evaluation. Absence of movement in in implants in clinical examinations does not guarantee the true absence of mobility. In a molecular context, Although it is considered as zero clinical mobility, a successful inserted implant may move less than 75 μm (Sekine,1986).Several different types of mobility have been recognised namely rotational mobility, lateral or horizontal mobility and axial or vertical mobility(Esposito, 1998). Another important indicator, which is frequently used in different criteria of success, is MBL (marginal bone loss). Existed bone around the implant marginal area is usually an important measure of implant health. Different researchers defined different acceptable amount of marginal bone loss for successful treatment. The level of the marginal bone may be determined from the marginal position of the implant at the primary (first) stage of implant surgery. Radiographic assessment is the most popular method amongst the researchers and clinicians to asses bone loss after the period of healing. Undeniably, routine radiographies only screen the bone loss around the implant body in limited dimensions (mesial or distal). As will be mentioned in details later, Albrektsson suggested success criteria for MBL, among other parameters, in 1986. It permitted maximum1 mm MBL during the first year after prosthesis installation followed by annual 0.2 mm. A classification of hypothetical patterns of implant marginal bone loss after the first year was suggested by Schwartz: a low-rate marginal bone loss over the years (Albrektsson's accepted process); low-rate marginal bone loss in the first few years followed by a quick loss of bone support; high-rate marginal bone loss in the first few years followed by almost no bone loss; and continuous high-rate marginal bone loss leading to a complete loss of bone support (Schwartz, 2005). Lately, the increase of data regarding MBL and an improved understanding of bone and soft tissue performance

around the implant region have shown these criteria to be inaccurate for the majority of implant systems. Based on all above, a number of criteria has been suggested for the definition of success. However, this variety makes comparison between studies difficult.

Schnitman, in 1979, proposed his criteria of success as follows:

1. The mobility of the implant in any direction should be less than one millimetre.
2. Radiolucency noticed in radiographies was classified; however, no success criterion was established.
3. The amount of bone loss should not exceed the one third of the vertical height of the bone.
4. Gingival inflammation agreeable to treatment, absence of signs, symptoms and infection, absence of paraesthesia and anaesthesia, absence of damage to adjacent teeth, or violation of maxillary sinus or floor of the nasal passage or the mandibular canal,.
5. A five years of functional service in 75% of patients was reported (Schnitman, 1979).

Cranin added bleeding and saucerisation to his criteria:

1. At least 60 months or more of survival.
2. Absence of major radiographic evidence of cervical saucerisation.
3. Absence of haemorrhage
4. Immobility.
5. Lack of any tenderness in percussion or pain in region.
6. Absence of gingival hyperplasia or any granulomatosis in cervical region.
7. Lack of widening around the implant on radiograph.(Cranin,1982)

In 1984, McKinney introduced his criteria of success, divided his criteria to subjective and objective criteria, and concluded a success criterion:

Subjective criteria

- Adequate function
- Absence of discomfort
- Patient feels improvements in appearance, psychological and emotional attitudes.

Objective criteria

- Good VD (vertical dimension) and appropriate occlusion.
- Amount of bone loss should not exceed than one third of the vertical height of the implant, there is no symptoms and after 5 years, the implant is still functionally stable.
- Gingival inflammation susceptible to treatment.
- Mobility in all directions should not be more than 1 millimetre (buccal, lingual, mesial, distal and vertical).
- Absence of symptoms and infection related with the dental implant.
- Lack of harm to adjacent teeth and their supporting structures.
- Lack of violation of mandibular canal or maxillary sinus or any kind of paraesthesia.
- Absence of polymorphonuclear infiltration and presented a healthy collagenous tissue.

Success criterion

- 75% of implant patients can benefit a functional service of at least 5 years (Karthic, 2013).

In 1986, Albrektsson introduced original criteria of success, which has been approved by numerous scientists and clinicians:

1. An individual, unattached implant is immobile when tested clinically.

2. Radiographic examination does not reveal any peri-implant radiolucency.

3. After the first year in function, radiographic vertical bone loss is less than 0.2 mm per annum.

4. Absence of signs and symptoms such as pain, infection, neuropathies, paraesthesia, or violation of inferior dental canal.

5. In content of criteria mentioned a success rate of 85% at the end of a 5-year observation period and 80% at the end of 10-year observation as a minimum criterion for success.

Further, in 1998, Esposito tabulated a number of criteria for success, which were approved upon at the first European Workshop on Periodontology. Following were to be considered success criteria for osseointegrated dental implants suggested by him:

1) Immobility.

2) During the first year of function, a normal radiographic marginal bone loss should be less than 1.5 mm.

3) Thereafter, the annual marginal bone loss must be Less than 0.2 mm.

4) There is no pain/paraesthesia (Esposito, 1998).

In 2007, the International Congress of Oral Implantologists (ICOI) at Pisa Consensus Conference proposed modified criteria of success, survival and failure of dental implants. Based on these criteria, successful implant treatment is considered with optimal health settings. No pain is detected with percussion, function or palpation. Implant is immobile at all of directions with loads less than 500 g. The implant has no history of suppuration. Less than 2.0 mm of marginal bone loss is detected in radiographies compared with the implant insertion surgery the prognosis of successful implants is very good to outstanding (Misch, 2008). In 2012, Papaspyridakos conducted a systematic review through studies published in English from 1980 until 2010 to evaluate the most common criteria to define treatment success in implant dentistry. The most frequently reported criteria for success or failure at the implant level were found out as mobility, radiolucency, pain, and peri-implant bone loss (> 1.5 mm).Suppuration, bleeding, and probing pocket depth were the most popular peri-implant tissue level. The criteria used to assess success at the prosthetic level included occurrence of technical complications/prosthetic maintenance, adequate function, and aesthetics during the five-year period. The criteria reported to assess patient consisted of satisfaction with appearance, Lack of discomfort, and ability to function and chewing (papaspyridakos, 2012). These modifications was a response to continual development and increasing demands for dental implant treatment. This popularity is attributed to some factors, as well as tooth loss, low performance of regular prostheses, rising patients' expectations, increasing expectedness of implant-supported restorations and endorsement by dentists. Due to the large number of existing variables such as surgical techniques, type of materials used, patient medical and dental factors and interval of follow-up, Studies on success rates in implantology are

compound because. However, not all implant treatments are successful as Albrektsson the end of his proposed criteria stated that, "some implants fail in patients within six months and some have resulted in extensive bone loss and produced irreversible defects and complications". Failure occurrences are inevitable as implants are not without possible complications. A noticeable number of implants fails to integrate or do not survive for a long functional time (Esposito, 1998; Goodacre, 1999). Implant failure is illustrated as the full failure of the implant to achieve its purposes (function, appearance, reconstruction, phonetics) due to mechanical or biological reasons (Elaskary, 1999). It is easier to describe a clinically failed implant than the successful one. Any kind of Horizontal mobility which exceeds 1mm or any vertical movement observed clinically by implementing a force of less than 500grams, pain during the percussion or function or fast progressive bone loss which is not responsive to the stress reduction and therapies indicate failure and regardless to the situation of the implant in the mouth, it has failed (Misch, 2008). Rosenberg categorised implant failures as infection failure and traumatic failure. An implant was considered to have failed from infection if at least one of the following criteria were observed:

- Clinical signs of infection with classic symptoms of inflammation.
- High plaque and gingival indices.
- Pocketing.
- Existence of glaucomatous tissue.
- Attachment loss.
- Bleeding.
- Radiolucency around the implant
- Suppuration.

Implant was supposed to fail because of traumatic circumstances if the following conditions existed.

- Radiographic peri-implant radiolucency.
- Mobility.
- Absence of increased probing depths.
- Absence of glaucomatous tissue upon removal.
- Low gingival and plaque indices.(Rosenberg, 1991)

In 1998, Esposito et al presented a classification of implant failure according to osseointegration idea. Based on this classification, failures can be divided to biological failures (connected to biological processes), mechanical failures of components, iatrogenic failures (due to malpositioning or violation of anatomic structures) and Inadequate patient adaptation (phonetical, psychological or aesthetical problems) (Esposito, 1998). The biological failures can be classified into “early failures” (due to unsuccessful osseointegration, indicating impaired or jeopardized bone healing) and “late failures” (due to loss of osseointegration) (Manor Y, 2009). The aetiology of these two kinds of failures can often be different. An early failure of an implant results from incapability to establish an intimate contact between bones and implant (Esposito, 1998). This can result in to implant mobility and consequently to marginal bone loss. However, late failure of an implant has been associated with peri-implant pathology resulted from plaque-related gingival problems (classical pathogenesis) or overloading (retrograde pathogenesis). Peri-implant pathology is defined as inflammatory responses with loss of supporting peri-implant bone tissue and is the main cause of late dental implant failure after implant being osseointegrated. The term peri-implantitis demonstrates the bone loss because of bacteria around an implant. Peri-implantitis is defined as an inflammatory procedure affecting the tissue around an implant in function

that has resulted in loss of supporting bone. Bacteria is dominantly the prime factor for bone loss around an implant. The sulcus of implants, particularly when probing depths are more than 5 mm is a common area that anaerobic bacteria could be detected. Stress-induced bone loss (overloading the bone-implant contact surface) occurs without bacteria as the primary causal mediator. However, once the bone loss from stress or bacteria extends the sulcular crevice and decreases the oxygen tension, anaerobic bacteria may become the superior contributor to the continued bone loss (Misch, 2005). In other words, the bacteria involved in peri-implant pathology may often be secondary to one of the prime contributing factors. Similarly, Heydenrijk categorised implant failures regarding to occurrence in time. Early failures in which the intact connection between bone and implant has never been established, thus, representing a problem with healing process. Late failures where osseointegration is not maintained indicating processes involving loss of osseointegration. Soon late failures and delayed late failures propose Implants failing in subsequent years. The author then suggested that early failures occur prior to prosthetic rehabilitation. Late failures, which occur following prosthetic rehabilitation, have been divided into soon (overloading in relation to poor bone quality and insufficient bone volume) and delayed (advanced changes of the loading conditions) in relation to bone quality) (Heydenrijk, 2006). High occlusal load affects the implants, its components and the prostheses and may finally lead to failure. When the term ‘overload’ is being used, it is indirectly suggested that an implant is in the process of either poor condition or failing, or has already failed (El Askaray, 1999). The costs of overload of dental implants can be divided into two groups: biological and biomechanical complications. In case of overload, balance between bone resorption and deposition is being disturbed. Thus, causing fatigue-induced micro-fractures in bone–implant region**.** These fractures could be repaired by bone resorption and a following ingrowth of connective tissue and epithelium instead of new bone (Lobbezoo, 2006). This situation will result in loss of

osseointegration. To reduce the risk of failure, a number of patient's general medical(age and life expectancy, general health like psychoses, irradiation of jaws, tobacco smoking and particularly diabetes) and oral/dental factors(mucous membranes, teeth periodontal tissues, oral health ,parafunctional habits, available bone) should be taken into account which may contraindicate or modify treatment (Hobkirk,1995). British Society for the Study of Prosthetic Dentistry (BSSPD) proposed the following criteria for application of successful osseointegrated dental implants:

1**)** Effective use of implants is determined by on an approving anatomical form and environment biocompatibility.

2) Adequate bone dimensions (height and width) must be available to a safe insertion of implants without violating adjacent anatomical structures (such as maxillary sinus, the neuro-vascular structures, floor of the nose and adjacent teeth).The implants should not invade or interfere with the function of the muscles, tongue or lips.

3) Enough bone volume must be existed to permit insertion of implants of an appropriately large dimension to survive in functional loading. It should allow optimal axial inclination to achieve the aesthetic and functional requirements.

4) The implant rendering the maximum interface with bone should be placed to achieve optimal load distribution.

5) The three dimensional interjaw relationship should be favourable.

6) If the current conditions do not suffice, adjunctive surgical procedures, such as bone grafting, osteotomy and vestibuloplasty should be considered.

7) There must be acceptable access for the surgical practice as well as adequate space for prosthetic reconstruction process and for following oral hygiene measures by the patient (BSSPD, 1996). These predictors such as quality and quantity of bone, the dentist's experience, oral hygiene maintenance, patient's age, axial loading, dimension of the implant, and site of implant placement should be considered for implant successful treatment (Porter JA, 2005). For long-term implant success, a good quality (density) as well as volume (quantity) of bone around the implant and an intact interface between them is necessary. BSSPD has presented a classification of jaw form after tooth loss, which helps the explanation of the existent bone and facilitates the communication among researchers and clinicians:

A) Classification of anterior (anterior to mental foramina) mandible

B) Classification of posterior (posterior to mental foramina) mandible

C) Classification of anterior maxilla

D) Classification of posterior maxilla

I. Dentate

II. Immediate post extraction

III. Convex ridge form

IV. Knife edge ridge form

V. Flat ridge form

VI. Loss of basal bone that may be widespread but follows no predictable form

Available bone is vital in implant dentistry and describes the external structure (quantity) of the implant site. Moreover, bone has an internal structure defined in terms of density or quality, which reflects the elasticity and mechanical strength of the bone. The quality of available bone in an implant site is a vital factor in the whole process of implant treatment like number and design of implants, surgical techniques, healing and loading time (Renouard, 2006). Overall, bone quality is a critical factor in choosing an implant and surgical procedure (Sevimay, 2005). Dense bone increases the percentage of bone-implant interface and provides more primary stability to the implant during the healing time after surgery. Furthermore, this type of bone quality allows better distribution of the stresses that occur at the implant-bone interface during function. It has been shown that the bone quality has a considerable impact on the stresses and strains around osseointegrated implants (Holmes, 1997). In other words, the key factor for success and initiation of osseointegration is the primary stability at implant placement. Studies have illustrated that the quality of the alveolar bone is the most important factor for achieving good primary stability. The primary stability could be improved with the quality of available bone, which would advance the osseointegration and increase the survival probability of the dental implant. However, it does not mean that the use of dental implants must be limited to sites with generous residual ridges. New regenerative techniques for ridge augmentation as well as implant innovative designs allow implant insertion in more complicated sites with deficient alveolar bone (Mijiritsky, 2013). Implant design and implant length are factors which tremendously affect the primary stability. However, correlation between implant length and survival or success rate of implants has not been observed completely. A study of fixed single-unit restorations revealed that a relationship between implant length and success might not exist, particularly over 13 mm in length (Eckert, 2001). Macro and microstructure engineering parameters of the implant, such as shape, presence of micro threads, type of connection between implant

and abutment, shape of threads, and surface treatment have been described to impact on surface interactions between implant and bone and therefore the maintenance of osseointegration. (Shin, 2006). Contrasting with micro designs, which are mainly surface treatments aimed to facilitate the attachment of the bone tissue to the implant surface, macro designs as if implant geometries such as thread pitch, helix angle, width, and depth are vital for achieving effective primary implant stability (Ma, 2014). No study shows significant differences in long-term success among different type of dental implant. Today, many manufacturers produce endo osseous dental implants with root shape, composed of titanium with various surface treatments and dimensions. Implant surfaces vary in their chemical and structural structures that aim to boost the biologic response. Surface treatments like anodized, acid etched, calcium phosphate coatings, sandblasted and laser-modified. IN 2014, Esposito stated that more than 1,300 different implants are available(Esposito M., 2014). Comparison of the failure rates of 38 different types of implants in terms of surface characteristics, shapes, and materials, did not observe any significant evidence show the advantage of any particular type of implant characteristic or implant system over another. Almost all the major manufacturers can display success rates greater than 90%, and the more advanced systems have achieved more than average success rate for more than 10 years. Another factor that should be considered related to bone quality and primary stability is bone augmentation. The survival rate of implant placement in grafted and native bone has been compared directly in some studies. However, the results have been inconsistent and often affected by several limits. A systematic review (Wallace Ss, 2003) found no difference between the survival of implants placed in native or augmented bone(Sbordone L, 2009). Owing to atrophy of hard and soft tissues consequential to tooth loss (Amler, 1960), implant site may lack sufficient amount of bone volume to attain adequate primary stability. In this case, Different options of bone augmentation prior to implant placement have been introduced. Several clinical studies

have shown that the survival rate of implants placed in primarily augmented autogenous bone is high and comparable to implants placed in native bone (Buser, 2002; Levin, 2007; Thoma, 2019). A systematic review conducted by Hammerle Compared the survival rates of implants placed at sites augmented by GBR versus native bone. No important differences were observed between implants in restored bone compared to implants in native bone (Hammerle, 2003). Similarly, a retrospective study by Levin et al showed that Implant placement in augmented areas presents high survival and success rates with minimal marginal bone loss (Levin, 2007). Due to the risk of osteoporosis, implant survival and surgical risks have been repeatedly examined in post-menopausal women. According to the Lekholm and Zarb classification of bone quality, osteoporotic bone is regarded as type IV bone(Lekholm U., 1985). Due to reduced primary implant stability in type IV bone, it is more likely to find a reduced survival rate among is type of bone. A review by Tsolaki on 39 studies, including animal and human studies, found that there were lower rates of osseointegration in osteoporotic bone than in normal bone(Tsolaki I., 2009). However, some studies did not confirm osteoporosis as a risk factor for osseointegration of dental implants (Dao, 1993). Holahan found that osteoporosis and osteopenia, the two conditions that could affect the quality of the head bone, are not contraindications to dental implant treatment (Holahan, 2008).A study by Slatger on osteoporotic patients concluded that endosseous implant treatment is not contraindicated (Slatger, 2008). Radiotherapy is the treatment largely employed for cancer and malignant tumours in that region, and osteoradionecrosis is one of the oral consequences of radiation therapy. Although radiation therapy is not an complete contraindication to implant therapy, the recorded success rate is just about 70%.There is a lack of long-term studies, but Jacobson in1988 showed increasing implant loss over time(Jacobson, 1988). In addition to quality and quantity of the bone, implant survival rates have also been associated with other elements like patient's age. Majority of implant patients

are aged individuals as there is more likelihood of tooth loss with high longevity. Patient's condition is distinctly different among individuals especially in the elderly. Implant failure looks to be a multifactor problem; hence, it is undistinguishable that aging itself is a risk factor for the placement of implants. Although the integration process itself is not jeopardised by increased longevity, older patients, hypothetically, have possibly longer healing periods, more systemic health issues, more problems familiarising to new prostheses, and a reduced ability to maintain hygiene. Several authors have discussed the age as a prognostic indicator in implant success. A study by Bryant, concerning implant outcomes in senior and junior individuals, found no contraindication to the use of endosseous implants in elderlies (Bryant, 1998). The quality and volume of available bone for insertion and the surgical technique used are more vital factors than age. However, the older the patient the greater possibility of unfavourable bone conditions, so caution in selecting the surgical sites is sensible. On the other hand, while lower age limit is not evident to be a limit for successful osseointegration, osseointegrated implants perform like ankylosed teeth, thus, lacking the ability of natural teeth to accommodate with skeletal growth. This situation may be acceptable in adult patients; however, it is a crucial consideration in adolescent or younger patients with growing potential. Possible problems of the placement of implants too early in life may be the immersing of an implant into the jaw, loss of support for the implant, reposition of the implant, and potential for interfering with normal growth of the jaws.

Studies point out that dental implants can be successfully inserted and maintained in patients demonstrating a diversity of systemic disease and congenital defects. However, it should be considered that those studies ,which report a low level of implant failure or complication risk associated with the health condition of the patients, are restricted to case report and case series (Malet, 2018). Diabetes mellitus is one of the world's major chronic health problems. It is a metabolic disorder consequential from malfunctioning secretion or lack of sensitivity to

insulin leading to hyperglycaemia (growth of glucose level circulating in the bloodstream). As stated by the American Diabetes Association, there are three types of diabetes: Type I, Type II, and gestational diabetes mellitus (GDM). Wounds in diabetic patients heals with delay, moreover, they express increased inflammatory tissue destruction, increased periodontal disease, and increased alveolar bone loss which are possibly complicating parameters when inserting implants. In addition, bone and mineral metabolism are different in diabetics, potentially interfering with the integration procedure. However, diabetes is not a total contraindication for dental implant treatment. In fact, a good rate of 85–95% global success has been achieved in well-controlled diabetic patients, which is only marginally lower than in healthy, non-diabetic people. A number of studies have shown success with dental implants in patients with controlled diabetes. A study of 40 patients conducted by Fiorellini, found lower success rates in diabetic patients, almost 85%, but the authors suggested that this was still a sensible treatment outcome. The majority of the failures occurred in the first year after loading (Fiorellini, 2000). In another study, over 650 patients with Type 2 diabetes and implant treatment were observed. Findings showed marginal more failures than nondiabetic patients (Morris, 2000) did. In addition, Kapur published a conducted study compared diabetics with moderate levels of metabolic control with nondiabetic patients and concluded that there is an acceptable success rate in for dental implants amongst the diabetic patients. In studies assessing the success or survival of dental implants in diabetic participants, a higher rate of failures has been detected compared to late-onset failures (Farzad,2002;Fiorellini,2000).Other studies found that the rate of implant failure between diabetic and non-diabetic volunteers is significantly different (Morris,2000; Loo ,2009;Moraschini,2016). In addition, diabetes has a strong two-way relationship with periodontitis, which is another risk factor for implant success (Perishaw, 2012). It is evident that dental implants do not decay, as they do not have any organic structure like pulp that

means dental indices may not suit for implant evaluation; thus, periodontal indices are usually used for evaluation of implant success. However classification of periodontal disease and the terms used to describe these dental conditions has made controversies when applied to implants (Misch, 2008). Studies by Mombelli, Rosenberg, and Leonhardt have demonstrated the presence of periodontal microorganisms around failing implants, illustrating that the microbiota around an infected implant corresponds to that detected at sites with periodontitis. Similarly, the peri-implant microbiota in well-maintained implant targets resembles to the bacterial flora found around teeth with healthy periodontium (Leonhardt, 1999; Mombelli, 1987, 1995; Rosenberg 1991). Patients with a history of periodontitis may demonstrate lower implant success rates than patients without a past periodontal diseases and were more likely to biological problems such as peri-implant mucositis and peri-implantitis(Simonis P, 2010). Since studies have indicated that periodontal pathogens may spread from pockets around teeth to peri-implant regions (Gouvoussis, 1997), it is sensible to expect that the risk of peri-implant infection may be higher in patients with periodontitis than in periodontally healthy persons. A history of cured periodontitis does not appear to impact unfavourably on implant survival rates, but it could have an undesirable effect on implant success rates, mostly over longer periods (Klokkevold, 2007). Baelum showed that inserted Implants in patients with and without history of periodontitis have a same survival rate over a 5-year period (Baelum, 2004). Two systematic reviews showed that compared with patients with no periodontal problem history, patients treated for periodontal disease presented a higher percentage of biological complications and decreased success rates at both patient and implant levels (Ong, 2008; Sousa, 2016). Hence, lower implant survival, increased peri-implant bone loss and higher incidence of peri-implantitis may be expected in patients who have a history of severe form of periodontitis when compared to those who have a moderate condition or those with no periodontal problem (Roccuzzo, 2010). Peri-implant diseases may affect the peri-implant

mucosa only (peri-implant mucositis) or involve the supporting bone as well. Peri-implantitis, as stated before, is described as a damaging inflammatory lesion of poly microbial aetiology (Charalampakis, 2011), which disturbs both soft and hard tissues around implants, resulting in bone loss and the creation of a peri-implant pocket (Zitzmann, 2008). A systematic review performed by Diniz showed that existence or history of periodontitis was associated with the incidence of peri-implantitis (Diniz, 2018). If undiagnosed, peri-implantitis may lead to complete loss of osseointegration (Lang, 2011). Haanaes stated that peri-implantitis is similar to periodontitis in natural teeth (Haanaes, 1990). Some factors like smoking also contribute to periodontitis and peri-implant diseases. The negative systemic effects of smoking have been well recognized (Fredriksson, 1999). Smoking has been established as a risk factor for periodontitis (Haber, 1994). This negative influence is attributed to negative effect on fibroblasts, immune system and vascular function. Likewise, another systematic review resulted in significant difference in implant failure and marginal bone loss between smokers and non-smokers (Nitzan, 2005). Although several studies have indicated no effect of smoking on the survival of dental implants (Esposito et al. 1998; Carlsson et al. 2000; Lambert et al 2000), it has been mentioned that local exposure of tissues around the implant site to tobacco products is the main factor leading to growth in implant failure rate in smokers(Levin, 2008). Lindquist suggested that smoking is the most important factor affecting the rate of peri-implant bone loss; furthermore, oral hygiene has a greater impact on bone loss among smokers than among non-smokers (Lindquist, 1997). Studies have shown a higher level of failure to achieve osseointegration in smokers compared to non-smokers (Kumar, 2002; Hindoe, 2006). Wallace demonstrated the toxic effect of tobacco on implant placement and suggested that smoking should be considered a relative contraindication to implant placement in treatment plan (Wallace, 2000). Smoking and antidepressant intake are suggested to be possible effective factors to the incidence of implant

failures (Chrcanovic, 2016) Bain reached an 11.3% and 4.8% failure rate in smokers and non-smokers, respectively. The short-term advantage of a smoking cessation protocol suggested by them further by demonstrating the causal relationship between smoking and implant failure. The protocol requires complete for one week peri-operation and 8 weeks post-operation smoking cessation. The results indicated that the smokers who complied with the cessation protocol, displayed short-term implant failure rates same as non-smokers, and significantly lower than smokers who did not abide with the protocol (Bain, 1993). A meta-analysis by Strietzel revealed that smoking was a risk factor for implant failure, inflammation around the implant region as well as bone augmentation procedure (Strietzel, 2007).

Four essential steps in the use of dental implants are precise selection of the patient, accurate choice of the implant, correct surgical technique and exact prosthetic replacement (Mahale, 2013). The operator's level of knowledge and skills in each of these are paramount. Negligence in any step may lead to harm to outcomes called iatrogenic damage. As a simple example, a study observed the relationship between excess dental cement and peri-implant disease using the dental endoscope (Jr, 2009). Aseptic conditions, appropriate surgical technique and avoiding malposition, hard and soft tissue management (tension-free suturing, avoiding over instrumentation, avoiding damage to adjacent teeth avoiding overheating, …), and vital structures protection should be considered to reduce iatrogenic problems.

Implants have gained tremendous popularity in modern dental practice and their use in the edentulous region for the prosthetic restoration has become routine. The patient’s expectations and motivations is a crucial factor, which has been concerned by many clinicians and researchers. Dental implant treatment planning varies depending on the pre-treatment expectations, which obviously would have a great influence on the level of satisfaction of the treatment outcome. It is vital for the dentist to understand the patient’s expectations from various types of available restorative treatments and explain the

misunderstandings and potential difficulties to tackle unrealistic expectations (Grey, 2013). This is even more critical today, as the present practice of Evidence Based Medicine needs that the patients be actively involved in the decision-making about their treatment. Moreover, empathy and measuring the expectations of patients before treatment appears to be a crucial requirement to achieve successful patient recorded clinical outcomes (Yao, 2014), However. Clinicians, as well as patients, can evaluate the aesthetic outcome of therapy not necessarily in the same way. (Cosyn, 2017). A systematic review has shown that as much as 38.7% of all implant-supported fixed partial dentures (FPD) for partially edentulous patients which had been diagnosed as successful treatment, had some type of complication during the observation period of 5 years (Pjetursson, 2007).

Conclusion

Evaluation of survival and failure rate is an effective and common practice to enhance success and suitability of a treatment modality in favour of enhancing patient experience there has sometimes been a confusion, or lack of clarity, between success and survival criteria or definition of implant failure (van Steenberghe, 1999). Over the time, it seems that the current definition of success criteria should be comprehensive, to include additional mentioned factors. , implants were mainly used for functional rehabilitation and papers largely reported on implant and superstructure survival, marginal bone loss and complication rates. Even though these aspects are of key importance, they are incomplete and merely focus on clinicians' judgement. . Implant and superstructure survival, marginal bone loss and complications are important parameters for assessing the outcome of implant treatment.

The survey of literature highlighted the importance of success rate in implantology, terms and definitions related to success, effective factors and proposed criteria. In the UK, the British Society documented the requirement for guidelines on criterions in the use of dental implants

for the Study of Prosthetic Dentistry (BSSPD) and the councils of the British Association of Oral and Maxillofacial Surgeons (BAOMS). A co-operative organisation was set up in 1992 in order to provide guidelines that have been accepted by the councils of both the BAOMS and the BSSPD. According to this guideline, success criteria of dental implant in the UK complies with the success criteria that was published by Albrektsson et al. Taking to the account that dental implant therapy is an elective procedure, a patient –centred approach (aesthetic, function and patient satisfaction) maybe the best choice in terms of evaluation. However, osseointegration is still the major parameter in implant dentistry (Papaspyridakos *et al.*, 2012).

Recently, researchers have introduced new criterions to analyse success in endossous implant restorations. These contain natural-looking soft tissues in around the implant region, health condition, as well as prosthodontic factors, appearance, and patient satisfaction. However, osseointegration remains the principal parameter in implantology (Annibali, 2009).

Chapter 2

Methodology

Methodology is the strategy to conduct the research the standards within each methodology are derived from accepted guidelines or from consensus on best practice. Objectives are then tested against the standard by analysing the collected data. The aim of this audit was to assess how much practitioners' implant success criteria is coincident with current guideline.

Guidelines

Guideline Standards for the Treatment of Patients using
Endosseous Implants was selected as criteria of success in implant treatment. This guideline was produced by a collective working party from British Society for the Study of Prosthetic Dentistry (BSSPD) and the British Association of Oral and Maxillo facial Surgeons (BAOMS) and approved by the councils of BSSPD and BAOMS. BSSPD has proposed Criteria for the successful use of endosseous dental implants:

Application of the criteria can result in successful output of implant treatment, which can be judged against the criteria of success proposed by Albrektsson in 1998:
That an individual, unattached implant is immobile when tested clinically.
That a radiograph does not demonstrate any evidence of peri-implant radiolucency.
That vertical bone loss be less than0.2 mm annually following the implant's first year of service.

That individual implant performance be characterised by an absence of persistent and/or irreversible signs and symptoms, such as pain, infections, neuropathies, paraesthesia, or violation of the mandibular canal.

Place of Audit

Bart's and London Medical and Dental school implant review clinic was the place in which the audit was conducted after being approved by Dr Hagi-Pavli, MSc in Dental Science for Clinical Practice course director, Centre for oral Immunobiology and Regenerative Medicine, Institute of Dentistry, Bart's and London and Dental school) before commencement .It was carried out during the months of June and July 2019.

Study Design

This audit was performed prospectively as an observational study, with collecting and analysing data at a specific point in time, therefore, it was cross sectional study.

Population and Sample size

The numbers selected for an audit should not necessarily need to meet the statistical requirements of research; however, sufficient numbers must be involved to make the audit representative of the population. A sample size calculator (https://www.surveysystem.com/sscalc.htm) was implemented to estimate the right sample size. The audit target population was the list of 20 consultants and postgraduate students at implant clinic. For having 95% confidence level with a confidence interval of 12% based on 20 implant practitioners, sample size was calculated at 15. We handed out 17 questionnaires which 16 of them were filled. Two participants did not reply to questions.

Instrument

After discussion with my supervisor, questionnaire was formed for data collection that consisted of four different parts.

Status

In this part, the status of participant was asked. The reason of noting this was to assess if academic position of participant has any impact on result or not.

Gender

Gender was included to see if it plays a role in practitioner's insight about the success criteria.

Work experience

It is evident that work experience has a great impact in outcome of implant treatments (Porter, 2005).

Parameters for criteria of success

The main part of questionnaire was about which parameters are considered by practitioner to judge an implant treatment as successful. There were up to ten rows provided for response.

Data collection procedure

During months of June and July, I went to implant review clinic to meet practitioners and collect the data in person. This place was chosen as I could meet all staffs and students involved in implant treatment individually. The data collection took 3 to 7 minutes per

participant to write the date and fill the form. All questionnaires remained anonymous and were ordered by numbers. Before giving the questionnaire, the audit purpose and benefit was explained, then practitioners were requested to fill the questionnaire immediately after my description. This procedure was adopted due to its effectiveness for collecting maximum information during a limited time.

Accuracy

Each questionnaire form was scheduled for a second revision to ensure that there was no mistake in transferring data to Excel software. Moreover, all participants received the same explanation and filled the form in the same environment and period. Thus, there was no any bias or discrimination.

Safety and Data Protection

Data collection was performed safely without any risk or harm to anyone. Benefit and procedure of the audit were explained, and informed consents were taken from participants. The data was collected anonymously with maximum confidentiality.

Data Analysis

In the first step, a Microsoft Excel table was designed to include the information provided by questionnaire. The main guideline parameters were allocated numbers as 1F, 2F, 3F and 4F. Each questionnaire information was transferred to the table and recorded with codes. In terms of gender, information was transferred to two provided columns for males or females. (Table 2.1).

No	Gender	
	Male	Female
1		
2		
3		
4		

Table 2.1: Collected information about the participants' gender was added to this part.

The clinician status was also transferred to another column the illustrated in Table 2.2.

No	Clinician status	
	Staff	Student
1		
2		
3		
4		

Table 2.2: The clinicians' status was transferred to this section.

According to the questionnaire, level of experience was divided from 1 to15 and >15 in order to specify the years of experience in implant treatment (Table 2.3)

No	Years of work experience															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15
1																
2																
3																
4																

Table 3.3: Illustration of a section of the practitioners' work experience table in implantology.

For the most important part of information, the main 4 guideline factors were coded as 1F,2F,3F and 4F and the rest of codes to 8F were allocated to factors which are cited in literature as the most frequent criteria used by clinicians (papaspyridakos,2012) (Table 2.4).

No	Parameters							
	F1	F2	F3	F4	F5	F6	F7	F8
1								
2								
3								
4								

Table 2.4: This part was allocated to assess which main or frequently used factors each individual mentioned.

The main factors of the selected guideline were ordered from 1 to 4 as follows:

1. Immobility in clinical test (F1).
2. Absence of any radiographic radiolucency around the implant (F2).
3. Radiographic vertical bone loss less than 0.2 mm per annum after the first year in function (F3).
4. Absence of signs and symptoms such as pain, infection, neuropathies, paraesthesia, or violation of inferior dental canal (F4).

Factors recognised in literature as frequently used parameters for implant success criteria from 5 to 8.

5. Peri-implant bone loss (> 1.5 mm) (F5).
6. Occurrence of technical complications/prosthetic maintenance (F6).
7. Adequate function (F7).

8. Aesthetic and appearance (F8).

Having the above demonstrated, a relevant Microsoft Excel Document was made to record and analyse the given data (Appendix 1).

Afterwards, all of the given answers were revised two times for appropriate comparison against the agreed guideline. Next, the given data was compared against the frequently used parameters to extract the maximum information out of the questionnaires.

Difficulties

During the data collection, a number of difficulties made the audit process to some extent challenging. Above of all, as the number of population was not high (20), the sample size had to be considerably large (compared to population) to represent the population with 95% confidence level (16). Therefore, I had to meet some of the clinicians, who were reluctant to participate in study, several times to explain the audit and convince them to attend the study. In addition, some of the attendants were interested in writing their answers at spare time. This could have negative effect on my audit, as there was a risk of using internet or other resources to answer the question so the main objective of the study could be swayed easily. Moreover, due to some unpredictable reasons, the process of data collection was done during the months of June and July, which are considered as busy months before summer holidays, thus clinicians were immensely busy. This situation made them to cancel our appointed time for several times. Furthermore, some of the answers were ambiguous with many details, making it difficult to extract the clinicians' main parameters of success. Finally, due to limited population, it was virtually impossible to have equal number of male/female or staff/student participants to conduct the audit in a more precise and detailed condition.

Chapter 3

Results

In this chapter, the outcomes and results of this audit are illustrated in different formats such as Bar Charts and Pie Charts.

Demographics

The pie chart 3.1 reveals the proportion of male and female clinicians participating this study. The percentage of genders was 60% and 40%, respectively.

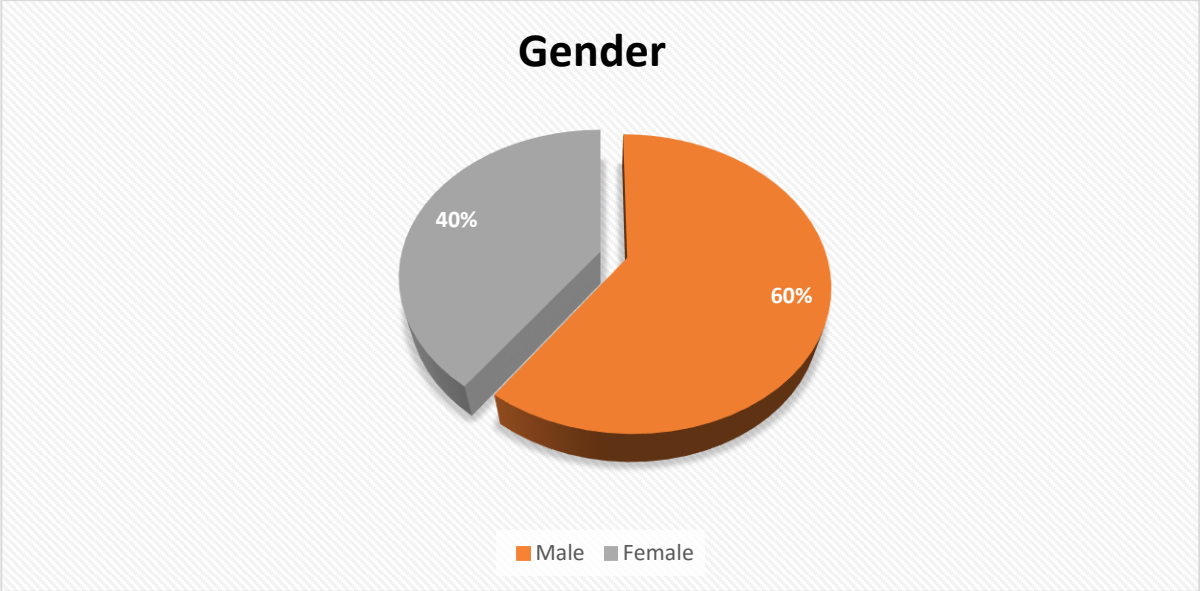

Chart 3.1: reveals the proportion of each gender.

The ratio of staff and student involved in this study is shown in pie chart 3.2. The number of student participants was twice more than staff. In other words, 10 participants out of 15 clinicians attending this audit were students.

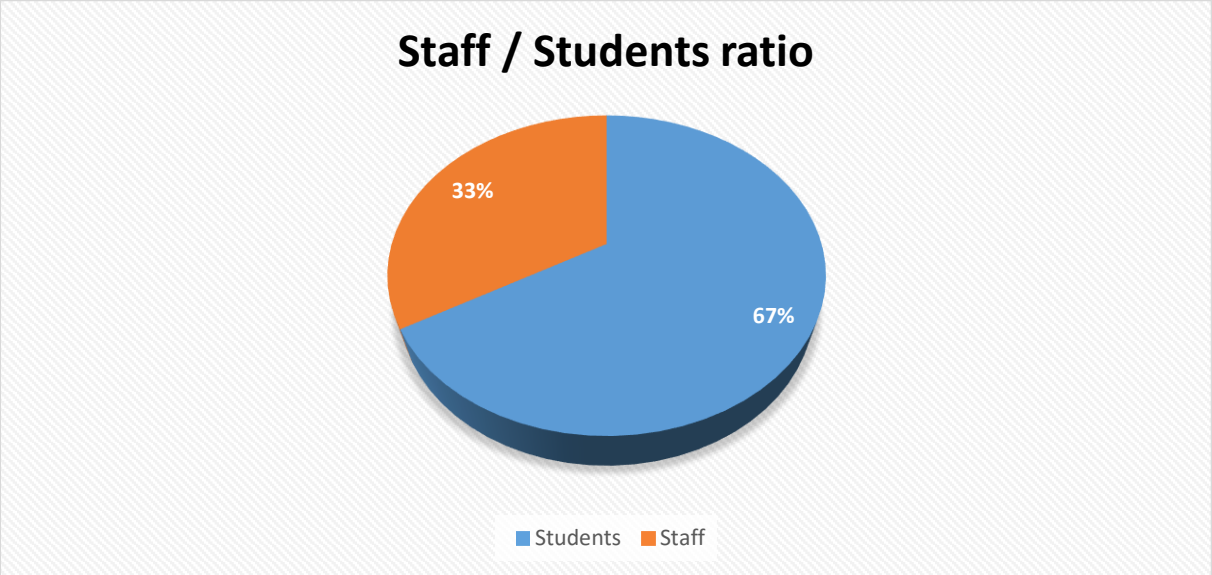

Chart 3.2: illustrates the academic level ratio of participants

Distribution of practitioners work experience is illustrated in the bar chart 3.3. The number of participants with 2 years of work experience in implant treatment was 8.Two of them had 3 years of experience or two others had an experience of more than 15 years. Equal number of one practitioner had one, 11 or 15 years of work experience. The average work experience of staff and students was measured at 12.6 and 2 years, respectively.

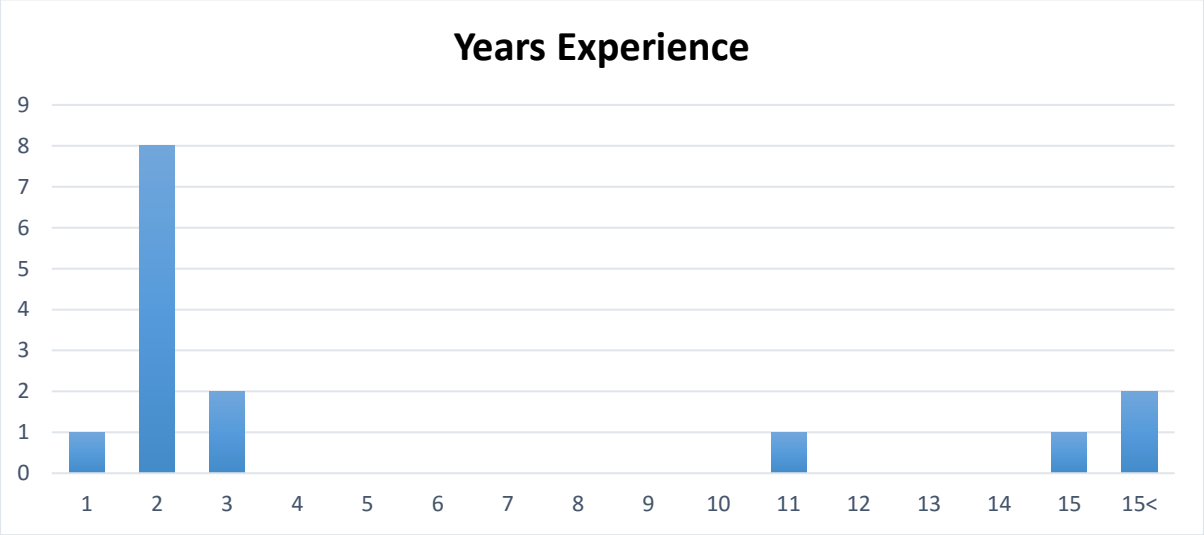

Chart 3.3: demonstrates the distribution of clinicians work experience.

The pie chart 3.4 shows that 20% of sample population did not consider any of guideline parameters of success in the forms while 80% of participants mentioned at least one of the those parameters..

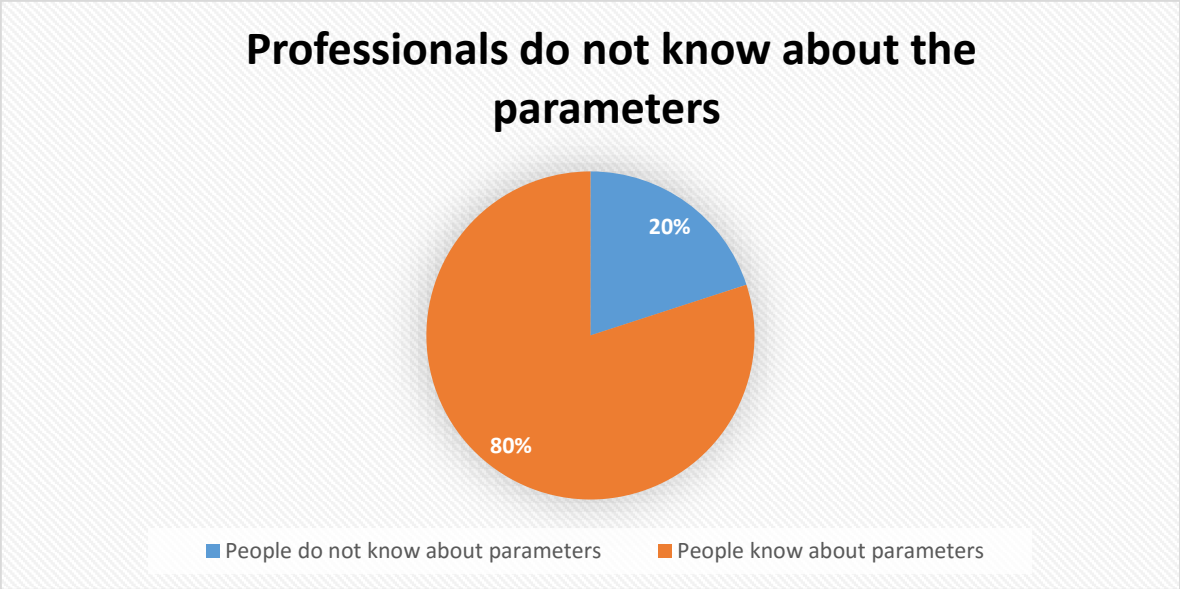

Chart 3.4: reveals the percentage of clinicians who did not know about the parameters.

Regarding to the above, the pie chart 3.5 illustrates that 30% of student did not consider any of guideline parameters in their criteria and 70% of them noted at least one of the guideline parameters in their questionnaire.

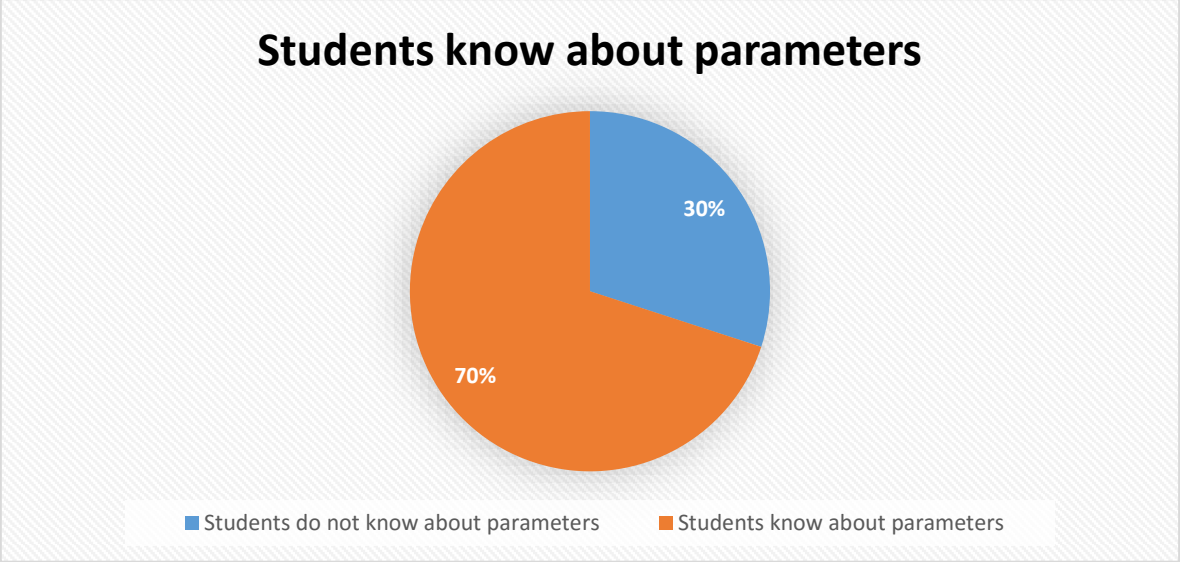

Chart 3.5: illustrates the proportion of students' awareness about the guideline factors

All of the staff cited at least one of the guideline parameters in their forms (pie chart 3.6).

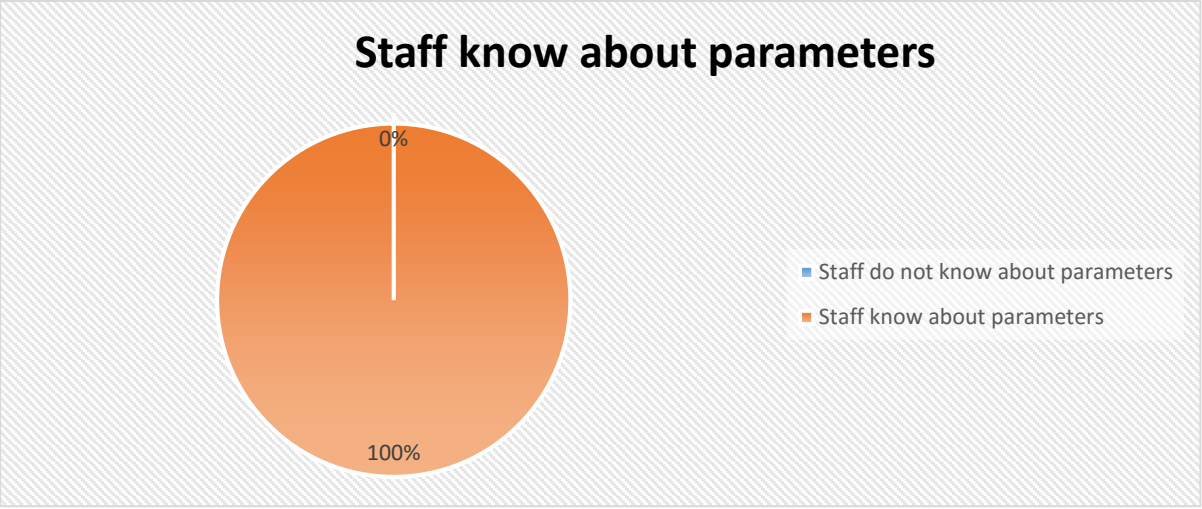

Chart 3.6: shows the proportion of awareness about the guideline parameters among the staff.

The pie chart 3.7 displays the percentage of clinicians who noted all of the guideline parameters in their questionnaire. A glance at the pie chart reveals that the proportion of practitioners containing all of the guideline parameters in their considerations about successful treatment was a quarter that of clinicians who did not mentioned all of the parameters. The percentages were 20% for the former and 80% for the latter.

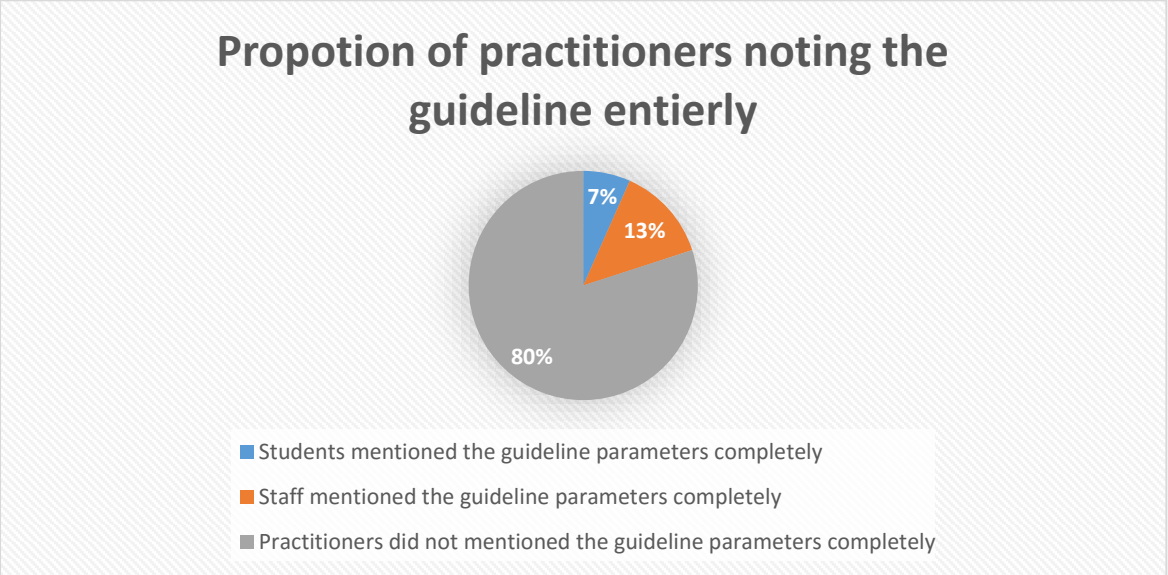

Chart 3.7: shows the proportion of professionals considering the entire guideline.

The pie chart 3.8 demonstrates the citation proportion of each guideline factors by clinicians. In total, all 4 main factors were mentioned 31 times (out of maximum 60 possible correct answers) by practitioners in the questionnaires. 19% of 31 notations was related to implant mobility, 23% to radiographic radiolucency and equal percentage of 29% to vertical bone loss and symptoms.

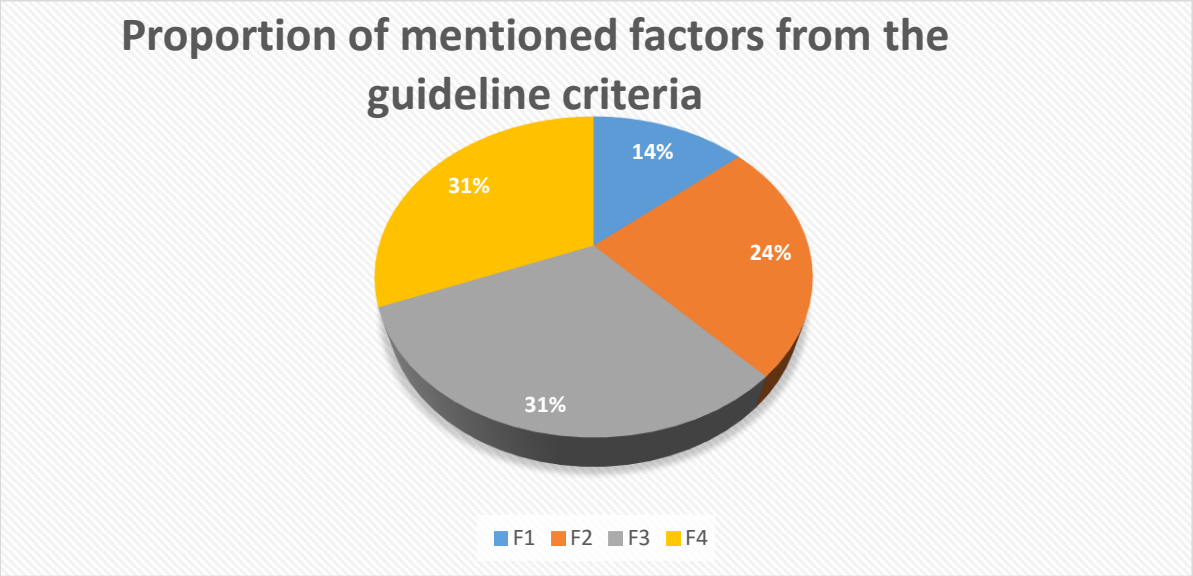

Chart 3.8: shows the percentage of mentioned guideline factors in the forms.

The pie chart 3.9 reveals the percentage of clinicians who mentioned at least one of the frequently used factors mentioned in literature. It is evident that the majority of clinicians (93%) reported at least one the parameters, which are frequently used in literature for assessing success implant treatment. 7% of professionals, did not write any frequently used parameters in their forms.

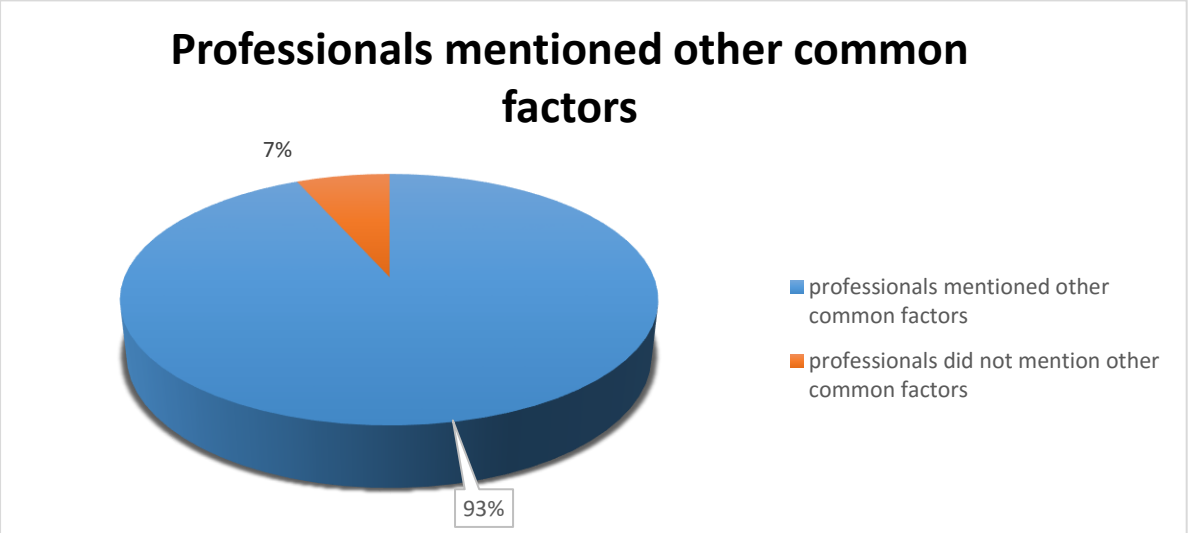

Chart 3.9: represents the proportion of professionals who mentioned one of the frequently used factors.

The pie chart 3.10 illustrates the percentage of four frequently used factors (other than guideline criteria) mentioned by practitioners. Appearance and aesthetic consideration accounted for the highest mentioned parameter (36%).Adequate function, occurrence of technical complications and pri-implant bone loss had the lower proportion at 28%, 25% and 11%, respectively.

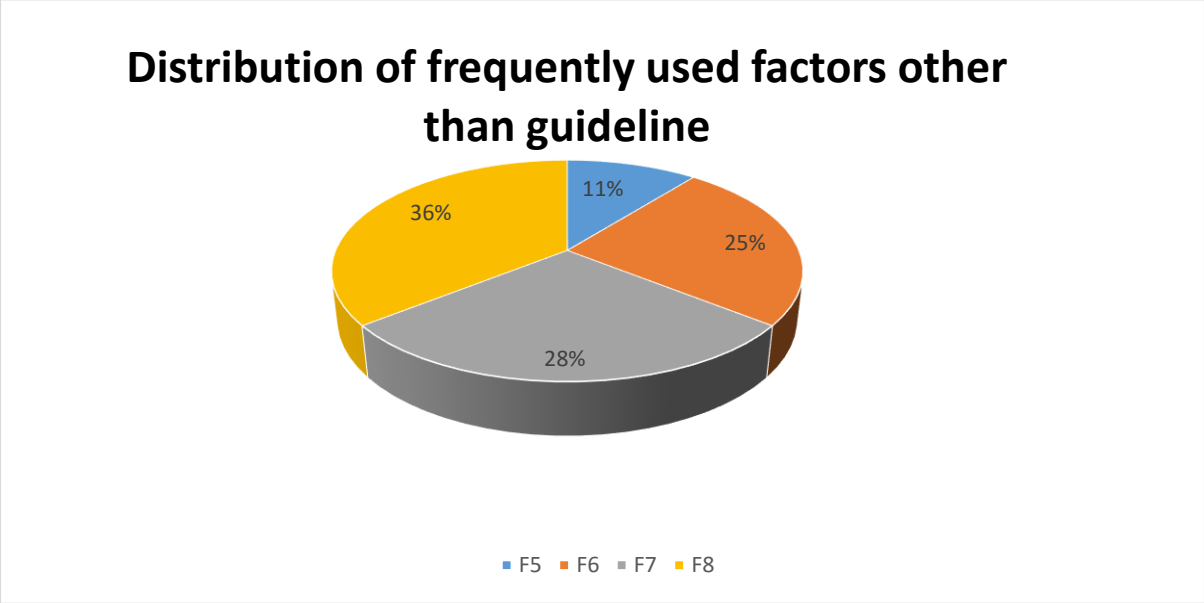

Chart 3.10: illustrates the proportion of each mentioned frequently used factors (other than guideline) in the questionnaires.

The bar chart 3.11 reveals the distribution of mentioned factors (guideline and other than guideline) by gender. The factor F4 and F5 were the most noted guideline parameters by males, recorded at 5. F3, F6 and F7 were noted 4 times while F1 and F5 were reported 2 times and 1 time.

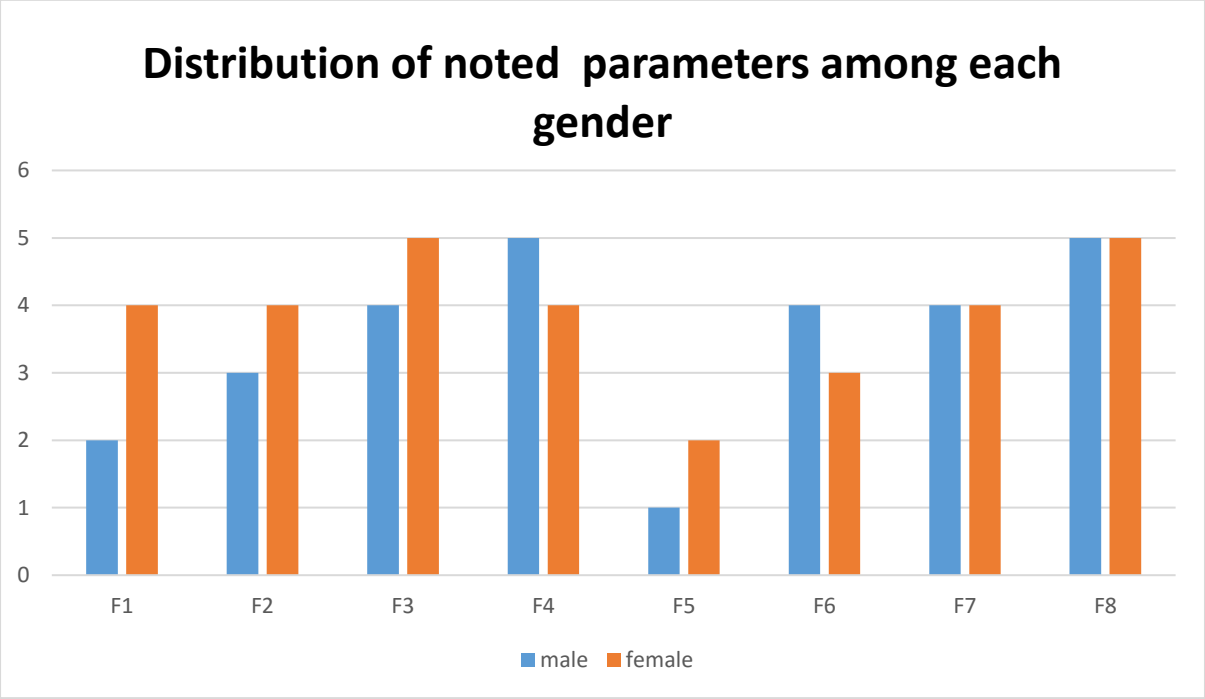

Chart 3.11: shows the distribution of reported parameters among each gender.

The bar chart 3.12 displays the distribution of mentioned factors by clinicians' status. It is evident that all of participants with staff status noted F3, F4 and F8 in their questionnaires. The postgraduate students mentioned the parameters F1 and F5 just once.

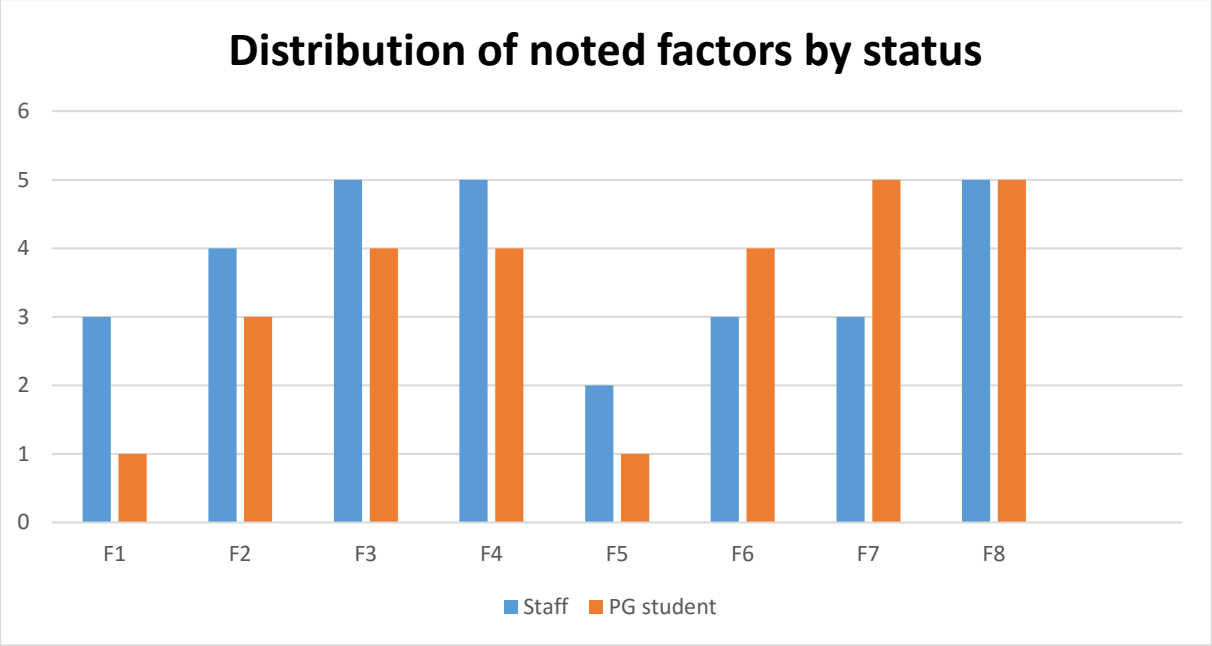

Chart 3.12: demonstrates distribution of mentioned factors by clinicians' status.

Chapter 4

Conclusion

The results of this audit portrays how much practitioners' consideration about a successful implant treatment complies with chosen guideline. The audit found out that the majority of clinicians (80%) did not mention all of the guideline parameters. While all staff could mention at least one of the guideline factors, 30% of postgraduate students did not note any of these parameters. In addition, only 20% of clinicians could include all of the guideline parameters (F1-F4) in their responses in which 13% were staff and 7% were students. In other words, 40% of staff and 10% of students could mention the guideline completely.

Practitioners showed the most interest for marginal bone loss and absence of signs and symptoms (F3 and F4), recorded at equal percentage of 31%. Implant mobility, which is considered as a clear sign of failure and main indicator for survival assessment, had the lowest rate of citation among the main factors, recorded at only 14% of parameters noted by clinicians. However, 4 out of 5 staff reflected this factor in their forms while only one student noted mobility in the questionnaire as a main factor.

In terms of "the most frequently used factors" reflected in papaspyridakos systematic review, clinicians showed more interest for including these factors compared with guideline parameters as they were noted at least one time by 93% of participants. Appearance and aesthetic consideration was the most popular factor, recorded at 10 citations. In terms of gender, despite the lower number of female practitioners, they mentioned reported more parameters of agreed guideline in questionnaires.

To sum up, In the light of the results of this audit it revealed that there was a poor level of compatibility between practitioners' criteria of success about an implant treatment and established guideline. In addition, it was evident that staff (with higher level of education and experience in implantology) significantly included more guideline factors in their considerations compared with student (with lower level of education and experience). The results illustrated that appearance and aesthetic as well as adequate function were of high importance and interest among clinicians.

Discussion

Despite the scarcity of controlled trials and the variability in defining implant survival/success, the great number of evidence is viewed as providing support for consideration of dental implant therapy as a safe and predictable substitute to conventional restorations for many treatments (Carr, 2011).. Albrektsson and colleagues proposed the most common established criteria for the assessment of implant success. This was adopted by BSSSPD and BAOMS as guideline for practitioners in the United Kingdom. Based on this criterion, the implant should not have any mobility and show no radiolucency in radiographs, annual bone loss after the first year should not vertically exceed than 0.2 mm, and there should not be any persistent and/or irreversible symptoms (Albrektsson, 1986). The audit revealed that only 20% of clinicians could include all of the guideline parameters completely .It may happen due to out of dated guideline or lack of awareness about it. 13% staff and 7% students). In other words, 40% of staff and 10% of students could mention the guideline. It may suggest that higher education level could contribute to level of awareness about the guideline. It seems that the absence of signs and symptoms parameter is the most interesting factor among the student in success evaluation. There are also some other factors, based on literature, which are used vastly to assess success rate in implant treatment. Participants were

keener on containing these factors in their criteria of success as 93% of practitioners mentioned at least one of these parameters in their forms.

The current guideline was established more than three decades ago. Authorities emphasize on regular revision update by expressing "These guidelines should be updated regularly to take account of continuing research and development. In the future, it is likely that the success rate will continue to improve. It is therefore suggested that the criteria for success should be reviewed at regular intervals in the light of the results achieved" (BSSPD, 1996). Moreover, there was a clear interest among the practitioners in adopting other factors, which are reported in literature as "frequently used factors". In other words, as aesthetics has become a key issue in contemporary practice, aesthetic evaluations should be included in future guideline. It is of paramount importance for practitioners to follow a comprehensive guideline when it comes to assessing the outcomes of an implant treatment plan.

Peri-implant bone loss (> 1.5 mm) criterion was proposed by Esposito. It has remained as a gold standard in measuring marginal bone loss. This factor had the lowest level of popularity among participants as jus 3 individuals (2 staff and one student) reported this parameter and accounted for only 11% of mentioned "frequently used factors". It may reflect the literature outcomes, which shows inaccuracy of MBL for the wide variety of implant systems (Schwartz, 2005).Popularity of technical complication Occurrence was at 25%of reported "frequently used factors". Appearance and aesthetic, which is one of the criteria reported to assess patient satisfaction level, accounted for the highest proportion of report among not only the" frequently used" but also all observed factors. Equal number of five male and female participants noted this factor in their consideration. In other words, 67% of participants reflected this parameter in their questionnaires. This can be illustrated by the strong interest displayed by scientific society in other aspects of implant treatment outcomes, which reflect the changing expectations of society. This highlights the importance of

including prosthesis success in analyses of dental implants outcomes. Since the axiom that patient reaction must be analysed and if a clinical method is to be successfully prescribed (Zarb, 1990), it is important to evaluate the outcome of treatment against a patient-centred criteria.

In terms of gender, although the proportion of female participants was 40% of population, they mentioned more factors than their males counterparts, recorded at 17 and 14, respectively. This can be investigated in in future researches to find out any possible link.

Recommendations

Based on the results of this audit, the following recommendations are suggested:

- Updating and revising the criteria of success the currently existed implantology guideline, which may help to improve the implant dentistry.
- It seems there is a lack of homogeneity in definition of success distinguished by the literature review of this audit, it might be beneficial to establish a comprehensive guideline regarding to the most commonly used parameters.
- Update the guideline with patient-centred approach may have a positive impact on the patient's experience.
- Easy accessible guidelines may help clinicians to update themselves more frequently.
- Audits should be conducted on regular basis to assess the compliance.
- Next audits and researches can be conducted with equal number of variables (gender, status and work experience) and bigger sample size to make precise and bias-free exploration about the effective factors on compliance.

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Abbreviations

AAID	American Academy of Implant Dentistry
BAOMS	British association of Oral and Maxillofacial Surgeons
BSSPD	British Society for the Study of Prosthetic Dentistry
F1	Immobility in clinical test
F2	Absence of any radiographic radiolucency
F3	Radiographic bone loss less than .2 mm
F4	Absence of signs and symptoms
F5	Peri-implant bone loss>1.5mm
F6	Technical complication
F7	Adequate function
F8	Aesthetic and appearance
FDP	Fixed Dental Prosthesis
GDM	Gestational Diabetes Mellitus
gr	Gram
ICOI	International Congress Of Implantology
MBL	Marginal Bone Loss
mm	Millimetre
VS	Versus

Appendixes

Appendix 1