

Rehabilitation Of Completely Edentulous Patients - A University Based Study

Research Article

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Abstract

Conventional complete dentures are supported by the edentulous ridges and the mucosa that overlies them. There is close contact, but no direct attachment between the prosthesis and the ridges, and the prostheses are constructed to maximise any potential retentive forces whilst attempting to minimise those that displace them. In such an active, muscularly-controlled environment this is problematic, and many patients have difficulties adapting to their dentures, particularly the lower denture. The main aim of this cross-sectional study is to evaluate the number of completely edentulous patients willing for implant supported fixed prosthesis. This is a record based study with a sample size of 365. The present study was conducted among edentulous patients who visited the outpatient department at the institution. The data was collected from the patient records. The data was categorised into age groups, gender, preference for fixed or removable prosthesis and type of fixed prosthesis. The coding was done in MS excel. The data was transferred to a host computer and processed using SPSS software version 21.0 (SPSS Inc., Chicago, IL, USA) by tabulation and graphical illustration. Descriptive statistics and chi square test was used to study the data collected and to analyse frequency distribution. The results showed that, of all the edentulous patients, only 3.8% wanted implant prosthesis and 96.2% wanted conventional complete dentures (CCD). Of the patients who preferred implant supported prosthesis 42% of them preferred screw retained prosthesis, followed by cement retained 35%, followed by overdenture 14% and 7% hybrid prosthesis. There is however, no significant association between gender and patients opting for full mouth rehabilitation(FMR) with implant prosthesis, but significant association is seen between age and patients preferring FMR.

Keywords: Completely Edentulous Patients; Implant Supported Prosthesis; Patient Preference; Quality Of Life.

Introduction

Partial and complete edentulism is a common problem encountered in dental practice. Oral rehabilitation in such patients is essential to restore function and aesthetics [1]. Accumulation of calculus over long periods of time along with bad oral hygiene habits can lead to severe loss of alveolar bone and soft tissue resulting in recession and ultimately severe periodontitis [2]. The end result is the loss of natural teeth due to mobility caused by severe bone loss [3]. Heavy smokers often have very poor or compromised periodontium and are candidates for chronic advanced periodontitis. In such patients full mouth extraction is done and is followed

by full mouth rehabilitation [4]. Complete dentures for patients who are completely edentulous can be either removable or fixed. Fixed prostheses are supported by dental implants and removable prostheses are held by capillary action and adhere to soft tissue [5]. In patients with narrow or resorbed ridge, connective tissue grafts, bone augmentation, ridge augmentation, ridge split or sinus lift can be done to accommodate implants [6].

Completely edentulous patients lack ability to masticate food which leads to lack of nutritional intake. they have to modify their food choices, especially when eating in a social environment, because of the limitations of their dentures. Evidence also suggests that if patients are challenged to eat a different range of foods,

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their current satisfaction with their conventional dentures is reduced. Patients' social interactions can be negatively affected by conventional dentures. To overcome this, dental prosthesis which is fixed or removable in nature reinforced by implant is fabricated for the patient. People report avoiding going out to eat, being self-conscious of the presence of others as they feel they may notice them moving in the mouth when talking, eating or laughing and because they may find it difficult to wear their dentures for a prolonged period of time. Lip biting can cause dislodgement of the denture [7].

Completely edentulous patients can be rehabilitated with fixed prosthesis using osseointegrated implants. Full mouth rehabilitation is done in periodontally compromised patients after full mouth extraction. Implants can be placed in three weeks after extractions with less waiting time for bone healing in order to minimize surgical visits. In cases of loss of gingival tissues the missing tissue can be compensated with composite resin which is an artificial gingival material. This is an alternative to pink porcelain which is lighter in weight [8]. Case reports of full mouth rehabilitation are also done in patients with ectodermal dysplasia have been documented [9]. In contrast to conventional denture wearers, when encouraged to modify their diet, the satisfaction with their prosthesis of those wearing implant overdentures is shown to increase [10]. Previously our team has a rich experience in working on various research projects across multiple disciplines [11-25]. Thus the aim of this study was to evaluate the number of completely edentulous patients willing for implant supported fixed prosthesis.

Materials And Methods

Study setting

In this retrospective study, data from 365 patients within the institution were collected from dental records. At data extraction, all information was anonymized and tabulated onto a spreadsheet. The study was commenced after approval from the Institutional Review Board. The ethical approval number for the study was SDC/SIHEC/2020/DIASDATA/0619 - 0320.

Data collection and/tabulation

To fulfil the inclusion criteria, patients who were completely edentulous were included in the study. The preference for fixed or removable prosthesis was assessed in these patients. Patients who were partially edentulous and those unwilling for the study have

been excluded.

Sampling

Data were collected from June 2019 to March 2020 for 365 patients who were completely edentulous and chose to have either conventional complete dentures or implant supported prosthesis. The following data were retrieved from the dental records: patient age, gender and preference for fixed or removable prosthesis. The data collected was analysed for the type of fixed prosthesis preferred.

Statistical analysis

The data was transferred to a host computer and processed using SPSS software version 21.0 (SPSS Inc., Chicago, IL, USA). Descriptive and inferential statistics was used to compare the type of type of prosthesis with the age and gender of the patient. The significance level was set at 5% for the present study.

Results

The data collected was analysed using IBM SPSS software. The results are as follows.

Discussion

In our study it was noted that the highest number of complete denture wearers were between the age of 60-69 years. This is in accordance with another study which showed the average age of complete denture patients in their study was 67.3 years [26]. Another study states an increase in patients older than 55 years wearing dentures [27]. In our study, the number of completely edentulous male patients (56.4%) outnumbered female patients (43.6%). This is in contradiction to another study that states, women are more likely to be edentulous than are men [28]. This could be because periodontal disease was predominant in women when compared to men [29, 30].

In our study, 96.2% of the subjects chose the conventional complete denture over an implant supported prosthesis. Magnetic prosthesis is available but was not fabricated for any patient in our study [31]. Although implant supported prostheses are gaining popularity, the results from the present study indicated that the CCD is the preferred treatment of choice and most patients were more likely to opt for minimum, low stress and low-cost interventions. A preference by patients for simpler intervention

Figure 1: Bar diagram representing age distribution of completely edentulous patients. X-Axis represents the age group distribution of completely edentulous patients and Y axis represents the percentage distribution with different age groups. The percentage distribution shows maximum number of edentulous patients (43.2%) were between were 60-69 years (orange), 26% were between 50- 59 years (green), 18.3% were 70 years and above (yellow), 9.3% were between 40-49 years (red) and the least (3.3%) were between 30-39 years (blue).

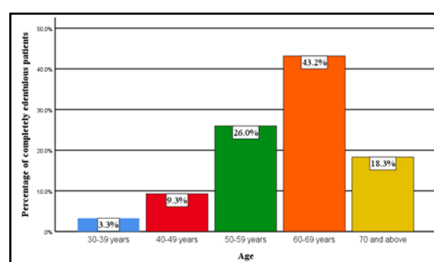


Figure 2: Bar diagram representing the comparison between the age distribution of study subjects and preference for FMR prosthesis. X-Axis represents the percentage distribution in each age group and Y axis represents the percentage of completely edentulous patients. Chi square test was done and association between age and preference for FMR was found to be statistically significant. (Pearson’s chi square value 18.885, df - 4, p value = 0.001- significant). This shows there is association between the age of the completely edentulous patient and the preference for type of prosthesis. The preference for conventional complete denture (blue) was highest (42.35%) among 60-69 years age group and for implant supported prosthesis (red) it was highest (1.64%) among 50-59 years.

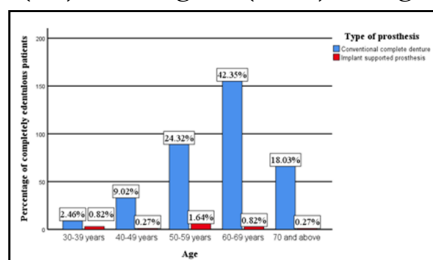


Figure 3: Pie chart representing gender distribution of completely edentulous patients. It is seen that shows that the number of males (59.02% ; blue) were more edentulous than females (40.98% ; red).

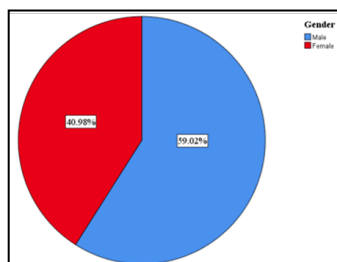


Figure 4: Bar diagram representing the comparison between the gender distribution of study subjects and preference for FMR prosthesis. X-Axis represents the percentage distribution in each gender and Y axis represents the percentage of completely edentulous patients. Chi square test was done and association between gender and preference for FMR was found to be statistically insignificant (Pearson’s chi square value 0.167, df - 4, p value = 0.683- not significant). However, males (56.56%) outnumbered females (2.46%) in terms of preference for conventional complete denture (blue). The preference for implant supported prosthesis (red) was also higher among males (2.46%) than females (1.37%).

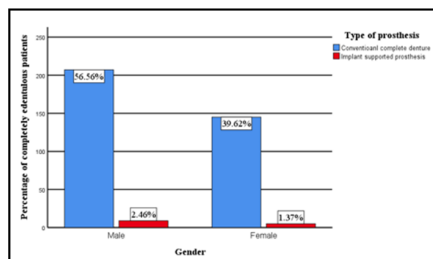
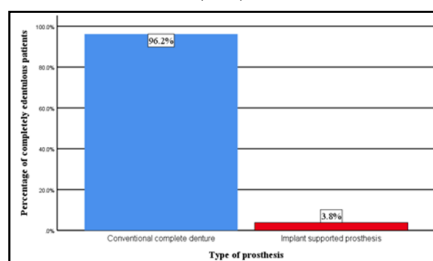


Figure 5: Bar diagram representing preference of FMR prosthesis in completely edentulous patients. X-Axis represents the preference of FMR prosthesis and Y axis represents the percentage distribution among completely edentulous. A higher percentage of 96.2% opted for conventional complete denture (blue) than 3.8% who preferred implant supported prosthesis (red).



within their financial capacity is of major concern especially for older edentulous subjects is common in clinical practice [32]. Patients’ disapproval of an extended treatment period was also mentioned by Kaptein [33]. Techniques that reduce the time required for completion of treatment, such as the immediate loading of implants for overdentures [34]. Cost and attitudes towards cost are the most important barriers to the utilization of dental care. This remains a very real perceived barrier to the delivery of im-

plant supported prostheses. On the other hand, the most common and most highly rated reason for refusal of implants was concern about surgical risks, even when there was no financial cost, indicating that choices involving surgery may cause anxiety and uncertainty about risks [35].

In our study, 3.8% opted for implant supported prosthesis. A substantial body of evidence shows patients report greater sat-

Figure 6: Bar diagram representing arch distribution of completely edentulous patients with FMR. X-Axis represents the arch distribution of patients and Y axis represents the percentage distribution among different completely edentulous arches. The percentage distribution shows 42.9% had implant supported prosthesis in both maxilla and mandible, the same percentage opted for implant supported prosthesis (42.9%) in mandible only but only 14.3% for implant supported prosthesis in maxilla only (red).

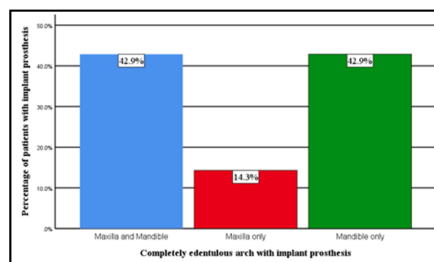
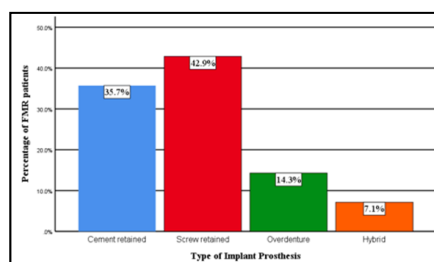


Figure 7: Bar diagram representing type of FMR prosthesis distribution in completely edentulous patients. X-Axis represents the type of FMR prosthesis and Y axis represents the percentage distribution among different types of FMR prosthesis. The percentage distribution shows the most preferred type of prosthesis (42.9%) was screw retained (red), followed by 35.7% cement retained prosthesis (blue), 14.3% had over dentures (green) and 7.1% had hybrid prosthesis (orange).



isfaction with the stability and retention with their implant supported-prostheses which, in turn, appears to contribute to greater satisfaction with comfort and ability to chew different foods. Esthetics have been reported with implant supported prosthesis[36]. Retraction cords can be used while taking the impression for ceramic restorations for the crown to provide the improved aesthetic results without any marginal discrepancy [36-40]. The dimensions of the teeth in edentulous patients can be determined using extraoral and intraoral factors [41]. Studies have shown that denture patients may be willing to pay the additional treatment cost for implants if payment options are more favorable [42]. dental insurance systems that facilitate access to dental treatment have a positive influence on attitudes and the motivation for utilization of dental services [43].

In our study, 42% of the participants had implant supported dentures in both arches. De Bruyn found that 90% of the patients treated with fixed implant prostheses in the maxilla or mandible were willing to undergo the same treatment again [44].

In our study, 42% preferred implant supported prosthesis for the mandible alone. This could be because patient's objective chewing efficiency is significantly increased when the lower conventional denture is stabilised by means of implants [10]. More recent evidence demonstrates that patients with mandibular implant-supported overdentures are more likely to positively modify their diet than patients with conventional dentures. implant-retained mandibular overdentures are a very reliable alternative and especially for those who have difficulties adapting to conventional dentures [45].

In our study, only 14% preferred an implant supported prosthesis for the upper arch alone. De Bruyn et al. treated patients with fixed implant-supported prostheses in the maxilla and found sig-

nificant improvements in esthetics, eating-comfort, phonetics, and overall satisfaction [44]. Another study, contradictory to ours, by Jemt reported a frequent occurrence of speech problems associated with fixed maxillary implant prostheses applied in the resorbed maxilla [46]. An increased intermaxillary space because of severe bone resorption was an indicator recommending a removable and not a fixed reconstruction [47].

In our study, for maxillary implant prosthesis 6 implants was the most preferred (66%) while 4 implants were used in 34% and for the mandible 4 implants (81%) was most commonly placed. There is sound evidence that two-implant-retained mandibular overdentures result in better patient-based outcomes than CD [48]. When patients are given the opportunity to compare, they tend to prefer a removable mandibular prosthesis fully supported by four implants over an overdenture that is retained by two implants. It has already been suggested that the much lower levels of satisfaction that characterize conventional mandibular dentures are probably due almost entirely to the poor bearing properties of the soft tissues [49]. Whilst they are certainly more expensive, the use of just two implants can keep the initial cost to a minimum.

In our study, the percentage distribution shows 35.7% had cement retained prosthesis, 42.9% had screw retained FMR, 14.3% had over dentures and 7.1% had hybrid prosthesis. One of the complications that arise with screw retained prosthesis is screw loosening [50]. However, sand blasting and diamond abrading of the surface can improve the bond strength of luting agents under masticatory load [51]. Implants supported overdentures offer many of the benefits of retained roots while avoiding a number of the liabilities from those roots [52]. Implant-supported hybrid prosthesis is an acrylic resin complete fixed dental prosthesis and supported by implants might be a solution in extreme cases that the need of the restoration for esthetics, function, lip support,

and speech [53].

The most common post-insertion complication is denture stomatitis and the elimination of denture faults, control of denture plaque and discontinuous denture wearing are sufficient treatment. The routine use of antiseptic or antimycotic drugs seems unnecessary [54, 55]. Topical application of local anaesthetic agents and anti inflammatory gels can be advised [56].

Treatment decisions for edentulousness and the motives underlying patients' preferences are expected to vary greatly among individuals. This clubbed with clinical judgement will reward promising outcomes that can satisfy both the doctor and the patient. Across all age groups and gender, the present study showed that a conventional complete Denture was the obvious choice of treatment for both the maxilla and mandible in edentulous patients. Psychological factors are considered to be extremely important in the acceptance of and adaptation to dentures [57], and many patients develop the skills required to overcome limitations of dentures and learn to accept these limitations with time [58]. This can aid in patient counselling while presenting them with alternate paths of treatment and identifying the best option for themselves. Our institution is passionate about high quality evidence based research and has excelled in various fields [59-69].

Small sample size, geographic isolation, socio economic factors, systemic complications contribute to the limitations of the study. The bone height and width for the placement of the implant and need for bone augmentation have not been assessed among the patients.

Conclusion

Within the limitations of the study, it can be concluded that a significant association is seen between age and patients opting for full mouth rehabilitation with implant prosthesis. There is however, no significant association between gender and patients opting for full mouth rehabilitation. Socioeconomic status and awareness were the most common factors influencing decision making.

Author Contributions

Author 1 (Jerusha Santa Packyanathan) carried out the retrospective study by collecting data and drafted the manuscript after performing the necessary statistical analysis. Author 2 (Padma Ariga) aided in the conception of the topic, participated in the study design, statistical analysis, supervised in the preparation of the manuscript and author 3 (Ganesh Jeevanandan) helped in study design and coordinated in developing the manuscript. All the authors have equally contributed in developing the manuscript.

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References

[1]. Chiapasco M, Zaniboni M, Boisco M. Augmentation procedures for the rehabilitation of deficient edentulous ridges with oral implants. *Clin. Oral*

- Implants Res.* 2006 Oct;17(S2):136-59.
- [2]. Basha FY, Ganapathy D, Venugopalan S. Oral hygiene status among pregnant women. *Res J Pharm Technol.* 2018;11(7):3099-102.
- [3]. Wehmeyer MM, Corwin CL, Guthmiller JM, Lee JY. The impact of oral health literacy on periodontal health status. *J. Public Health Dent.* 2014 Jan;74(1):80-7.
- [4]. Heasman L, Stacey F, Preshaw PM, McCracken GI, Hepburn S, Heasman PA. The effect of smoking on periodontal treatment response: a review of clinical evidence. *J. Clin. Periodontol.* 2006 Apr;33(4):241-53.
- [5]. Tyson KW. Physical factors in retention of complete upper dentures. *J. Prosthet. Dent.* 1967 Aug 1;18(2):90-7.
- [6]. "Eric" Hamrick JF. Horizontal Alveolar Ridge Augmentation Using Titanium Mesh and Particulate Bone Graft for the Treatment of Alveolar Ridge Defects. *Horizontal Alveolar Ridge Augmentation in Implant Dentistry: A Surgical Manual.* 2016 Jan 4:107-19.
- [7]. Ashok V, Nallaswamy D, Benazir Begum S, Nesappan T. Lip Bumper Prosthesis for an Acromegaly Patient: A Clinical Report. *J Indian Prosthodont Soc.* 2014 Dec;14(Suppl 1):279-82. Pubmed PMID: 26199531.
- [8]. Bencharit S, Schardt-Sacco D, Border MB, Barbaro CP. Full mouth rehabilitation with implant-supported prostheses for severe periodontitis: a case report. *Open Dent. J.* 2010;4:165.
- [9]. Rad AS, Siadat H, Monzavi A, Mangoli AA. Full mouth rehabilitation of a hypohidrotic ectodermal dysplasia patient with dental implants: a clinical report. *J. Prosthodont.* 2007 May;16(3):209-13.
- [10]. Thomason JM, Feine J, Exley C, Moynihan P, Müller F, Naert I, et al. Mandibular two implant-supported overdentures as the first choice standard of care for edentulous patients—the York Consensus Statement. *Br Dent J.* 2009 Aug 22;207(4):185-6. Pubmed PMID: 19696851.
- [11]. Hafeez N. Accessory foramen in the middle cranial fossa. *Res. J. Pharm. Technol.* 2016;9(11):1880-2.
- [12]. Krishnan RP, Ramani P, Sherlin HJ, Sukumaran G, Ramasubramanian A, Jayaraj G, et al. Surgical Specimen Handover from Operation Theater to Laboratory: A Survey. *Ann Maxillofac Surg.* 2018 Jul-Dec;8(2):234-238. Pubmed PMID: 30693238.
- [13]. Somasundaram S, Ravi K, Rajapandian K, Gurunathan D. Fluoride Content of Bottled Drinking Water in Chennai, Tamilnadu. *J Clin Diagn Res.* 2015 Oct;9(10):ZC32-4. Pubmed PMID: 26557612.
- [14]. Felicita AS. Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor - The sling shot method. *Saudi Dent J.* 2018 Jul;30(3):265-269. Pubmed PMID: 29942113.
- [15]. Kumar S, Rahman R. Knowledge, awareness, and practices regarding biomedical waste management among undergraduate dental students. *Asian J. Pharm. Clin. Res.* 2017;10(8):341.
- [16]. Gurunathan D, Shanmugaavel AK. Dental neglect among children in Chennai. *J Indian Soc Pedod Prev Dent.* 2016 Oct 1;34(4):364.
- [17]. Sneha S. Knowledge and awareness regarding antibiotic prophylaxis for infective endocarditis among undergraduate dental students. *Asian J. Pharm. Clin. Res.* 2016 Oct 1:154-9.
- [18]. Dhinesh B, Lalvani JI, Parthasarathy M, Annamalai K. An assessment on performance, emission and combustion characteristics of single cylinder diesel engine powered by Cymbopogon flexuosus biofuel. *Energy Convers. Manag.* 2016 Jun 1;117:466-74.
- [19]. Choudhari S, Thenmozhi MS. Occurrence and Importance of Posterior Condylar Foramen. *Res J Pharm Technol.* 2016;9(8):11-43.
- [20]. Paramasivam A, Vijayashree Priyadharsini J, Raghunandhakumar S. N6-adenosine methylation (m6A): a promising new molecular target in hypertension and cardiovascular diseases. *Hypertens Res.* 2020 Feb;43(2):153-154. Pubmed PMID: 31578458.
- [21]. Wu F, Zhu J, Li G, Wang J, Veeraghavan VP, Krishna Mohan S, et al. Biologically synthesized green gold nanoparticles from Siberian ginseng induce growth-inhibitory effect on melanoma cells (B16). *Artif Cells Nanomed Biotechnol.* 2019 Dec;47(1):3297-3305. Pubmed PMID: 31379212.
- [22]. Palati S, Ramani P, Shrelin HJ, Sukumaran G, Ramasubramanian A, Don KR, et al. Knowledge, Attitude and practice survey on the perspective of oral lesions and dental health in geriatric patients residing in old age homes. *Indian J Dent Res.* 2020 Jan-Feb;31(1):22-25. Pubmed PMID: 32246676.
- [23]. Saravanan M, Arokiyaraj S, Lakshmi T, Pugazhendhi A. Synthesis of silver nanoparticles from *Phenerochaete chrysosporium* (MTCC-787) and their antibacterial activity against human pathogenic bacteria. *Microb Pathog.* 2018 Apr;117:68-72. Pubmed PMID: 29427709.
- [24]. Govindaraju L, Gurunathan D. Effectiveness of Chewable Tooth Brush in Children-A Prospective Clinical Study. *J Clin Diagn Res.* 2017 Mar;11(3):ZC31-ZC34. Pubmed PMID: 28511505.
- [25]. Vijayakumar Jain S, Muthusekhar MR, Baig MF, Senthilnathan P, Loganathan S, Abdul Wahab PU, et al. Evaluation of Three-Dimensional Changes in Pharyngeal Airway Following Isolated Lefort One Osteotomy for the Correction of Vertical Maxillary Excess: A Prospective Study. *J Maxillofac Oral*

- Surg. 2019 Mar;18(1):139-146.Pubmed PMID: 30728705.
- [26]. de Castellucci Barbosa L, Ferreira MR, de Carvalho Calabrich CF, Viana AC, De Lemos MC, Lauria RA. Edentulous patients' knowledge of dental hygiene and care of prostheses. *Gerodontology*. 2008 Jun;25(2):99-106.
- [27]. Douglass CW, Shih A, Ostry L. Will there be a need for complete dentures in the United States in 2020? *J Prosthet Dent*. 2002 Jan;87(1):5-8.Pubmed PMID: 11807476.
- [28]. Adams C, Slack-Smith LM, Larson A, O'Grady MJ. Edentulism and associated factors in people 60 years and over from urban, rural and remote Western Australia. *Aust Dent J*. 2003 Mar;48(1):10-4.Pubmed PMID: 14640151.
- [29]. Javed F, Klingspor L, Sundin U, Altamash M, Klinge B, Engström PE. Periodontal conditions, oral *Candida albicans* and salivary proteins in type 2 diabetic subjects with emphasis on gender. *BMC Oral Health*. 2009 May 12;9:12.Pubmed PMID: 19435501.
- [30]. Jyothi S, Robin PK, Ganapathy D. Periodontal health status of three different groups wearing temporary partial denture. *Res J Pharm Technol*. 2017;10(12):4339-42.
- [31]. Venugopalan S, Ariga P, Aggarwal P, Viswanath A. Case Report: Magnetically retained silicone facial prosthesis. *Niger. J. Clin. Pract*. 2014 Mar 27;17(2):260-4.
- [32]. Srisilapanan P, Korwanich N, Sheiham A. Assessing prosthodontic dental treatment needs in older adults in Thailand: normative vs. sociodental approaches. *Spec Care Dentist*. 2003 Jul-Aug;23(4):131-4.Pubmed PMID: 14765891.
- [33]. Kaptein ML, Hoogstraten J, de Putter C, de Lange GL, Blijdorp PA. Dental implants in the atrophic maxilla: measurements of patients' satisfaction and treatment experience. *Clin Oral Implants Res*. 1998 Oct;9(5):321-6.Pubmed PMID: 9835811.
- [34]. Liddelow GJ, Henry PJ. A prospective study of immediately loaded single implant-retained mandibular overdentures: preliminary one-year results. *J Prosthet Dent*. 2007 Jun;97(6 Suppl):S126-37.Pubmed PMID: 17618927.
- [35]. Walton JN, MacEntee MI. Choosing or refusing oral implants: A prospective study of edentulous volunteers for a clinical trial. *J Prosthet Dent*. 2006 Nov 1;96(5):353.
- [36]. Ashok V, Suvitha S. Awareness of all ceramic restoration in rural population. *Res J Pharm Technol*. 2016;9(10):1691-3.
- [37]. Kannan A, Venugopalan S. A systematic review on the effect of use of impregnated retraction cords on gingiva. *Res J Pharm Technol*. 2018;11(5):2121-6.
- [38]. Ranganathan H, Ganapathy DM, Jain AR. Cervical and Incisal Marginal Discrepancy in Ceramic Laminate Veneering Materials: A SEM Analysis. *Contemp Clin Dent*. 2017 Apr-Jun;8(2):272-278.Pubmed PMID: 28839415.
- [39]. Ganapathy D, Sathyamoorthy A, Ranganathan H, Murthykumar K. Effect of Resin Bonded Luting Agents Influencing Marginal Discrepancy in All Ceramic Complete Veneer Crowns. *J Clin Diagn Res*. 2016 Dec;10(12):ZC67-ZC70.Pubmed PMID: 28209008.
- [40]. Duraisamy R, Krishnan CS, Ramasubramanian H, Sampathkumar J, Mariappan S, Navarasampatti Sivaprasaman A. Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments. *Implant Dent*. 2019 Jun;28(3):289-295.Pubmed PMID: 31124826.
- [41]. Jain AR, Nallaswamy D, Ariga P, Ganapathy DM. Determination of correlation of width of maxillary anterior teeth using extraoral and intraoral factors in Indian population: A systematic review. *World J Dent*. 2018 Jan;9(1):68-75.
- [42]. Esfandiari S, Lund JP, Penrod JR, Savard A, Thomason JM, Feine JS. Implant overdentures for edentulous elders: study of patient preference. *Gerodontology*. 2009 Mar;26(1):3-10.Pubmed PMID: 18498362.
- [43]. Narby B, Kronström M, Söderfeldt B, Palmqvist S. Prosthodontics and the patient. Part 2: Need becoming demand, demand becoming utilization. *Int J Prosthodont*. 2007 Mar-Apr;20(2):183-9.Pubmed PMID: 17455442.
- [44]. de Bruyn H, Collaert B, Lindén U, Björn AL. Patient's opinion and treatment outcome of fixed rehabilitation on Brånemark implants. A 3-year follow-up study in private dental practices. *Clin Oral Implants Res*. 1997 Aug;8(4):265-71.Pubmed PMID: 9586472.
- [45]. Feine JS, Carlsson GE. Implant overdentures the standard of care for edentulous patients. *New York*. 2003.
- [46]. Jemt T, Lindén B, Lekholm U. Failures and complications in 127 consecutively placed fixed partial prostheses supported by Brånemark implants: from prosthetic treatment to first annual checkup. *Int J Oral Maxillofac Implants*. 1992 Spring;7(1):303.Pubmed PMID: 1398822.
- [47]. Zitzmann NU, Marinello CP. Treatment outcomes of fixed or removable implant-supported prostheses in the edentulous maxilla. Part I: patients' assessments. *J Prosthet Dent*. 2000 Apr 1;83(4):424-33.
- [48]. Emami E, Heydecke G, Rompré PH, de Grandmont P, Feine JS. Impact of implant support for mandibular dentures on satisfaction, oral and general health-related quality of life: a meta-analysis of randomized-controlled trials. *Clin Oral Implants Res*. 2009 Jun;20(6):533-44.Pubmed PMID: 19515032.
- [49]. Boerrigter EM, Stegenga B, Raghoobar GM, Boering G. Patient satisfaction and chewing ability with implant-retained mandibular overdentures: a comparison with new complete dentures with or without preprosthetic surgery. *J Oral Maxillofac Surg*. 1995 Oct 1;53(10):1167-73.
- [50]. Ganapathy DM, Kannan A, Venugopalan S. Effect of coated surfaces influencing screw loosening in implants: A systematic review and meta-analysis. *World J. Dent*. 2017 Nov;8(6):496-502.
- [51]. Ajay R, Suma K, Ali SA, Kumar Sivakumar JS, Rakshagan V, Devaki V, et al. Effect of Surface Modifications on the Retention of Cement-retained Implant Crowns under Fatigue Loads: An In vitro Study. *J Pharm Bioallied Sci*. 2017 Nov;9(Suppl 1):S154-S160.Pubmed PMID: 29284956.
- [52]. Adell R, Lekholm U, Rockler BR, Brånemark PI. A 15-year study of osseointegrated implants in the treatment of the edentulous jaw. *Int J Oral Surg*. 1981 Jan 1;10(6):387-416.
- [53]. Egilmez F, Ergun G, Cekic-Nagas I, Bozkaya S. Implant-supported hybrid prosthesis: Conventional treatment method for borderline cases. *Eur J Dent*. 2015 Jul-Sep;9(3):442-448.Pubmed PMID: 26430378.
- [54]. Selvan SR, Ganapathy D. Efficacy of fifth generation cephalosporins against methicillin-resistant *Staphylococcus aureus*-A review. *Res J Pharm Technol*. 2016;9(10):1815-8.
- [55]. Vijayalakshmi B, Ganapathy D. Medical management of cellulitis. *Res J Pharm Technol*. 2016;9(11):2067-70.
- [56]. Subasree S, Murthykumar K. Effect of aloe vera in oral health-A review. *Res J Pharm Technol*. 2016;9(5):609-12.
- [57]. Carlsson GE. Clinical morbidity and sequelae of treatment with complete dentures. *J Prosthet Dent*. 1998 Jan 1;79(1):17-23.
- [58]. Allen PF, McMillan AS. A review of the functional and psychosocial outcomes of edentulousness treated with complete replacement dentures. *J Can Dent Assoc*. 2003 Nov;69(10):662.Pubmed PMID: 14611716.
- [59]. Vijayashree Priyadharsini J. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *J Periodontol*. 2019 Dec;90(12):1441-1448.Pubmed PMID: 31257588.
- [60]. Pc J, Marimuthu T, Devadoss P, Kumar SM. Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study. *Clin Implant Dent Relat Res*. 2018 Apr 6;20(4):531-4.
- [61]. Ramesh A, Varghese S, Jayakumar ND, Malaiappan S. Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study. *J Periodontol*. 2018 Oct;89(10):1241-1248.Pubmed PMID: 30044495.
- [62]. Ramadurai N, Gurunathan D, Samuel AV, Subramanian E, Rodrigues SJ. Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial. *Clin Oral Investig*. 2019 Sep;23(9):3543-50.
- [63]. Sridharan G, Ramani P, Patankar S, Vijayaraghavan R. Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma. *J Oral Pathol Med*. 2019 Apr;48(4):299-306.
- [64]. Ezhilarasan D, Apoorva VS, Ashok Vardhan N. Syzygium cumini extract induced reactive oxygen species-mediated apoptosis in human oral squamous carcinoma cells. *J Oral Pathol Med*. 2019 Feb;48(2):115-121.Pubmed PMID: 30451321.
- [65]. Mathew MG, Samuel SR, Soni AJ, Roopa KB. Evaluation of adhesion of *Streptococcus mutans*, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: randomized controlled trial. *Clin Oral Investig*. 2020 Sep;24(9):1-6.Pubmed PMID: 31955271.
- [66]. Samuel SR. Can 5-year-olds sensibly self-report the impact of developmental enamel defects on their quality of life? *Int J Paediatr Dent*. 2021 Mar;31(2):285-286.Pubmed PMID: 32416620.
- [67]. R H, Ramani P, Ramanathan A, R JM, S G, Ramasubramanian A, et al. CYP2 C9 polymorphism among patients with oral squamous cell carcinoma and its role in altering the metabolism of benzo[a]pyrene. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2020 Sep;130(3):306-312.Pubmed PMID: 32773350.
- [68]. Chandrasekar R, Chandrasekar S, Sundari KKS, Ravi P. Development and validation of a formula for objective assessment of cervical vertebral bone age. *Prog Orthod*. 2020 Oct 12;21(1):38.Pubmed PMID: 33043408.
- [69]. Vijayashree Priyadharsini J, Smiline Girija AS, Paramasivam A. In silico analysis of virulence genes in an emerging dental pathogen *A. baumannii* and related species. *Arch Oral Biol*. 2018 Oct;94:93-98.Pubmed PMID: 30015217.