



**International Journal of Biology, Pharmacy
and Allied Sciences (IJBPAS)**

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

SATISFACTORY LEVELS OF MARGINAL FIT OF FIXED PARTIAL DENTURES DURING FRAMEWORK TRIAL - A RETROSPECTIVE ANALYSIS

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Received 19th March 2021; Revised 25th April, 2021; Accepted 20th May 2021; Available online 1st Aug, 2021

<https://doi.org/10.31032/IJBPAS/2021/10.8.1062>

ABSTRACT

Long term success of fixed partial denture depends on a variety of factors, one of them being accuracy of fit between the restoration and prepared tooth structure. The marginal fit of a fixed partial denture to the supporting tooth structure can influence the strength of the restoration. Very few studies have been done to evaluate the marginal fit of fixed partial dentures during framework trial. Case records were collected from DIAS (Dental information archiving software). This university setting consisted of 413 patients. Data was tabulated with parameters of Name, Age, Sex, Satisfactory level of marginal fit of the framework. Data was imported into SPSS for statistical analysis. Descriptive statistics having frequency percentage and chi sq. test was done for association. 94.43% of the population's frameworks marginal fit was found to be satisfactory. The satisfactory results were found to be higher in males than females comparatively. The age group 31-40 yrs had satisfactory results compared to any other age groups. Within the limitation of the study, short term clinical data suggest that the marginal fit of the frameworks are satisfactory. Further extensive research can be done with a larger sample size.

Keywords: Cad/cam, marginal fit, FPD, framework

INTRODUCTION

Several treatment options are available for the replacement of missing teeth. These include Fixed partial dentures, removable partial dentures and implants supported crowns. Generally fixed partial dentures are more effective than removable partial dentures in terms of patient acceptance. Implants have been well documented in the dental literature, however deficiency in quality/quantity of hard or soft tissues play a factor during treatment planning. Long term success of fixed partial denture can be influenced by marginal discrepancies [1–3]. Poor marginal adaptation can lead to increased plaque retention and therefore may lead to periodontal infection [4–7]. They may also cause secondary caries and lead to failure of fixed partial denture [8–11].

Low quality impressions are a significant obstacle for fabricating restorations with the adequate fit. Marginal fit of the fixed partial denture exert great influence over the longevity of indirect restoration [12–15]. The better the impression accuracy, the closer the proximity degree between the restoration and abutment is and better the internal and marginal fit of the Fixed partial denture [16, 17]. Acceptable marginal fit for full crowns has been widely discussed, marginal fit of 120um or less is desirable from a clinical

view. An inadequate marginal fit i.e, wider than 120um may compromise the longevity of the Fixed partial denture as a wider cement film is exposed to the environment [18–20]. Accordingly fabrication of fixed partial denture with inadequate marginal fit is dependent on the impression accuracy, therefore quality of the impression is important in the fabrication of fixed partial denture.

The present aim of this study is to evaluate the satisfactory level of marginal adaptation of the framework of the fixed partial dentures that are fabricated in saveetha dental college and hospitals.

MATERIALS AND METHODS

This is a retrospective study regarding satisfactory levels of marginal fit of fixed partial dentures during framework trial done in saveetha dental college and hospitals among patients undergoing fixed partial denture treatment from june 2019 to april 2020. The approval for this university setting was obtained from the Institution of Ethics Board.

The sample size of this study was found to be 413 patients, from a given period of time. These patient details were obtained from a software system known as DIAS (Dental Information Achieves System) which is

exclusive for saveetha dental college and hospitals. Sampling bias was minimised with justification of photographs. The data was extracted and tabulated in Microsoft Excel based on the parameters required.

Inclusion Criteria: Patients treated with Fixed partial dentures

Exclusion Criteria: Incomplete Data

Once the case details have been obtained, the data is then extracted and tabulated based on the parameters which are age groups (<20, 21-30, 31-40, 41-50, 51-60, 61-70, >70) , gender , satisfactory levels of marginal fit.

Statistical analysis

Once the results have been tabulated based on the parameters, the data is then exported to SPSS software. Frequency, percentage and mean values were employed in the analysis. Association of the parameters (age group, gender, satisfactory level) were done in SPSS. Figures and Tables are added to represent the Association between the parameters.

RESULTS AND DISCUSSION

This study included a total number of 413 frameworks in which 244 of it was for males while 169 frameworks were fabricated for females. It is seen that 94.43% of the framework's marginal fit was satisfactory and only 5.57% from the total population had non-satisfactory marginal fit of the

frameworks. Association of Gender, Age and sextant of the framework with marginal fit showed no statistical significance, although males (56.6%) predominantly received a framework that had better marginal fit compared to females and the age group 31-40yrs (32.2%) had high satisfactory levels compared to the other age groups. Among the sextants, sextant 5(39.71%) had the highest rate of satisfactory levels comparatively.

Fixed partial denture replacements for the teeth have taken a variety of designs throughout the years, many principles in its preparation are involved. Although more compatible and more resilient materials have been introduced in the recent years. Variety of techniques and methods are employed in the preparation of the tooth and restoration of the missing tooth. Even though there are many techniques and methods in restoration of the missing tooth. There are reported failures of fixed partial dentures which attribute over 50% of failures to the dentists and the materials used in the fabrication of fixed partial dentures [21, 22], other self reported failures attributed to biological and technical failures including secondary caries, retention loss and marginal defects [23].

Marginal adaptation plays an important role in the success and failure of a fixed partial

denture, marginal gap can create favourable conditions for the biofilm deposition, thereby contributing to the development of caries and periodontal disease [24–26]. There are various studies done regarding marginal adaptation of the fixed partial denture post treatment but very few are available in the literature regarding marginal adaptation of the framework during the trial phase.

From this study it is evident that 94.43% of the patients' frameworks were satisfactory while 5.57% of the frameworks did not have satisfactory results comparatively as seen in Figure 4. These results coincides with the studies done by Tsumita *et al.*, [27] Benic *et al.*, [28] reported in their study that the mean marginal gap was 86.9um which was less than 120um and clinically acceptable therefore satisfactory marginal adaptation and Benic *et al.*, had similar satisfactory results in his digitally fabricated zirconia and metal framework.

Table 1, Figure 1 show association of the site of the fixed partial denture with marginal fit of the framework in which sextant 2 i.e., upper anterior teeth had better framework marginal adaptation than the rest which is most required as there is an importance of marginal for aesthetic regions. Though there were high satisfactory levels in the upper

anterior region, the results of this association were not statistically significant.

Table 2, Figure 2 show association of gender with marginal fit of the framework, there was a higher rate of satisfactory levels of marginal fit among the males(56.66%) when compared to females(37.77) and also the most non-satisfactory frameworks were seen among females(3.15%) though there was only a slight difference among males and females in this aspect. Though they had different rates of satisfactory levels the results were not statistically significant. This coincides with a study done by De Backer H *et al.*, [29–31] in which he stated that gender did not play an important role in marginal fit of the framework.

In Table 3 and Figure 3, association between age and marginal fit can be seen where age group It shows that the age group 31-40 show better satisfactory levels (32.2%) compared to the other age groups; the most non-satisfactory marginal fit was seen among the age group 21-30(2.18%). These results did not show statistical significance and it was contradicted to a study done by De Backer H in which he states that there is a clear statistical significant association between age groups and marginal fit discrepancy.

The study was geographically limited and predominantly consisted of the South Indian population. Data which were unclear were excluded thereby reducing the sample size. Within the limit of the study, it was found that most of the frameworks of fixed partial dentures were satisfactory. To ascertain the results of this study and to increase the level of significance, the sample size and the

geographic area of coverage should be extended to at least most parts of South India. Conducting a multicentered study with extended geographic area and wide range of population in future we can obtain better results. Thus this knowledge of marginal fit of frameworks and Association with various parameters is essential in a dental practice for clinical implementation.

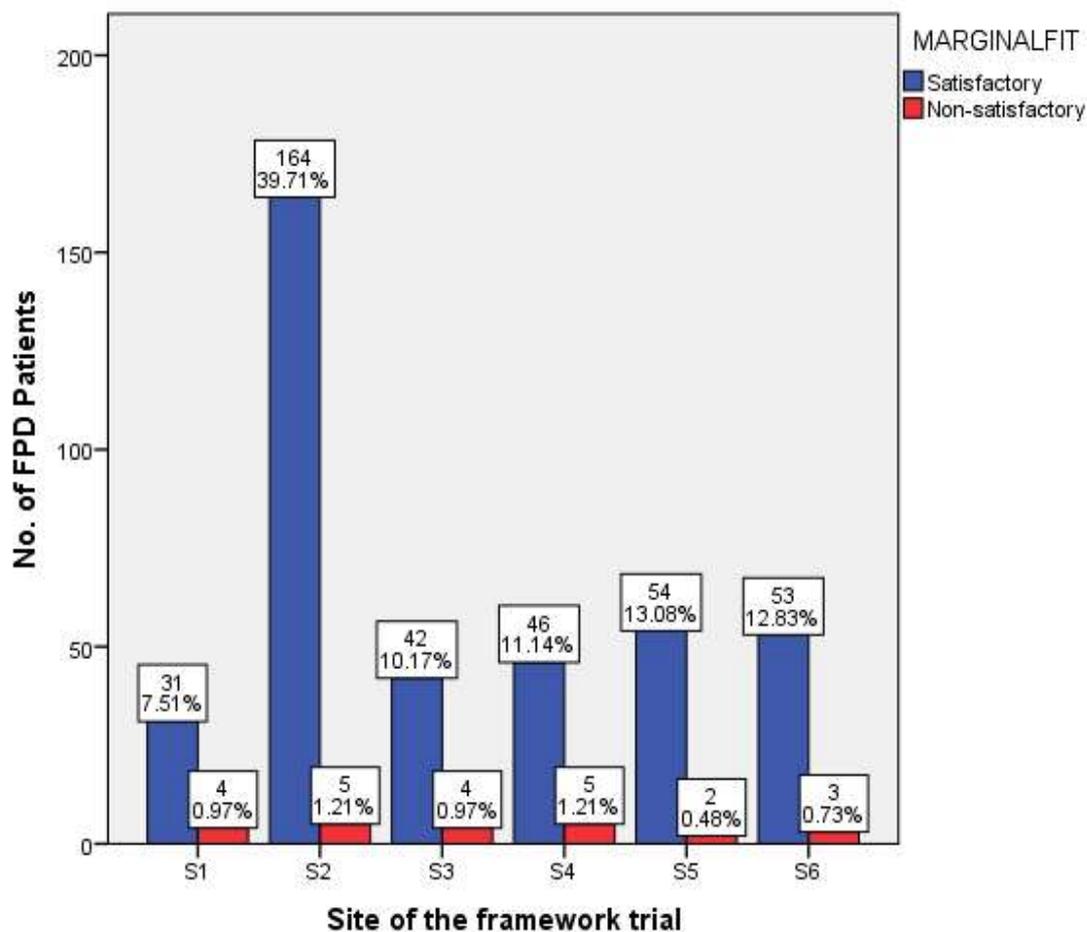


Figure 1: Bar graph showing the Association of different sextants and satisfactory levels of marginal fit of frameworks of fixed partial dentures. X axis represents the site of the tooth prepared and Y axis represents the number of patients treated with fixed partial denture. Chi-square test was done and was found to be statistically not significant [chi square value - 7.499; p value (>0.05)]. It shows that the sextant 2 (Upper Anteriors) shows better satisfactory levels (Blue) with 39.71% compared to the other sextants; the most non-satisfactory marginal fit (Red) was seen among sextant 2 & 4 (1.21%).

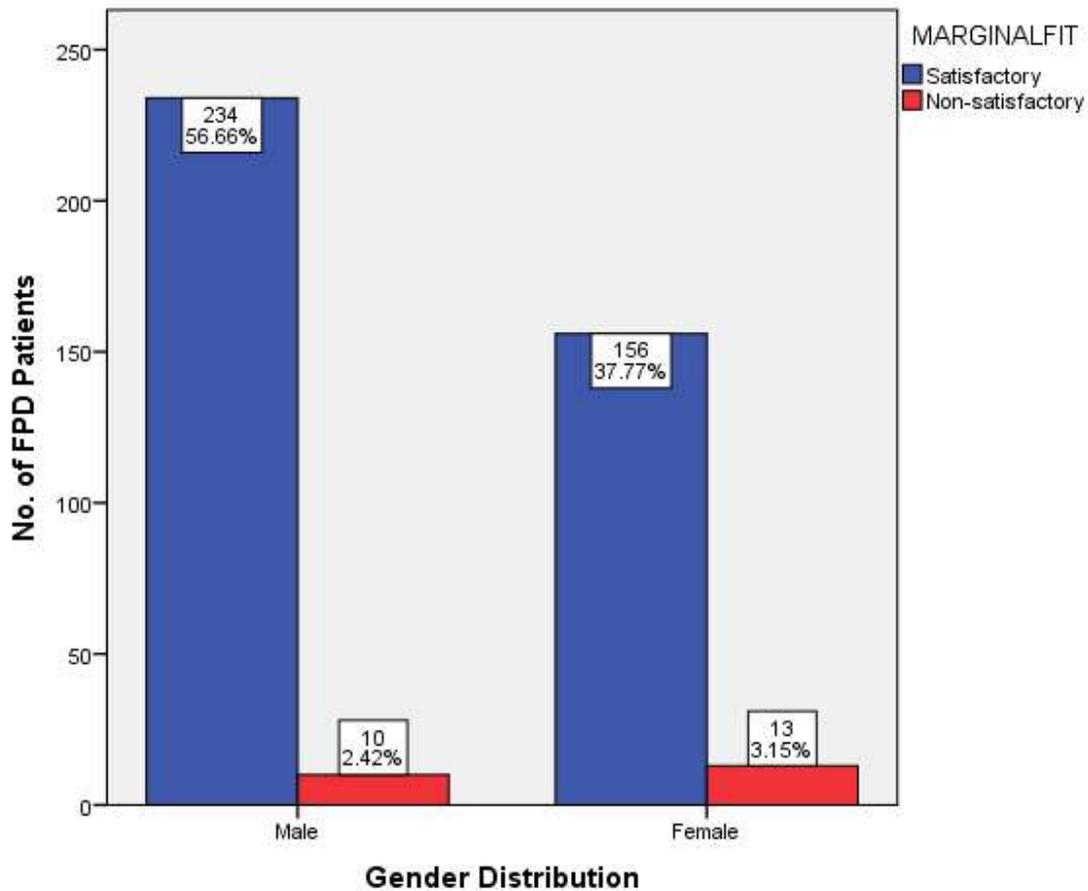


Figure 2: Bar graph showing the Association between gender and satisfactory levels of marginal fit of frameworks of fixed partial dentures. X axis represents the gender distribution and Y axis represents the number of patients treated with fixed partial denture. Chi-square test was done and was found to be statistically not significant [chi square value -2.452; p value(>0.05)]. It shows that the males show better satisfactory levels (Blue) with 56.66% compared to the females; the most non-satisfactory marginal fit (Red) was seen among females (3.15%).

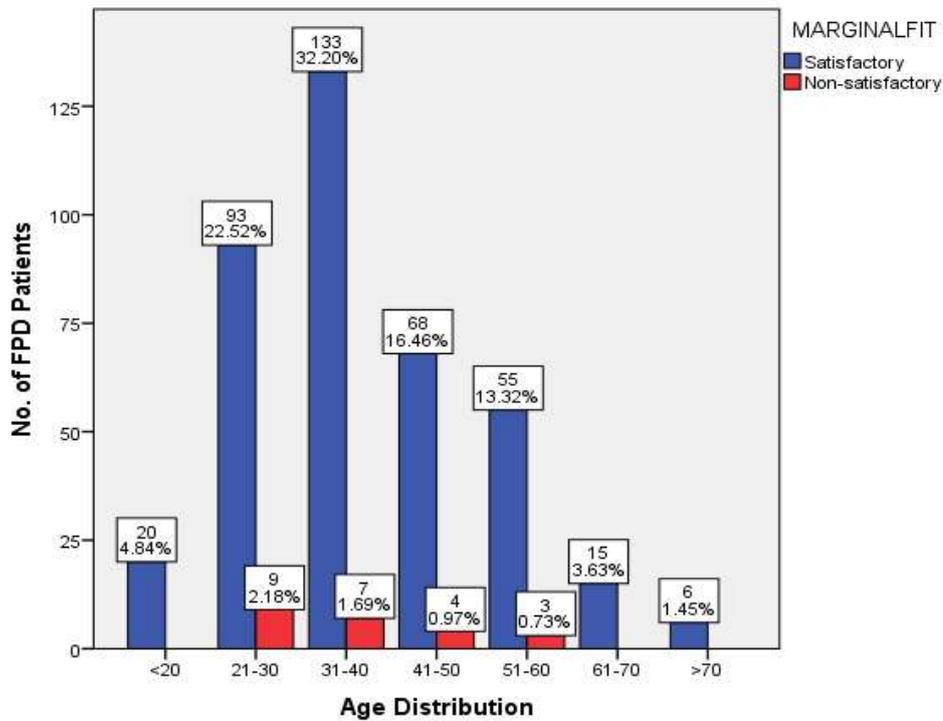


Figure 3: Bar graph showing the Association of age group and satisfactory levels of marginal fit of frameworks of fixed partial dentures. X axis represents the age distribution and Y axis represents the number of patients treated with fixed partial denture. Chi-square test was done and was found to be statistically not significant [chi square value - 4.576; p value (>0.05)]. It shows that the age group 31-40 show better satisfactory levels (Blue) (32.2%) compared to the other age groups; the most on-satisfactory marginal fit (Red) was seen among the age group 21-30 (2.18%).

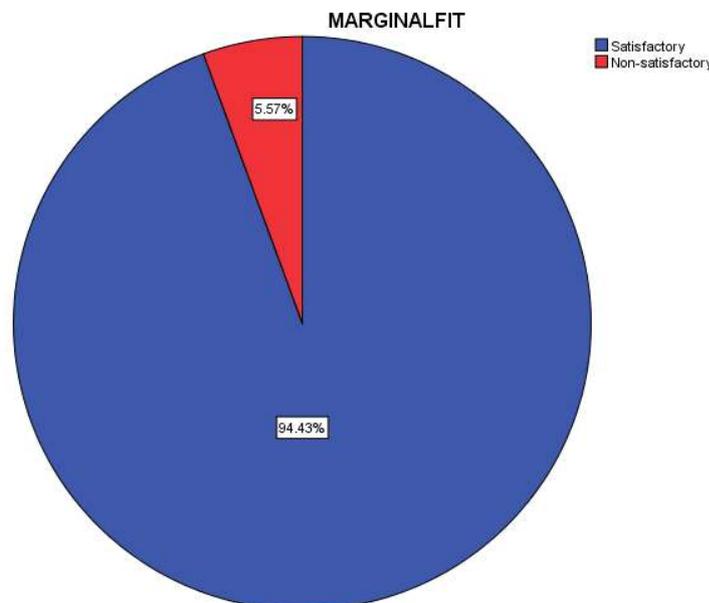


Figure 4: This Pie chart shows the satisfactory levels of marginal fit of frameworks of fixed partial dentures involved in this study. It shows that 94.43% of the frameworks had satisfactory marginal fit (Blue) and only 5.57% of the frameworks were not satisfactory (Red).

CONCLUSION

Within the limitation of the present study, 94.4% of the patients Fixed partial denture frameworks had satisfactory marginal fit whereas only 5.6% of the entire population reported that the frameworks had some marginal discrepancy. More extensive research and implementation of novel ideas to reduce the discrepancy in marginal adaptation should be encouraged and is definitely required to overcome failures in fixed partial dentures due to marginal fit discrepancies.

ACKNOWLEDGEMENT

The authors are thankful to Saveetha Dental College for providing a platform to express our knowledge.

REFERENCES

- [1] Bindl A, Mörmann WH. Marginal and internal fit of all-ceramic CAD/CAM crown-copings on chamfer preparations. *J Oral Rehabil* [Internet]. 2005; Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-2842.2005.01446.x>
- [2] Cho L, Song H, Koak J, Heo S. Marginal accuracy and fracture strength of ceromer/fiber-reinforced composite crowns: effect of variations in preparation design. *J*

Prosthet Dent. 2002 Oct;88(4):388–95.

- [3] 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* [Internet]. 2018; Available from: https://www.researchgate.net/profile/Ashish_Jain52/publication/323548671_Determination_of_correlation_of_width_of_maxillary_anterior_teeth_using_extraoral_and_intraoral_factors_in_indian_population_A_systematic_review/links/5b00347c0f7e9be94bd8caf9/Determination-of-correlation-of-width-of-maxillary-anterior-teeth-using-extraoral-and-intraoral-factors-in-indian-population-A-systematic-review.pdf
- [4] Glauser R, Sailer I, Wohlwend A, Studer S, Schibli M, Schärer P. Experimental zirconia abutments for implant-supported single-tooth restorations in esthetically demanding regions: 4-year results of a prospective clinical study. *Int J Prosthodont*. 2004 May;17(3):285–90.
- [5] Lang NP, Kiel RA, Anderhalden K.

- Clinical and microbiological effects of subgingival restorations with overhanging or clinically perfect margins. *J Clin Periodontol.* 1983 Nov;10(6):563–78.
- [6] Valderhaug J, Heloe LA. Oral hygiene in a group of supervised patients with fixed prostheses. *J Periodontol.* 1977 Apr;48(4):221–4.
- [7] Jyothi S, Robin PK, Ganapathy D. Periodontal health status of three different groups wearing temporary partial denture. *Research Journal of [Internet].* 2017; Available from: <http://www.indianjournals.com/ijor.aspx?target=ijor:rjpt&volume=10&issue=12&article=046>
- [8] Sailer I, Fehér A, Filser F, Gauckler LJ, Lüthy H, Hämmerle CHF. Five-year clinical results of zirconia frameworks for posterior fixed partial dentures. *Int J Prosthodont.* 2007 Jul;20(4):383–8.
- [9] Duraisamy R, Krishnan CS, Ramasubramanian H, Sampathkumar J, Mariappan S, Navarasampatti Sivaprakasam 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):289–95.
- [10] Selvan SR, Ganapathy D. Efficacy of fifth generation cephalosporins against methicillin-resistant *Staphylococcus aureus*-A review. *Research Journal of Pharmacy and Technology.* 2016;9(10):1815–8.
- [11] 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):ZC67–70.
- [12] Beuer F, Naumann M, Gernet W, Sorensen JA. Precision of fit: zirconia three-unit fixed dental prostheses. *Clin Oral Investig.* 2009 Sep;13(3):343–9.
- [13] Subasree S, Murthykumar K, Others. Effect of Aloe Vera in Oral Health-A Review. *Research Journal of Pharmacy and Technology.* 2016;9(5):609–12.
- [14] Ranganathan H, Ganapathy DM, Jain AR. Cervical and Incisal Marginal Discrepancy in Ceramic Laminate Veneering Materials: A SEM Analysis. *Contemp Clin Dent.*

- 2017 Apr;8(2):272–8.
- [15] Vijayalakshmi B, Ganapathy D. Medical management of cellulitis. *Research Journal of Pharmacy and Technology*. 2016;9(11):2067–70.
- [16] Fransson B, Oilo G, Gjeitanger R. The fit of metal-ceramic crowns, a clinical study. *Dent Mater*. 1985 Oct;1(5):197–9.
- [17] Karlsson S. The fit of Procera titanium crowns. An in vitro and clinical study. *Acta Odontol Scand*. 1993 Jun;51(3):129–34.
- [18] McLean JW, von Fraunhofer JA. The estimation of cement film thickness by an in vivo technique. *Br Dent J*. 1971 Aug 3;131(3):107–11.
- [19] Ganapathy DM, Kannan A, Venugopalan S. Effect of Coated Surfaces influencing Screw Loosening in Implants: A Systematic Review and Meta-analysis [Internet]. Vol. 8, *World Journal of Dentistry*. 2017. p. 496–502. Available from: <http://dx.doi.org/10.5005/jp-journals-10015-1493>
- [20] Ashok V, Suvitha S. Awareness of all ceramic restoration in rural population. *J Pharm Res* [Internet]. 2016; Available from: <http://www.indianjournals.com/ijor.aspx?target=ijor:rjpt&volume=9&issue=10&article=039&type=pdf>
- [21] Maryniuk GA, Kaplan SH. Longevity of restorations: survey results of dentists' estimates and attitudes. *J Am Dent Assoc*. 1986 Jan;112(1):39–45.
- [22] 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.
- [23] Swartz B, Svenson B. Long-term changes in marginal and periapical periodontal conditions in patients with fixed prostheses: a radiographic study. *Journal of oral* [Internet]. 1996; Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1365-2842.1996.tb01217.x>
- [24] Groten M, Axmann D, Pröbster L, Weber H. Determination of the minimum number of marginal gap measurements required for practical in-vitro testing. *J Prosthet Dent*. 2000 Jan;83(1):40–9.
- [25] Kannan A, Venugopalan S. A

- systematic review on the effect of use of impregnated retraction cords on gingiva. *Research Journal of Pharmacy and Technology*. 2018;11(5):2121–6.
- [26] Venugopalan S, Ariga P, Aggarwal P, Viswanath A. Magnetically retained silicone facial prosthesis. *Niger J Clin Pract*. 2014 Mar;17(2):260–4.
- [27] Tsumita M, Kokubo Y, Ohkubo C, Nagayama Y, Sakurai S, Fukushima S. Clinical Evaluation of Marginal and Internal Gaps of Zirconia-based 3-unit CAD/CAM Fixed Partial Dentures. *Prosthodontic Research & Practice*. 2007;6(2):114–9.
- [28] Benic GI, Sailer I, Zeltner M, Gütermann JN, Özcan M, Mühlemann S. Randomized controlled clinical trial of digital and conventional workflows for the fabrication of zirconia-ceramic fixed partial dentures. Part III: Marginal and internal fit. *J Prosthet Dent*. 2019 Mar;121(3):426–31.
- [29] De Backer H, Van Maele G, De Moor N. The influence of gender and age on fixed prosthetic restoration longevity: an up to 18-to 20-year follow-up in an undergraduate clinic. *International [Internet]*. 2007; Available from: <http://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=08932174&asa=Y&AN=36852270&h=zvvh6BmzS5%2BaxqFojoNMcWCaNjGVclM8EINyrxgwyBR3KdGBD7SEMZYD7WRXrD2ytxm96ZDHuaboXLeidTZpA%3D%3D&crl=c>
- [30] Basha FYS, Ganapathy D, Venugopalan S. Oral Hygiene Status among Pregnant Women. *Research Journal of Pharmacy and Technology*. 2018;11(7):3099–102.
- [31] Ajay R, Suma K, Ali S, Sivakumar JK, 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 [Internet]. Vol. 9, *Journal of Pharmacy And Bioallied Sciences*. 2017. p. 154. Available from: http://dx.doi.org/10.4103/jpbs.jpbs_146_17