

The complexity of Partial edentulism among patients visiting saveetha dental college based on PDI classification

¹Ajrish George S, ²Dhanraj M*

¹Saveetha Dental College and hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai-77

²Professor, Department of Prosthodontics Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences Saveetha University Chennai 600077

Abstract

Background: Complexity is the state of being irritated or complicated. It varies for each individual. The loss of tooth happens in different manners, the most common being extraction due to non-restorable caries. This loss of tooth affects many attributes of the individual. The functions like speech, chewing are affected. But most importantly it affects the aesthetics of the individual which affects their personality of the person which makes the individual more complex. **Aim:** The study aims at analyzing the complexity of partial edentulism patients based on PDI classification. **Materials and methods:** The study involved analyzing a patient with partial edentulism who is visiting Saveetha Dental College. The patients were classified based on age and based on PDI classification. The clinical analysis done was noted in DIAS{Dental Information Archiving Software} of Saveetha Dental College. All the data from DiAS was then collected. All collected data were computed in excel format and statistical analysis was done. **Results:** In this study, a total of 630 patients were examined. Class 1 PDI was more common in both genders. The males had more missing compared to females. Class 1 was found in 36.8% followed by class 3 was 25.1%, then class 2 was 22.5% and the least common was class 4 16%. **Conclusion:** Within the limitation of the study, it was found that the patients were more complex age group of 40-49 years of age and more willing for treatment in the age group of 29-30 years of age.

Keywords: ACPDI classification partial edentulism

DOI: 10.47750/pnr.2022.13.S04.144

Introduction

Complexity is the state or quality of an individual being intricate or complicated(Zaigham and Muneer, 2010). Complexity varies from each person(Olga O. Charyeva, Altynbekov and Nysanova, 2012). Oral health is one of the major issues concerning the quality of life. Poor oral health and loss of teeth adversely affect the dietary intake, nutritional status, phonetics, psychology, and the general health of a patient(O. O. Charyeva, Altynbekov and Nysanova, 2012). Tooth loss takes place in different ways. It can either be non-restorable caries, aggressive periodontitis, any periapical infection that leads to the extraction of the teeth(Shah, Shah and Parmar, 2012). Tooth loss affects speech, function, and esthetics(Jeyapalan, 2015). Masticatory efficacy is strongly related to the remaining number of occluding pairs of teeth in the oral cavity(Moaleem, 2017). The complexity of the person will depend on the time and site of missing teeth. Persons will be more complex if the anterior teeth are missing than that of the missing posteriors(Curtis *et al.*, 1992). Much emphasis on tooth preservation has led to an increase in the number of partially dentate patients(Arigo *et al.*, 2018). An increase in the age of these partially dentate patients and oral morphological characteristics greatly adds to the complexity of these cases. Therefore, each patient should be managed accordingly in order to ensure adequate function and comfort(Jyothi *et al.*, 2017).

Even Though the aesthetics part is the main concern the function of the tooth is also very important(Duraisamy *et al.*, 2019). Some people get irritated when they are not able to chew the food in an efficient manner. So the complexity of persons with partial edentulism is multifactorial (Selvan and Ganapathy, 2016). Various classification systems have been devised for partial edentulism(Ganapathy *et al.*, 2016). An ideal classification should include information regarding all the clinical aspects of the case. In the last decades a new attitude of expectancy has appeared, consisting of following up the parameters of oral health in a partially edentulous patient(Subasree, Murthykumar and Dhanraj, 2016). A common one is Kennedy's classification has many benefits including immediate visualization, recognition of prosthesis support(Ranganathan, Ganapathy and Jain, 2017). But the condition of supporting structures, adjacent

teeth wasn't considered in Kennedy's classification. These limitations led to PDI(Prosthodontic Diagnostic Index) which was given by the American College of Prosthodontists(ACP). In PDI classification it uses 4 categories(class I-IV)(Ganapathy, Kannan and Venugopalan, 2017). ACP PDI classification system categorizes patients according to the complexity of the edentulous condition and helps the clinician to make a diagnostically driven treatment plan(Ashok and Suvitha, 2016). The analysis of diagnostic factors is facilitated with the use of a worksheet and guidelines have been given for the use of this index(Ashok *et al.*, 2014). Our team has extensive knowledge and research experience that has translate into high quality publications (Kumar *et al.*, 2006; Devi and Gnanavel, 2014; Varghese *et al.*, 2015; Sivamurthy and Sundari, 2016; Chen *et al.*, 2019) (Rao and Kumar, no date; Nair, Jeevanandan and Vignesh, 2018; Anbu *et al.*, 2019; Sekar *et al.*, 2019; Johnson *et al.*, 2020).Now the growing trend in this area motivated us to pursue this project.

This study will explain whether a patient is up for prosthetic treatment. This study aims at analyzing the complexity of patients based on ACPDI classification and categorizing them based on gender and different age groups.

Materials and methods

This study assessed the patient complexity of the partial edentulism of patients visiting Saveetha dental college. The patient without partial edentulism was excluded from the study. The study setting was a university setting that included patients living in one geographic area under this study. This involves data collection of the history of patient, clinical, and radiographic examination for 650 patients from 1-10-2019 to 31-3-2020. Then the ACPDI classification of each patient was noted separately. Then the patients were categorized into different classes based on the classification. The data was obtained from digital interference DIAS {Dental Information Archiving Software}. The patient was split into different age groups from age 20-85 years as group 1(20-29 years), group 2(30-39 years), group 3(40-49 years), group 4(50-59 years), group 5(60-69 years), group 6(70-79 years), group 7(80-85 years) All the collected data were then computed in excel format. It was cross-checked for any errors by a third person. Then descriptive statistics involving Chi-square analysis were done with IBM SPSS software.

Inclusion criteria - patient with missing teeth

Exclusion criteria - patient without missing teeth

Dependant variable of the study - patient complexity, partial edentulism

Independent variable - health status, age, gender

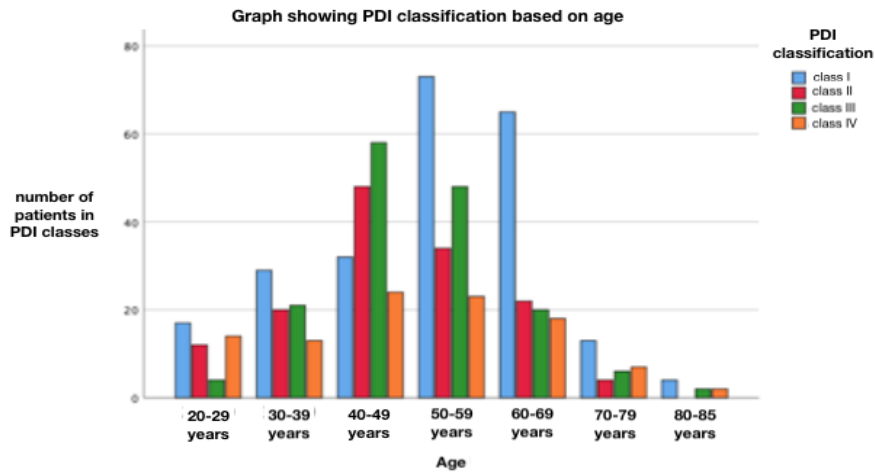
Results

This study involved a total of 633 patients. The selected patient age ranges from age 20-85 years. There was a male 341 female 292 in this study. ACPDI classification was then compared with both ages of the patient and the gender of the patient. Chi-square analysis was done using SPSS (IBM SPSS Statistics for Mac os, built 1.0.0.1347, 64-bit version, IBM Corp). On the prevalence of partial edentulism, the males had more missing when compared to that of the females. Class 1 PDI was high in both genders.

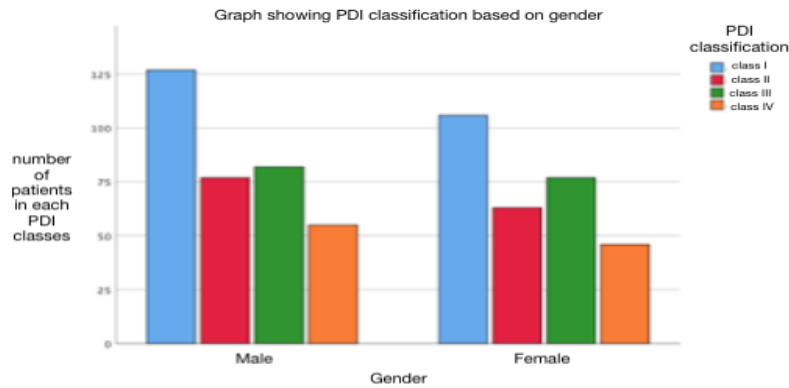
Discussion

The study primarily aimed at analyzing the complexity of the patient with partial edentulism. In that way, PDI classification was used to categorize patients. Along with the 7 age groups, class 1 was high. In group 1 the frequency was class 1 followed by class 4 than class 2 and class 3. In the 30-39 age group, class 1 was high followed by class 3 than class 2 least was class 4. In the age group of 40-49, class 3 was high followed by class 1 and class 4 and the least was class 2. In the age group of 50-59 year class 1 was high followed by class 3 than class 2 and the least was class 4. In the 60-69 year group, class 1 was high followed by class 2 than class 3, and the least was class 4. In the 70-79 age group, class 1 was high followed by class 4 than class 3, and the least was class 2. In the 80-85 age group, all classes were almost equal to each other {graph 1}.

Based on gender, males reported with more missing teeth than females. In that study of 633 patients, 53% were male and 46% were female. Among the males 37% was class 1, 22% was class 2, 24% was class 3 and 16% was class 4. Among the female 36% was class 1, 21% was class 2, 26% was class 3 and 15% was class 4 {graph 2}



Graph 1 showing PDI classification based on the age of the patient. The X-axis denotes the age groups and the Y-axis denotes the number of patients in each PDI classification. The blue bars show patients under the class I PDI, red bars show patients under class II PDI, the green bars show patients under class III PDI and the orange bars show patients under class IV PDI



Graph 2 showing PDI classification based on gender. The X-axis shows the gender of the patient and the Y-axis shows the number of patients in each PDI class. The blue bars show patients under the class I PDI, red bars show patients under class II PDI, the green bars show patients under class III PDI and the orange bars show patients under class IV PDI

A similar study has been done by Azad et.al., in which 17.2% were class 1 39.7% class 2 27.3% class 3, and 15.3% class 4 were class 2 had been more common (There were significant association of partial edentulism with age but no significance with gender, 2011). In the current study class 1 was 36.8% class 2 was 22.1% class 3 was 25.1% and class 4 was 16% (2). In another study by the dental school of Athens Natala et.al., out of 71 partially edentulous patients two were class 1, class 2 was 17, class 3 was 29 and class 4 was 23 where the most common was class 3(Ntala et al., 2010)

According to classification (ACPD) class, 1 and class 2 were common in age groups less than 55 years of age, and classes 3 and 4 more in age more than 55 years of age(Jeyapalan and Krishnan, 2015). In a previous study by Arati Sharma class, 1 and class 2 was less than 50 years of age and class 3 and 4 was present greater than 50 years of age(. There were significant association of partial edentulism with age but no significance with gender, 2011). Compared to this to the current study, there was a difference of 5%. Though ACPDI has recommended a comprehensive evaluation of each patient the diagnostic criteria used to classify patients are more objective and based on clinical findings(Venugopalan et al., 2014).Our institution is passionate about high quality evidence based research and has excelled in various fields (Pc, Marimuthu and Devadoss, 2018; Ramesh et al., 2018; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Vijayashree Priyadharsini, 2019; Mathew et al., 2020). We hope this study adds to this rich legacy

In this study, some of the findings have little variation compared to the previous study. Though having it lacks in the sample size which was less and only one geographic area was considered in this study. Following up this we could collect more samples across the different geographic area and evaluate and compare the result

Conclusion

Within the limitations of the study, the most common class of ACPDI partial edentulism was class 1(36.8%), the second common was class 3(25.1%), the third common was class 2(22.1%) and the least common was class 4(16.0%). There was a significant association of partial edentulism with age but no significance with gender. It was also found that the patients were more complex age group of 40-69 years of age and more willing for treatment in the age group of 20-39 years of age.

Acknowledgment: The authors are thankful to the Director of Saveetha Dental College and Hospital, Chennai.

AUTHOR CONTRIBUTION:

Ajrish George S has contributed to data collection, study design, data analysis, results, tables, and manuscript preparation.

Dr. Visalakshi has contributed to the manuscript preparation, proofreading of the manuscript, and reviewing the manuscript.

Dr. Nashra Kareem has contributed to reviewing the manuscript.

CONFLICT OF INTEREST: There is no conflict of interest

References

1. ([No title], no date a)
2. (Website, no date)3
3. ([No title], no date b)
4. (Zaigham and Muneer, 2010)
5. (Ntala *et al.*, 2010)
6. (Olga O. Charyeva, Altynbekov and Nysanova, 2012)
7. (Shah, Shah and Parmar, 2012)
8. (Jeyapalan, 2015)
9. (Moaleem, 2017)
10. (AL-Dwairi, 2006)
11. (Madhankumar *et al.*, 2015)
12. (Curtis *et al.*, 1992).
13. ([No title], no date c)
14. (Moreno *et al.*, 2016)
15. Jyothi S., Pon Kirubha Robin, Dhanraj Ganapathy, Anandiselvaraj. Periodontal Health Status of Three Different Groups Wearing Temporary Partial Denture. *Research J. Pharm. and Tech* 2017; 10(12): 4339-4342.
16. Duraisamy R, Krishnan CS, Ramasubramanian H, Sampathkumar J, Mariappan S, Navarasampatti Sivaprakasam A. Compatibility of Nonoriginal Abutments With Implants: Evaluation of Micro gap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments. *Implant Dent.* 2019;28(3):
17. Subashree Rathi Selvan, Dhanraj Ganapathy. Efficacy of Fifth Generation Cephalosporins against Methicillin-Resistant *Staphylococcus aureus*- A Review. *Research J. Pharm. and Tech* 2016; 9(10):1815-1818.
18. 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;10:ZC67-70
19. S. Subasree, Karthikeyan Murthykumar, Dr Dhanraj. Effect of Aloe Vera in Oral Health – A Review. *Research J. Pharm. and Tech.* 2016; 9(5): 609-612.
20. Ranganathan H, Ganapathy DM, Jain AR. The cervical and incisal marginal discrepancy in ceramic laminate veneering materials: an SEM analysis. *Contem Clin den J.* 2017;8(2):272-278
21. Vijayalakshmi B, Dhanraj Ganapathy. Medical Management of Cellulitis. *Research J. Pharm. and Tech* 2016; 9(11):2067-2070
22. Kannan A, V Suresh, Ganapathy M.Effect of Coated Surfaces influencing Screw Loosening in Implants: A Systematic Review and Meta-analysis. *World Journal of Dentistry*, November- December 2017;8(6):496-502
23. Ashok, V., Suvitha, S. Awareness of all-ceramic restoration in rural population *Research Journal of Pharmacy and Technology*, 2016; 9 (10), pp. 1691-1693.
24. Ashok, V., Nallaswamy, D., Benazir Begum, S., Nesappan, T. Lip Bumper Prosthesis for an Acromegaly Patient: A Clinical Report: *Journal of Indian Prosthodontist Society*, 2014 14, pp. 279-282.
25. Venugopalan S, Ariga P, Aggarwal P, Viswanath A. Magnetically retained silicone facial prosthesis. *Niger J Clin Pract* 2014; 17: 260-4
26. Kannan, A. and Venugopalan, S., 2018. A systematic review on the effect of use of impregnated retraction cords on the gingiva. *Research Journal of Pharmacy and Technology*, 11(5), pp.2121- 2126.

27. .(Ajay *et al.*, 2017)
28. Ajay, R. *et al.* (2017) 'Effect of surface modifications on the retention of cement-retained implant crowns under fatigue loads: An In vitro study', *Journal of Pharmacy And Bioallied Sciences*, p. 154. doi:10.4103/jpbs.jpbs_146_17.
29. AL-Dwairi, Z.N. (2006) 'Partial edentulism and removable denture construction: a frequency study in Jordanians', *The European journal of prosthodontics and restorative dentistry*, 14(1). Available at: <https://pubmed.ncbi.nlm.nih.gov/16599092/> (Accessed: 13 August 2020).
30. Anbu, R.T. *et al.* (2019) 'Comparison of the Efficacy of Three Different Bone Regeneration Materials: An Animal Study', *European journal of dentistry*, 13(1), pp. 22–28.
31. Ariga, P. *et al.* (2018) 'Determination of Correlation of Width of Maxillary Anterior Teeth using Extraoral and Intraoral Factors in Indian Population: A Systematic Review', *World Journal of Dentistry*, pp. 68–75. doi:10.5005/jp-journals-10015-1509.
32. Ashok, V. *et al.* (2014) 'Lip Bumper Prosthesis for an Acromegaly Patient: A Clinical Report', *Journal of Indian Prosthodontic Society*, 14(Suppl 1), pp. 279–282.
33. Ashok, V. and Suvitha, S. (2016) 'Awareness of all ceramic restoration in rural population', *Research Journal of Pharmacy and Technology*, p. 1691. doi:10.5958/0974-360x.2016.00340.1.
34. Charyeva, O.O., Altynbekov, K.D. and Nysanova, B.Z. (2012) 'Kennedy Classification and Treatment Options: A Study of Partially Edentulous Patients Being Treated in a Specialized Prosthetic Clinic', *Journal of Prosthodontics*, pp. 177–180. doi:10.1111/j.1532-849x.2011.00809.x.
35. Charyeva, O.O., Altynbekov, K.D. and Nysanova, B.Z. (2012) 'Kennedy classification and treatment options: a study of partially edentulous patients being treated in a specialized prosthetic clinic', *Journal of prosthodontics: official journal of the American College of Prosthodontists*, 21, pp. 177–180.
36. Chen, F. *et al.* (2019) '6-shogaol, a active constituents of ginger prevents UVB radiation mediated inflammation and oxidative stress through modulating Nrf2 signaling in human epidermal keratinocytes (HaCaT cells)', *Journal of photochemistry and photobiology. B, Biology*, 197, p. 111518.
37. Curtis, D.A. *et al.* (1992) 'Incidence of various classes of removable partial dentures', *The Journal of prosthetic dentistry*, 67(5), pp. 664–667.
38. Devi, V.S. and Gnanavel, B.K. (2014) 'Properties of Concrete Manufactured Using Steel Slag', *Procedia Engineering*, 97, pp. 95–104.
39. Duraisamy, R. *et al.* (2019) 'Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments', *Implant dentistry*, 28(3), pp. 289–295.
40. Ezhilarasan, D., Apoorva, V.S. and Ashok Vardhan, N. (2019) 'Syzygium cumini extract induced reactive oxygen species-mediated apoptosis in human oral squamous carcinoma cells', *Journal of oral pathology & medicine: official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology*, 48(2), pp. 115–121.
41. Ganapathy, D. *et al.* (2016) 'Effect of Resin Bonded Luting Agents Influencing Marginal Discrepancy in All Ceramic Complete Veneer Crowns', *Journal of clinical and diagnostic research: JCDR*, 10(12), pp. ZC67–ZC70.
42. Ganapathy, D.M., Kannan, A. and Venugopalan, S. (2017) 'Effect of Coated Surfaces influencing Screw Loosening in Implants: A Systematic Review and Meta-analysis', *World Journal of Dentistry*, pp. 496–502. doi:10.5005/jp-journals-10015-1493.
43. Jeyapalan, V. (2015) 'Partial Edentulism and its Correlation to Age, Gender, Socio-economic Status and Incidence of Various Kennedy's Classes– A Literature Review', *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH* [Preprint]. doi:10.7860/jcdr/2015/13776.6124.
44. Jeyapalan, V. and Krishnan, C.S. (2015) 'Partial Edentulism and its Correlation to Age, Gender, Socio-economic Status and Incidence of Various Kennedy's Classes- A Literature Review', *Journal of clinical and diagnostic research: JCDR*, 9(6), pp. ZE14–7.
45. Johnson, J. *et al.* (2020) 'Computational identification of MiRNA-7110 from pulmonary arterial hypertension (PAH) ESTs: a new microRNA that links diabetes and PAH', *Hypertension research: official journal of the Japanese Society of Hypertension*, 43(4), pp. 360–362.
46. Jyothi, S. *et al.* (2017) 'Periodontal Health Status of Three Different Groups Wearing Temporary Partial Denture', *Research Journal of Pharmacy and Technology*, p. 4339. doi:10.5958/0974-360x.2017.00795.8.
47. Kumar, M.S. *et al.* (2006) 'Expression of matrix metalloproteinases (MMP-8 and -9) in chronic periodontitis patients with and without diabetes mellitus', *Journal of periodontology*, 77(11), pp. 1803–1808.
48. Madhankumar, S. *et al.* (2015) 'Prevalence of partial edentulousness among the patients reporting to the Department of Prosthodontics Sri Ramachandra University Chennai, India: An epidemiological study', *Journal of pharmacy & bioallied sciences*, 7(Suppl 2), pp. S643–7.
49. Mathew, M.G. *et al.* (2020) 'Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary ...', *Clinical oral investigations* [Preprint]. Available at: <https://link.springer.com/article/10.1007/s00784-020-03204-9>.
50. Moaleem, M.A. (2017) 'Patterns of Partial Edentulism and its Relation to Khat Chewing in Jazan Population - A Survey Study', *Journal of clinical and diagnostic research: JCDR*, 11(3), pp. ZC55–ZC59.
51. Moreno, A. *et al.* (2016) 'Epidemiological Data and Survival Rate of Removable Partial Dentures', *Journal of clinical and diagnostic research: JCDR*, 10(5), pp. ZC84–7.
52. Nair, M., Jeevanandan, G. and Vignesh, R. (2018) 'Comparative evaluation of post-operative pain after pulpectomy with k-files, kedo-s files and mtwo files in deciduous molars-a randomized clinical trial', *Brazilian dental journal* [Preprint]. Available at: <https://bds.ict.unesp.br/index.php/cob/article/view/1617>.
53. [No title] (no date a). Available at: http://podj.com.pk/archive/Jun_2015/PODJ-36.pdf (Accessed: 13 August 2020).
54. [No title] (no date b). Available at: http://podj.com.pk/archive/Jul_2011/50-Podj.pdf (Accessed: 13 August 2020).
55. [No title] (no date c). Available at: <https://academicjournals.org/journal/JDOH/article-full-text-pdf/630CA3D901> (Accessed: 2 November 2020).
56. Ntala, P.C. *et al.* (2010) 'Screening of edentulous patients in a dental school population using the prosthodontic diagnostic index', *Gerodontology*, 27(2), pp. 114–120.
57. Pc, J., Marimuthu, T. and Devadoss, P. (2018) 'Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study', *Clinical implant dentistry and related research* [Preprint]. Available at: <https://europepmc.org/article/med/29624863>.
58. Ramadurai, N. *et al.* (2019) 'Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial', *Clinical oral investigations*, 23(9), pp. 3543–3550.
59. Ramesh, A. *et al.* (2018) 'Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study', *Journal of periodontology*, 89(10), pp. 1241–1248.
60. Ranganathan, H., Ganapathy, D.M. and Jain, A.R. (2017) 'Cervical and Incisal Marginal Discrepancy in Ceramic Laminate Veneering Materials: A SEM Analysis', *Contemporary clinical dentistry*, 8(2), pp. 272–278.

61. Rao and Kumar (no date) 'Analgesic efficacy of paracetamol vs ketorolac after dental extractions', *Journal of advanced pharmaceutical technology & research* [Preprint]. Available at: <https://www.indianjournals.com/ijor.aspx?target=ijor:rjpt&volume=11&issue=8&article=026>.
62. Sekar, D. et al. (2019) 'Methylation-dependent circulating microRNA 510 in preeclampsia patients', *Hypertension research: official journal of the Japanese Society of Hypertension*, 42(10), pp. 1647–1648.
63. Selvan, S.R. and Ganapathy, D. (2016) 'Efficacy of fifth generation cephalosporins against methicillin-resistant Staphylococcus aureus-A review', *Research Journal of Pharmacy and Technology*, p. 1815. doi:10.5958/0974-360x.2016.00369.3.
64. Shah, V.R., Shah, D.N. and Parmar, C.H. (2012) 'Prosthetic Status and Prosthetic Need Among the Patients Attending Various Dental Institutes of Ahmedabad and Gandhinagar District, Gujarat', *The Journal of Indian Prosthodontic Society*, pp. 161–167. doi:10.1007/s13191-012-0126-9.
65. Sivamurthy, G. and Sundari, S. (2016) 'Stress distribution patterns at mini-implant site during retraction and intrusion—a three-dimensional finite element study', *Progress in orthodontics*, 17(1), pp. 1–11.
66. Sridharan, G. et al. (2019) 'Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma', *Journal of oral pathology & medicine: official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology*, 48(4), pp. 299–306.
67. Subasree, S., Murthykumar, K. and Dhanraj (2016) 'Effect of Aloe Vera in Oral Health-A Review', *Research Journal of Pharmacy and Technology*, p. 609. doi:10.5958/0974-360x.2016.00116.5.
68. . There were significant association of partial edentulism with age but no significance with gender (2011) 'Reference Azad Ali Azad, Awais Shabbir Malik, Amna Ahmed , Muzamal Maqsood Butt, Comolexity of Partial Edentulism Among Patients Seen at Armed Forces Institute of Dentistry, Rawalpindi Pakistan Oral & Dental Journal 2015 Vol 35(2) Arati Sharma, Description of Partial Edentulism among Patients Visiting the Prosthodontic Department at a Tertiary Care Center in the Eastern part of Nepal, ACTA SCIENTIFIC DENTAL SCIENCES 2019 vol 3(10)Naveed H, Aziz MS, Hassan A, Khan W, Azad AA', *Pattern of partial edentulism among armed forces personnel reporting at armed forces institute of dentistry Pakistan. Pak Oral Dent J.*, 31, pp. 217–221.
69. Varghese, S.S. et al. (2015) 'Estimation of salivary tumor necrosis factor-alpha in chronic and aggressive periodontitis patients', *Contemporary clinical dentistry*, 6(Suppl 1), pp. S152–6.
70. Venugopalan, S. et al. (2014) 'Magnetically retained silicone facial prosthesis', *Nigerian journal of clinical practice*, 17(2), pp. 260–264.
71. Vijayashree Priyadharsini, J. (2019) 'In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens', *Journal of periodontology*, 90(12), pp. 1441–1448.
72. Website (no date). Available at: https://www.researchgate.net/publication/336231159_Description_of_Partial_Edentulism_among_Patients_Visiting_the_Prosthodontic_Department_at_a_Tertiary_Care_Center_in_the_Eastern_part_of_Nepal (Accessed: 13 August 2020).
73. Zaigham, A.M. and Muneer, M.U. (2010) 'Pattern of Partial edentulism and its association with age and gender', *Pak Oral Dent J.*, 30, pp. 260–263.