Journal of Contemporary Issues in Business and Government Vol. 27, No. 2, 2021
https://cibg.org.au/

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2021.27.02.052

Need for Orthodontic Treatment Among Adults with Generalized Chronic Periodontitis

Nurul Syamimi binti Mohd Azlan Sunil[1], Ravindra Kumar Jain M.D.S[2*], Revathi Duraisamy M.D.S[3]

[1]Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India.
[2]Reader, Department of Orthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India.
[3]Senior Lecturer, Department of Prosthodontics, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, India.
*Corresponding Author

Abstract: One of the most common etiologic factors of periodontitis is malocclusion. Malocclusion as an etiologic factor to periodontitis is due to certain morphological traits of malocclusion which impede and prevent oral hygiene and self cleaning, which then leads to increased bacterial dental plaque accumulation. The aim of this study was to evaluate the need for orthodontic treatment among adults suffering from chronic periodontitis. This study included adults, both males and females who reported to Saveetha Dental College between June 2019 to March 2020. Inclusion criteria included adult patients between 18 to 40 years with chronic periodontitis. Patients outside the age range were excluded from the study. Around 86000 patient records were reviewed and analysed for the inclusion criteria and the following parameters were extracted; (i) patients' gender, (ii) patient's diet and (iii) presence of habits and (iv) orthodontic treatment need. Need for orthodontic treatment was measured using Dental Health Components of Orthodontic Treatment Need (DCH-IOTN). Data was recorded in Microsoft Office Excel (2013) and analysed using SPSS Software Version 26.0. Chi-square test was done to find out the association in need for orthodontic treatment between variables such as patient's gender, diet and presence of habits. Significant level test was set at $p<0.05$. A total of 149 patients presented with chronic periodontitis and 63.4% of these patients needed orthodontic treatment (37.9% with need for orthodontic treatment and 25.5% with borderline need). 65.9% females and 62.4% males needed treatment. 96.1% of patients who presented with habits need orthodontic treatment. No statistically significant association was observed in gender and diet ($p>0.05$). Statistically significant association was found between patients with and without habits ($p<0.05$). Within the limits of this study, it was observed that the majority of patients with chronic periodontitis needed orthodontic treatment and treatment need was more common in females. Majority of patients with habits needed orthodontic treatment.

Keywords: Chronic periodontitis, malocclusion, oral habits, orthodontic treatment needs innovative technique

INTRODUCTION

Periodontitis is an inflammatory disease of the periodontium, characterised by progressive destruction of supporting tissues of the tooth. One of the most common etiologic factors of periodontitis is malocclusion. Malocclusion is defined as irregularity or incorrect placement of teeth in the dental arch that is outside the ideal range (Nalcaci *et al.*, 2012). It has been hypothesized that malocclusion predisposes to periodontal disease and vice versa in patients with underlying medical conditions which affects the periodontium, in which case it is known as secondary malocclusion. Malocclusion as an etiologic factor to periodontitis is due to certain morphological traits of malocclusion which impede and prevent oral hygiene and self cleaning, which then leads to increased bacterial dental plaque accumulation (Helm and Petersen, 1989). On the other hand, patients with periodontitis may lose osseous bone support of the tooth, which is an etiologic factor for developing secondary periodontitis. Periodontitis as a result of malocclusion can be corrected with orthodontic treatment but clinicians have to be careful in case selection and evaluating prognosis as bone loss has already taken place.

Numerous studies have obtained conflicting results in association between malocclusion and periodontitis (Ramfjord, 1974). A few studies have found association between periodontal disease and increased maxillary overjet and overbite (McCombie and Stothard, 1964; GOULD and MSE, 1966; Geiger, Wasserman and

Turgeon, 1973; Geiger, 2001) but negative findings have also been reported (Hellgren, 1956; Alexander and Tipnis, 1970). Previous study by Ngom et al reported significant correlation between malocclusion and periodontal disease (Ngom *et al.*, 2007). Helm et al, in his study, found that periodontal disease is most frequent in maxilla with crowding, extreme overjet and crossbite (Helm and Petersen, 1989). Christensen et al made a research on adults seeking orthodontic treatment and observed that patients sought for orthodontic treatment when there is drifting of the teeth where bone loss has occurred (Christensen and Luther, 2015).

Our department is passionate about research we have published numerous high quality articles in this domain over the past years ((Kavitha *et al.*, 2014) , (Praveen *et al.*, 2001),(Devi and Gnanavel, 2014), (Putchala *et al.*, 2013), (Vijayakumar *et al.*, 2010), (Lekha *et al.*, 2014a, 2014b) (Danda, 2010) (Danda, 2010) (Parthasarathy *et al.*, 2016) (Gopalakannan, Senthilvelan and Ranganathan, 2012), (Rajendran *et al.*, 2019), (Govindaraju, Neelakantan and Gutmann, 2017), (P. Neelakantan *et al.*, 2015), (PradeepKumar *et al.*, 2016), (Sajan *et al.*, 2011), (Lekha *et al.*, 2014a), (Neelakantan, Grotra and Sharma, 2013), (Patil *et al.*, 2017), (Jeevanandan and Govindaraju, 2018), (Abdul Wahab *et al.*, 2017), (Eapen, Baig and Avinash, 2017), (Menon *et al.*, 2018), (Wahab *et al.*, 2018), (Vishnu Prasad *et al.*, 2018), (Uthrakumar *et al.*, 2010), (Ashok, Ajith and Sivanesan, 2017), (Prasanna Neelakantan, Sharma, *et al.*, 2015).Currently we are focusing on analysing the orthodontic treatment needs in chronic periodontitis patients.

Our department is passionate about research we have published numerous high quality articles in this domain over the past years (Abraham *et al.*, 2005; Devaki, Sathivel and BalajiRaghavendran, 2009; Neelakantan *et al.*, 2010; Arja *et al.*, 2013; Ramshankar *et al.*, 2014; Sumathi *et al.*, 2014; Surapaneni and Jainu, 2014; Surapaneni, Priya and Mallika, 2014; Prasanna Neelakantan, Cheng, *et al.*, 2015; Ramamoorthi, Nivedhitha and Divyanand, 2015; Manivannan *et al.*, 2017; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; J *et al.*, 2018; Ravindiran and Praveenkumar, 2018; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Krishnaswamy *et al.*, 2020; Samuel, Acharya and Rao, 2020; Sathish and Karthick, 2020)

The aim of this study was to evaluate the need for orthodontic treatment among adults suffering from generalized chronic periodontitis.

MATERIALS AND METHODS

This retrospective study included adults, both males and females who had reported to Saveetha Dental College between June 1st 2019 to March 31st 2020. The study setting was a university hospital-based study. Such setting allowed flexible data retrieval, automated data collection, cost-effective as well as time saving. However, such a setting allowed only a limited population to be covered and may be subjected to researcher's personal bias. Patients' data which were retrieved received approval from the Ethical Committee Board of Saveetha Dental College and patients informed consent was obtained from patients prior to dental examination.

Around 86000 patient records between June 2019 to March 2020 were reviewed and analysed for patients with generalized chronic periodontitis and information was cross verified with periodontal charts and intraoral photographs of patients which were uploaded into the system. Patients with incomplete case sheets were exempted from the study. Simple random sampling was done to minimize sampling bias.

Data was collected by a single examiner. The inclusion criteria included adult patients between the age of 18 to 40 years with chronic periodontitis. Patients outside the age range were excluded from the study. The following parameters were observed and recorded; (i) Patient's gender, (ii) diet, (iii) presence of habits and (iv) need for orthodontic treatment. Need for orthodontic treatment was measured using Dental Health Components of Orthodontic Treatment Need (DCH-IOTN).

Statistical analysis

All the datas was entered into Microsoft Office Excel (2013) and analysed using SPSS software Version 26.0. Descriptive statistics were used to report distribution of patients' gender, diet, presence of habits and orthodontic treatment needs. Chi-square test was further conducted to assess the association of orthodontic treatment needs between gender, diet and presence of habits. Significant level test was set at $p<0.05$.

RESULTS AND DISCUSSION

A total of 149 patients were found to have chronic periodontitis. This involved 44 (30.3%) females and 101 (69.7%) males (Figure 1). Figure 2 shows the distribution of diet in chronic periodontitis patients. Presence of habits was found in 22.1% of chronic periodontitis patients (Figure 3). 37.9% of chronic periodontitis patients needed orthodontic treatment and 25.5% had borderline need for orthodontic treatment. 36.6% did not need orthodontic treatment (Figure 4).

Based on gender, 65.9% of females need orthodontic treatment (27.3% borderline need and 38.6% need) and 62.4% males (24.8% borderline need and 37.6% need) need orthodontic treatment. (Table 1, Figure 5). However, no statistically significant association was found in orthodontic treatment need between males and females ($p>0.05$)(Figure 5). Based on diet, no significant association was found between patients with mixed diet and vegetarian diet ($p>0.05$) (Table 2, Figure 6).

According to the presence of habits, 96.1% of patients who presented with habits needed orthodontic treatment and 54% of patients without habits needed orthodontic treatment (Table 3, Figure 7). Statistically significant association was found in orthodontic treatment need between patients with habits and patients without habits ($p<0.05$) (Figure 7).

Malocclusion and abnormal position of tooth are now qualified as potential contributors to periodontal disease process when they cause occlusal traumatism. Information obtained from previous cross-sectional study is important to monitor trends in oral health and evaluate levels of dental need (Burt, 1997; Jamieson and Thomson, 2002). In the wider literature, a vast majority of students investigated association of malocclusion and periodontitis and there is a lack of study with regards to orthodontic treatment need in patients with chronic periodontitis.

In this study, orthodontic treatment need was evaluated using Denial Health Components of Orthodontic Treatment Need (DCH-IOTN). The IOTN has been described as an index for easy use to grade and identify the need for orthodontic treatment (Brook and Shaw, 1989). Considering the results presented, DHC-IOTN could be considered reliable and valid.

Our study found that orthodontic treatment need was observed more in females that compared to males. However, no significant association was observed between need for treatment in males and females ($p>0.05$). Hirschfield et al agreed with the findings as his study reported 56% of patients who expressed orthodontic treatment need were females (Hirschfeld *et al.*, 2019). This adds to the consensus of our finding and can be included in clinical practice.

The current study observed no statistically significant association was seen in relation to diet intake and orthodontic treatment need ($p>0.05$). This finding was contradictory to previous study by Blackwelder et al who found association between dietary factors and malocclusion especially crowding (Blackwelder, 2013). The possible differences in finding may be due to differing study population, and socioeconomic status.

96.9% of patients with habits need orthodontic treatment. Our study found a significant association between orthodontic treatment needs and habits. Grippaudo et al agreed with the current findings as his study found significant association between bad habits and malocclusion, primarily in patients with increased overjet and open bite (Grippaudo *et al.*, 2016).

Limitations of the study

This study has limitations as it was conducted as a university hospital-based study. Thus, research may be subjected to researcher's personal bias and allowed only a limited population to be covered.

Future scope

Extensive research needs to be done with a larger sample population. Future study is needed to associate orthodontic treatment needs in patients with chronic periodontitis with other potential associating factors such as malocclusions, socioeconomic status and geographic location**.**

CONCLUSION

Within the limits of this study, it was observed that the majority of patients with chronic periodontitis need orthodontic treatment and treatment need was more common in females. Majority of patients with habits need orthodontic treatment.

Authors Contribution

Nurul Syamimi binti Mohd Azlan Sunil contributed to the original drafting, acquisition of data, analysis and interpretation of data and writing of this research. Dr. Ravindra Kumar Jain. substantially contributed to improvising the research draft and revising the article critically for important intellectual content. Dr. Revathi Duraisamy contributed to the conception and design of this study.

Conflict of Interest

No conflict of interest has been declared by the authors.

REFERENCES

1. Abdul Wahab, P. U. *et al.* (2017) 'Risk Factors for Post-operative Infection Following Single Piece Osteotomy', *Journal of maxillofacial and oral surgery*, 16(3), pp. 328–332.
2. Abraham, S. *et al.* (2005) 'Evaluation of the inhibitory effect of triphala on PMN-type matrix metalloproteinase (MMP-9)', *Journal of periodontology*, 76(4), pp. 497–502.
3. Alexander, A. G. and Tipnis, A. K. (1970) 'The effect of irregularity of teeth and the degree of overbite and overjet on the gingival health. A study of 400 subjects', *British dental journal*, 128(11), pp. 539–544.
4. Arja, C. *et al.* (2013) 'Oxidative stress and antioxidant enzyme activity in South Indian male smokers with chronic obstructive pulmonary disease', *Respirology* , 18(7), pp. 1069–1075.

5. Ashok, B. S., Ajith, T. A. and Sivanesan, S. (2017) 'Hypoxia-inducible factors as neuroprotective agent in Alzheimer's disease', *Clinical and experimental pharmacology & physiology*, 44(3), pp. 327–334.
6. Blackwelder, A. C. (2013) *Association between dietary factors and malocclusion*. University of Iowa. doi: 10.17077/etd.roxs07hq.
7. Brook, P. H. and Shaw, W. C. (1989) 'The development of an index of orthodontic treatment priority', *European journal of orthodontics*, 11(3), pp. 309–320.
8. Burt, B. A. (1997) 'How useful are cross-sectional data from surveys of dental caries?', *Community dentistry and oral epidemiology*, 25(1), pp. 36–41.
9. Christensen, L. and Luther, F. (2015) 'Adults seeking orthodontic treatment: expectations, periodontal and TMD issues', *British dental journal*, 218(3), pp. 111–117.
10. Danda, A. K. (2010) 'Comparison of a single noncompression miniplate versus 2 noncompression miniplates in the treatment of mandibular angle fractures: a prospective, randomized clinical trial', *Journal of oral and maxillofacial surgery: official journal of the American Association of Oral and Maxillofacial Surgeons*, 68(7), pp. 1565–1567.
11. Devaki, T., Sathivel, A. and BalajiRaghavendran, H. R. (2009) 'Stabilization of mitochondrial and microsomal function by polysaccharide of Ulva lactuca on D-Galactosamine induced hepatitis in rats', *Chemico-biological interactions*, 177(2), pp. 83–88.
12. Devi, V. S. and Gnanavel, B. K. (2014) 'Properties of Concrete Manufactured Using Steel Slag', *Procedia Engineering*, 97, pp. 95–104.
13. Eapen, B. V., Baig, M. F. and Avinash, S. (2017) 'An Assessment of the Incidence of Prolonged Postoperative Bleeding After Dental Extraction Among Patients on Uninterrupted Low Dose Aspirin Therapy and to Evaluate the Need to Stop Such Medication Prior to Dental Extractions', *Journal of maxillofacial and oral surgery*, 16(1), pp. 48–52.
14. Ezhilarasan, D. (2018) 'Oxidative stress is bane in chronic liver diseases: Clinical and experimental perspective', *Arab journal of gastroenterology: the official publication of the Pan-Arab Association of Gastroenterology*, 19(2), pp. 56–64.
15. Ezhilarasan, D., Sokal, E. and Najimi, M. (2018) 'Hepatic fibrosis: It is time to go with hepatic stellate cell-specific therapeutic targets', *Hepatobiliary & pancreatic diseases international: HBPD INT*, 17(3), pp. 192–197.
16. Geiger, A. M. (2001) 'Malocclusion as an etiologic factor in periodontal disease: a retrospective essay', *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 120(2), pp. 112–115.
17. Geiger, A. M., Wasserman, B. H. and Turgeon, L. R. (1973) 'Relationship of Occlusion and Periodontal Disease: Part VI.—Relation of Anterior Overjet and Overbite to Periodontal Destruction and Gingival Inflammation', *Journal of periodontology*, 44(3), pp. 150–157.
18. Gopalakannan, S., Senthilvelan, T. and Ranganathan, S. (2012) 'Modeling and Optimization of EDM Process Parameters on Machining of Al 7075-B4C MMC Using RSM', *Procedia Engineering*, 38, pp. 685–690.
19. GOULD and MSE (1966) 'The relation between irregularities of the teeth and periodontal disease', *British dental journal*, 121, pp. 20–23.
20. Govindaraju, L., Neelakantan, P. and Gutmann, J. L. (2017) 'Effect of root canal irrigating solutions on the compressive strength of tricalcium silicate cements', *Clinical oral investigations*, 21(2), pp. 567–571.
21. Grippaudo, C. *et al.* (2016) 'Association between oral habits, mouth breathing and malocclusion', *Acta otorhinolaryngologica Italica: organo ufficiale della Societa italiana di otorinolaringologia e chirurgia cervico-facciale*, 36(5), pp. 386–394.
22. Hellgren, A. (1956) 'The association between crowding of the teeth and gingivitis', *Transactions. European Orthodontic Society*, 32, pp. 134–140.
23. Helm, S. and Petersen, P. E. (1989) 'Causal relation between malocclusion and periodontal health', *Acta odontologica Scandinavica*, 47(4), pp. 223–228.
24. Hirschfeld, J. *et al.* (2019) 'Interest in orthodontic tooth alignment in adult patients affected by periodontitis: A questionnaire-based cross-sectional pilot study', *Journal of periodontology*, 90(9), pp. 957–965.
25. Jamieson, L. M. and Thomson, W. M. (2002) 'The Dental Neglect and Dental Indifference scales compared', *Community dentistry and oral epidemiology*, 30(3), pp. 168–175.
26. Jeevanandan, G. and Govindaraju, L. (2018) 'Clinical comparison of Kedo-S paediatric rotary files vs manual instrumentation for root canal preparation in primary molars: a double blinded randomised clinical trial', *European Archives of Paediatric Dentistry*, pp. 273–278. doi: 10.1007/s40368-018-0356-6.
27. J, P. C. *et al.* (2018) 'Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study', *Clinical implant dentistry and related research*, 20(4), pp. 531–534.

28. Kavitha, M. *et al.* (2014) 'Solution combustion synthesis and characterization of strontium substituted hydroxyapatite nanocrystals', *Powder Technology*, 253, pp. 129–137.
29. Krishnaswamy, H. *et al.* (2020) 'Investigation of air conditioning temperature variation by modifying the structure of passenger car using computational fluid dynamics', *Thermal Science*, 24(1 Part B), pp. 495–498.
30. Lekha, L. *et al.* (2014a) 'Schiff base complexes of rare earth metal ions: Synthesis, characterization and catalytic activity for the oxidation of aniline and substituted anilines', *Journal of organometallic chemistry*, 753, pp. 72–80.
31. Lekha, L. *et al.* (2014b) 'Synthesis, spectroscopic characterization and antibacterial studies of lanthanide(III) Schiff base complexes containing N, O donor atoms', *Journal of Molecular Structure*, pp. 307–313. doi: 10.1016/j.molstruc.2013.10.014.
32. Malli Sureshbabu, N. *et al.* (2019) 'Concentrated Growth Factors as an Ingenious Biomaterial in Regeneration of Bony Defects after Periapical Surgery: A Report of Two Cases', *Case reports in dentistry*, 2019, p. 7046203.
33. Manivannan, I. *et al.* (2017) 'Tribological and surface behavior of silicon carbide reinforced aluminum matrix nanocomposite', *Surfaces and Interfaces*, 8, pp. 127–136.
34. McCombie, F. and Stothard, D. (1964) 'Relationships between gingivitis and other dental conditions', *Journal* , 30, pp. 506–513.
35. Mehta, M. *et al.* (2019) 'Oligonucleotide therapy: An emerging focus area for drug delivery in chronic inflammatory respiratory diseases', *Chemico-biological interactions*, 308, pp. 206–215.
36. Menon, S. *et al.* (2018) 'Selenium nanoparticles: A potent chemotherapeutic agent and an elucidation of its mechanism', *Colloids and surfaces. B, Biointerfaces*, 170, pp. 280–292.
37. Nalcaci, R. *et al.* (2012) 'The relationship of orthodontic treatment need with periodontal status, dental caries, and sociodemographic factors', *TheScientificWorldJournal*, 2012, p. 498012.
38. Neelakantan, P. *et al.* (2010) 'Root and Canal Morphology of Mandibular Second Molars in an Indian Population', *Journal of endodontics*, 36(8), pp. 1319–1322.
39. Neelakantan, P. *et al.* (2015) 'Antibiofilm activity of three irrigation protocols activated by ultrasonic, diode laser or Er:YAG laser in vitro', *International endodontic journal*, 48(6), pp. 602–610.
40. Neelakantan, P., Sharma, S., *et al.* (2015) 'Influence of Irrigation Sequence on the Adhesion of Root Canal Sealers to Dentin: A Fourier Transform Infrared Spectroscopy and Push-out Bond Strength Analysis', *Journal of endodontia*, 41(7), pp. 1108–1111.
41. Neelakantan, P., Cheng, C. Q., *et al.* (2015) 'Photoactivation of curcumin and sodium hypochlorite to enhance antibiofilm efficacy in root canal dentin', *Photodiagnosis and photodynamic therapy*, 12(1), pp. 108–114.
42. Neelakantan, P., Grotra, D. and Sharma, S. (2013) 'Retreatability of 2 mineral trioxide aggregate-based root canal sealers: a cone-beam computed tomography analysis', *Journal of endodontia*, 39(7), pp. 893–896.
43. Ngom, P. I. *et al.* (2007) 'Influence of orthodontic anomalies on periodontal condition', *Odonto-stomatologie tropicale= Tropical dental journal*, 30(118), pp. 9–16.
44. Parthasarathy, M. *et al.* (2016) 'Effect of hydrogen on ethanol-biodiesel blend on performance and emission characteristics of a direct injection diesel engine', *Ecotoxicology and environmental safety*, 134(Pt 2), pp. 433–439.
45. Patil, S. B. *et al.* (2017) 'Comparison of Extended Nasolabial Flap Versus Buccal Fat Pad Graft in the Surgical Management of Oral Submucous Fibrosis: A Prospective Pilot Study', *Journal of maxillofacial and oral surgery*, 16(3), pp. 312–321.
46. PradeepKumar, A. R. *et al.* (2016) 'Diagnosis of Vertical Root Fractures in Restored Endodontically Treated Teeth: A Time-dependent Retrospective Cohort Study', *Journal of endodontia*, 42(8), pp. 1175–1180.
47. Praveen, K. *et al.* (2001) 'Hypotensive anaesthesia and blood loss in orthognathic surgery: a clinical study', *The British journal of oral & maxillofacial surgery*, 39(2), pp. 138–140.
48. Putchala, M. C. *et al.* (2013) 'Ascorbic acid and its pro-oxidant activity as a therapy for tumours of oral cavity – A systematic review', *Archives of Oral Biology*, pp. 563–574. doi: 10.1016/j.archoralbio.2013.01.016.
49. Rajendran, R. *et al.* (2019) 'Comparative Evaluation of Remineralizing Potential of a Paste Containing Bioactive Glass and a Topical Cream Containing Casein Phosphopeptide-Amorphous Calcium Phosphate: An in Vitro Study', *Pesquisa Brasileira em Odontopediatria e Clínica Integrada*, pp. 1–10. doi: 10.4034/pboci.2019.191.61.
50. Ramamoorthi, S., Nivedhitha, M. S. and Divyanand, M. J. (2015) 'Comparative evaluation of postoperative pain after using endodontic needle and EndoActivator during root canal irrigation: A randomised controlled trial', *Australian endodontic journal: the journal of the Australian Society of Endodontology Inc*, 41(2), pp. 78–87.

51. Ramfjord, S. P. (1974) 'Periodontal aspects of restorative dentistry', *Journal of oral rehabilitation*, 1(2), pp. 107–126.
52. Ramshankar, V. *et al.* (2014) 'Risk stratification of early stage oral tongue cancers based on HPV status and p16 immunoexpression', *Asian Pacific journal of cancer prevention: APJCP*, 15(19), pp. 8351–8359.
53. Ravindiran, M. and Praveenkumar, C. (2018) 'Status review and the future prospects of CZTS based solar cell – A novel approach on the device structure and material modeling for CZTS based photovoltaic device', *Renewable and Sustainable Energy Reviews*, 94, pp. 317–329.
54. Sajan, D. *et al.* (2011) 'Molecular structure and vibrational spectra of 2,6-bis(benzylidene)cyclohexanone: a density functional theoretical study', *Spectrochimica acta. Part A, Molecular and biomolecular spectroscopy*, 78(1), pp. 113–121.
55. Samuel, S. R., Acharya, S. and Rao, J. C. (2020) 'School Interventions-based Prevention of Early-Childhood Caries among 3-5-year-old children from very low socioeconomic status: Two-year randomized trial', *Journal of public health dentistry*, 80(1), pp. 51–60.
56. Sathish, T. and Karthick, S. (2020) 'Wear behaviour analysis on aluminium alloy 7050 with reinforced SiC through taguchi approach', *Journal of Materials Research and Technology*, 9(3), pp. 3481–3487.
57. Sumathi, C. *et al.* (2014) 'Production of prodigiosin using tannery fleshing and evaluating its pharmacological effects', *TheScientificWorldJournal*, 2014, p. 290327.
58. Surapaneni, K. M. and Jainu, M. (2014) 'Comparative effect of pioglitazone, quercetin and hydroxy citric acid on the status of lipid peroxidation and antioxidants in experimental non-alcoholic steatohepatitis', *Journal of physiology and pharmacology: an official journal of the Polish Physiological Society*, 65(1), pp. 67–74.
59. Surapaneni, K. M., Priya, V. V. and Mallika, J. (2014) 'Pioglitazone, quercetin and hydroxy citric acid effect on cytochrome P450 2E1 (CYP2E1) enzyme levels in experimentally induced non alcoholic steatohepatitis (NASH)', *European review for medical and pharmacological sciences*, 18(18), pp. 2736–2741.
60. Uthrakumar, R. *et al.* (2010) 'Bulk crystal growth and characterization of non-linear optical bisthiourea zinc chloride single crystal by unidirectional growth method', *Current applied physics: the official journal of the Korean Physical Society*, 10(2), pp. 548–552.
61. Vijayakumar, G. N. S. *et al.* (2010) 'Synthesis of electrospun ZnO/CuO nanocomposite fibers and their dielectric and non-linear optic studies', *Journal of alloys and compounds*, 507(1), pp. 225–229.
62. Vishnu Prasad, S. *et al.* (2018) 'Report on oral health status and treatment needs of 5-15 years old children with sensory deficits in Chennai, India', *Special care in dentistry: official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry*, 38(1), pp. 58–59.
63. Wahab, P. U. A. *et al.* (2018) 'Scalpel Versus Diathermy in Wound Healing After Mucosal Incisions: A Split-Mouth Study', *Journal of oral and maxillofacial surgery: official journal of the American Association of Oral and Maxillofacial Surgeons*, 76(6), pp. 1160–1164.

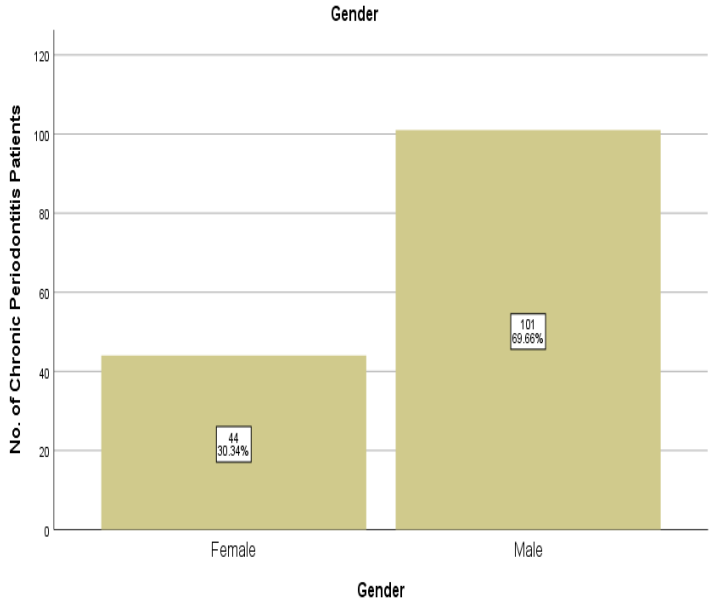

Fig.1: Bar chart represents the number of patients with chronic periodontitis based on gender. X-

axis represents gender and Y-axis axis represents the number of patients with chronic periodontitis. More patients with chronic periodontitis were males (69.7%) compared to females (30.3%)

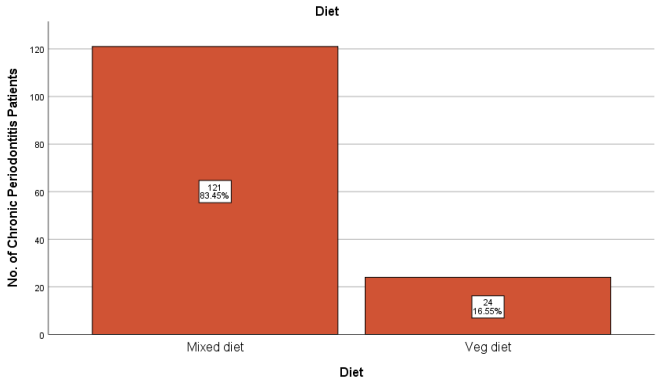

Fig.2: Bar chart represents the number of patients with chronic periodontitis based on diet. X-axis represents diet and Y-axis represents number of chronic periodontitis patients. Majority of the patients with chronic periodontitis had a mixed diet (83.4%) compared to a vegetarian diet (16.6%).

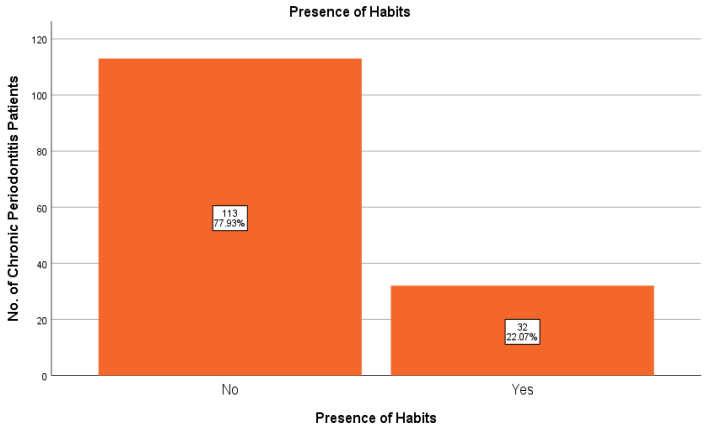

Fig.3:Bar chart represents the number of patients with chronic periodontitis based on the presence of habits. X-axis represents diet and Y-axis represents the number of patients with chronic periodontitis. Majority of the patients with chronic periodontitis had no habits (77.9%) compared to patients with habits (22.1%).

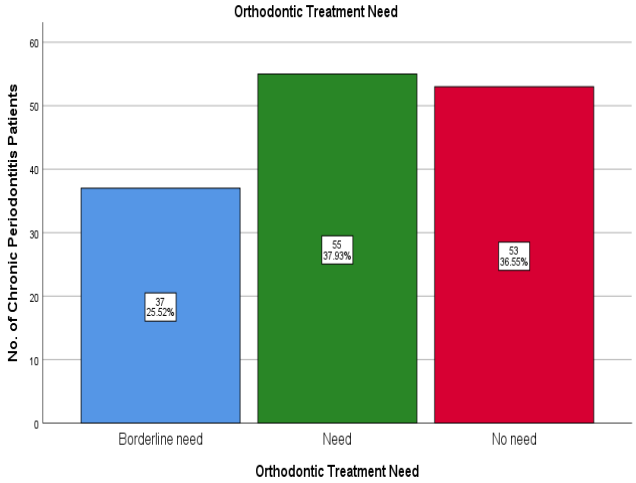

Fig.4: Bar chart represents the number of patients with chronic periodontitis based on orthodontic treatment needs. X-axis represents orthodontic treatment needs and Y-axis

represents the percentage of chronic periodontitis patients. 37.9% of chronic periodontitis patients needed orthodontic treatment (green), 25.5% had borderline need for orthodontic treatment (blue) and 36.6% did not need orthodontic treatment (red). More patients with chronic periodontitis needed orthodontic treatment compared to patients who did not need treatment.

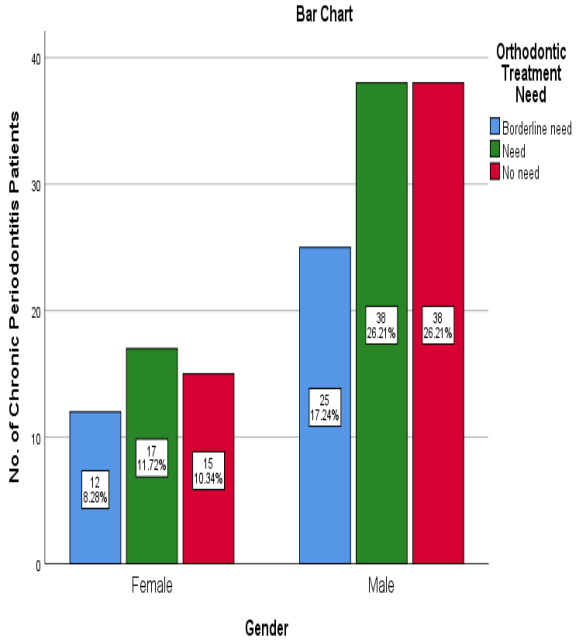

Fig.5: Bar chart represents the association between orthodontic treatment need and gender. X-axis represents gender and Y-axis represents the orthodontic treatment need in chronic periodontitis patients. Chi-square test was done and association was found to be statistically not significant. Pearson Chi-Square value- 0.189; df- 2; p value- 0.910 (>0.05), hence, not statistically significant. Orthodontic treatment needs (green) were higher in females compared to males but the results were statistically not significant.

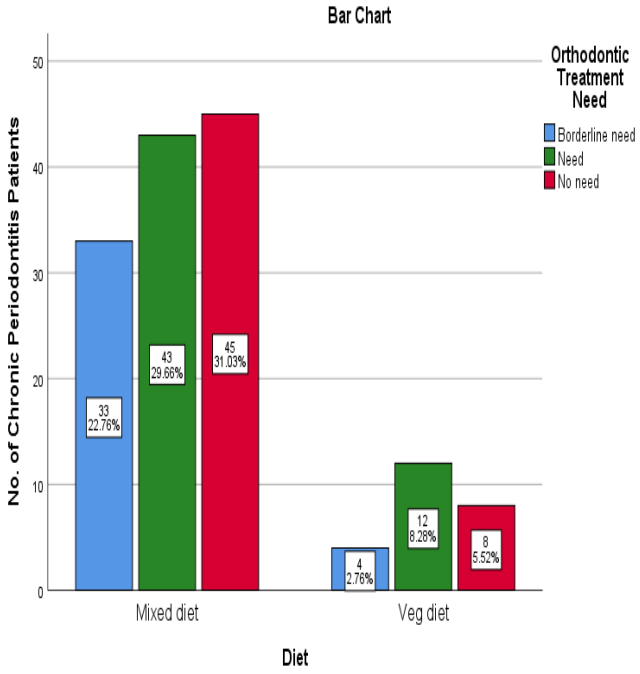

Fig.6: Bar chart represents the association between orthodontic treatment needs and diet. X-axis represents the diet and Y-axis represents the orthodontic treatment need in chronic periodontitis patients. Chi-square test was done and association was found to be statistically not significant. Pearson Chi-Square value- 2.069; df- 2; p value- 0.355 (>0.05), hence, statistically not significant.

Orthodontic treatment needs (green) were higher in patients with vegetarian diet compared to patients with mixed diet but the results were statistically not significant.

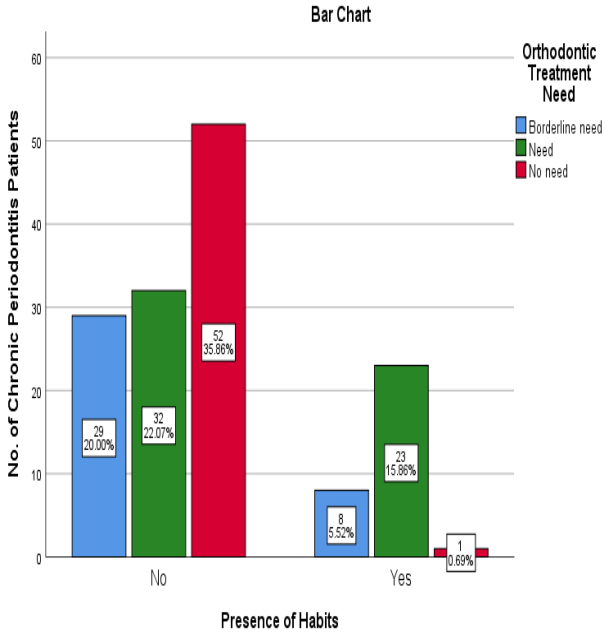

Fig.7: Bar chart represents the association between orthodontic treatment needs and presence of habits. X-axis represents presence of habits and Y-axis represents the orthodontic treatment needs in chronic periodontitis patients . Chi-square test was done and association was found to be statistically significant. Pearson Chi-Square value- 25.029; df- 2; p value- 0.000 (<0.05), hence statistically significant, proving patients with habits had significantly higher orthodontic treatment needs (green) compared to patients without habits.