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Prevalence of Chronic Gingivitis in Adolescents with Moderate Crowding of Dental Arches

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ABSTRACT

Dental crowding makes it challenging to maintain oral hygiene brushing since there is food debris accumulation in the interdental area which cannot be removed by regular brushing leading to plaque and calculus formation that in turn causes gingivitis and dental caries. The aim of this study was to evaluate the prevalence of gingivitis in the adolescent population with moderate crowding of the dental arches visiting a private dental hospital. This retrospective study was conducted using records of patients visiting a private dental college from June 2019 to April 2020. The study population included adolescent patients with crowding of dental arches, selected by non-probability purposive sampling. Data was collected, tabulated and then subjected to statistical analysis. Chi-square tests were performed. Out of 1926 patients aged between 15-18 years, 110 patients reported with moderate crowding of the dental arches. There was no significant association between age and gingivitis, gender and gingivitis and malocclusion and gingivitis. Gingivitis was commonly seen in subjects with Class I malocclusion. The prevalence rate of gingivitis was 72.2% in patients with moderate crowding. The prevalence of moderate crowding was 2% in the entire population and there was no association of moderate crowding with age, gender or type of malocclusion

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KEYWORDS

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INTRODUCTION

Occlusion is defined as the relationship between the maxillary and mandibular tooth surface during mandibular jaw movements which ends is also the occlusal contact relationship between the teeth in both jaws [1],[2]. Occlusion of teeth is influenced by several factors such as dental, skeletal and muscular balance.[3],[4],[5] Malocclusion can also be defined as the deviation from the normal occlusion. Malocclusion occupies third position among various problems of health care after dental caries and periodontal diseases. [6],[7],[8]

Crowding of teeth is a condition in which the teeth are positioned irregularly in the dental arches and are not in alignment with the archform. Crowding of teeth is associated with many problems in patients.[9],[10] Tooth brushing becomes difficult to perform in crowded teeth, as these interdental areas are difficult to access, leading to the formation of plaque and calculus formation. [11],[12],[13]This

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plaque and calculus leads to the formation of gingivitis and caries, which further leads to the destruction of the periodontal tissue resulting in tooth mobility. [14],[15]

Gingivitis is defined as the reversible dental plaque-induced inflammation of the gingiva, without bone loss or clinical attachment loss [16]. It is frequently encountered in dental practice and seen in individuals of all age groups. Gingivitis is most commonly plaque associated, but certain types of gingivitis are associated with endocrine disorders. [17],[18]

The etiology of gingivitis is multifactorial and there are various factors which are responsible such as bacterial biofilm, genetic, socioeconomic, demographic, iatrogenic and behavioral factors. [19],[20]. The most important factor associated with gingivitis is plaque accumulation in moderate crowding cases. [21]. Plaque accumulation leads to an inflammatory reaction with clinical signs such as bleeding, edema, redness and sometimes even pain is experienced by the patient.

Studies show the crowding may complicate oral hygiene procedures which hinders in plaque removal and results in gingival inflammation.[22], [23] An increase in the periodontal disease associated with malocclusion is one of the reasons for performing orthodontic therapy. This irregularity of the teeth has been associated with gingivitis[24],[25], and there is a direct relationship between crowding and gingival inflammation. [26][27] It can be concluded that crowding is a predisposing factor, leading to periodontal inflammation.

Previously our team had conducted numerous clinical trials and in vitro studies [28–47] over the past 5 years. Now we are focusing on prevalence studies

This study aims at evaluating the prevalence of gingivitis in moderately crowded arches among adolescents visiting Saveetha Dental College and Hospitals.

MATERIALS AND METHOD

Study setting

This retrospective study included 1926 subjects reported to Saveetha Dental College and Hospitals during June 2019-March 2020 for dental treatment. Online database was used to retrieve the data. Ethical approval was obtained from the Institutional Ethics Committee. Number of people involved in the study were totally 2(1 Principal Investigator and 1 Guide). Demographic data such as age and gender of the patient were recorded.

Data collection

The data was collected from the electronic database. Data was collected from June 1, 2019 to Feb 29, 2020. Relevant data was entered in Microsoft Excel Sheet. Repeated data were excluded from the study. Data verification was done by an additional reviewer.

Statistical analysis

Data collection was performed and entered in excel sheet and was later transferred to the SPSS software (Version 20.0) for statistical analysis. Independent variables included age, gender, ethnicity and crowding. Dependent variables included bleeding on probing, colour, contour, surface texture. Both descriptive and inferential statistics were employed. Level of significance was $p<0.05$.

RESULTS AND DISCUSSION

The results inferred from the present study were as follows:

- Out of 1926 subjects, there were 110 subjects who were diagnosed with moderate crowding. In which, 80 (72.2%) subjects were diagnosed with gingivitis.

- The most common age group that presented with gingivitis were 17 years old (29.09%) followed by 18 years of age. (20.0%). No statistical significance between age and gingivitis was seen ($p>0.05$) - Figure 1
- Male subjects (37.27%) were commonly diagnosed with gingivitis than female subjects (35.45%). No association was seen between gender and gingivitis. ($p>0.05$) - Figure 2
- Class I malocclusion (66.36%) presented the most with gingivitis, followed by Class 2 division 1 (4.55%). There was no significant association seen between the malocclusion and gingivitis (p.0.05)- Figure 3.

Prevalence of gingivitis among moderately crowded dental arches was found to be 2%. According to the present study, no significant association between the gender and gingival conditions was noted. Studies reported that males had higher prevalence than female subjects. The result of the present study showed that there was no significant association between malocclusion and gingivitis. It was seen that cases with class I malocclusion reported the most with gingivitis.

Prevalence of gingivitis among moderately crowded dental arches was found to be 2% and it was not statistically significant. According to the study reported by Glans et. al [48] prevalence of adolescents with crowding and gingivitis was 8% which is more than the results of the present study. The studies reported by Abu et.al [49] reported gingivitis prevalence of only 0.5% among the selected subjects.

According to this study there was no association noted between the gender and gingival conditions.

Studies in the past had reported males with higher prevalence than female subjects. Vadiakal et.al [50] and Dhar et.al [51] reported similar findings in their studies, they reported more gingivitis prevalence in males than in females. But another study by Tanni et.al [52] reported higher gingivitis prevalence in females with crowding compared to males.

The result of the present study reports no significant association between malocclusion and gingivitis. It was seen that more number of class I malocclusion subjects reported with gingivitis. Studies reported by Katz et.al,[53] reported that there was no association between malocclusion and the gingival conditions. According to studies reported by Gabris et. al [54], Mtaya et. al, [55] and Nalcaci et.al [56] reported dissimilar results that malocclusion and gingivitis have a significant relationship and also class I malocclusion was commonly diagnosed with gingivitis.

Further studies with a much larger sample size are needed to generalize the results of the present study also multicentre studies should be encouraged in the near future to derive authentic conclusions on the concerned subject.

CONCLUSION

Within the limitations of the present study it can be concluded that gingivitis was most commonly reported in patients with class I malocclusion with moderate crowding and no gender associations were noted.

AUTHORS CONTRIBUTIONS

First author (Palak Mayur Shah) conducted the study, did the data analysis, interpretation and wrote the manuscript. Second author (Dr. Ravindra Kumar Jain) contributed to conception, data design, analysis, interpretation and critically revised the manuscript. Third author (Dr. Manjari Chaudhary) participated in the study and revised the manuscript. All the three authors have discussed the results and contributed to the final manuscript.

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CONFLICT OF INTEREST

No conflict of interest.

REFERENCES

1. Watrianthos R. Buku Ajar SISTEM OPERASI [Internet]. Available from: http://dx.doi.org/10.31227/osf.io/6yh4e
2. Viswanath A, Ramamurthy J, Dinesh SPS, Srinivas A. Obstructive sleep apnea: awakening the hidden truth. Niger J Clin Pract. 2015 Jan;18(1):1–7.
3. Singh G, Varma M. Occlusion in Orthodontics [Internet]. Textbook of Orthodontics. 2007. p. 53–53. Available from: http://dx.doi.org/10.5005/jp/books/10936_6
4. Sivamurthy G, Sundari S. Stress distribution patterns at mini-implant site during retraction and intrusion--a three-dimensional finite element study. Prog Orthod. 2016 Jan 18;17:4.
5. Felicita AS, Sumathi Felicita A. Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor – The sling shot method [Internet]. Vol. 30, The Saudi Dental Journal. 2018. p. 265–9. Available from: http://dx.doi.org/10.1016/j.sdentj.2018.05.001
6. Proffit WR, Fields HW Jr, Sarver DM. Contemporary Orthodontics. Elsevier Health Sciences; 2006. 768 p.
7. Samantha C, Sundari S, Chandrasekhar S, Sivamurty G, Dinesh S. Comparative Evaluation of Two Bis-GMA Based Orthodontic Bonding Adhesives - A Randomized Clinical Trial. J Clin Diagn Res. 2017 Apr;11(4):ZC40–4.
8. Krishnan S. Effect of Bisphosphonates on Orthodontic Tooth Movement—An Update [Internet]. JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH. 2015. Available from: http://dx.doi.org/10.7860/jcdr/2015/11162.5769
9. Kumar KRR, Ramesh Kumar KR, Shanta Sundari KK, Venkatesan A, Chandrasekar S. Depth of resin penetration into enamel with 3 types of enamel conditioning methods: A confocal microscopic study [Internet]. Vol. 140, American Journal of Orthodontics and Dentofacial Orthopedics. 2011. p. 479–85. Available from: http://dx.doi.org/10.1016/j.ajodo.2010.10.022
10. Vikram NR, Prabhakar R, Kumar SA, Karthikeyan MK, Saravanan R. Ball Headed Mini Implant. J Clin Diagn Res. 2017 Jan;11(1):ZL02–3.
11. Kamisetty SK. SBS vs Inhouse Recycling Methods-An Invitro Evaluation [Internet]. JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH. 2015. Available from: http://dx.doi.org/10.7860/jcdr/2015/13865.6432
12. Felicita AS. Quantification of intrusive/retraction force and moment generated during en-masse retraction of maxillary anterior teeth using mini-implants: A conceptual approach. Dental Press J Orthod.

2017 Sep;22(5):47–55.
13. Dinesh SPS, Saravana Dinesh SP. An Indigenously Designed Apparatus for Measuring Orthodontic Force [Internet]. JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH. 2013. Available from: http://dx.doi.org/10.7860/jcdr/2013/7143.3631
14. Bugaighis I, Elorfi S. An odontometric study of tooth size in normal, crowded and spaced dentitions [Internet]. Vol. 2, Journal of Orthodontic Science. 2013. p. 95. Available from: http://dx.doi.org/10.4103/2278-0203.119681
15. Jain RK. Comparison of Intrusion Effects on Maxillary Incisors Among Mini Implant Anchorage, J-Hook Headgear and Utility Arch [Internet]. JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH. 2014. Available from: http://dx.doi.org/10.7860/jcdr/2014/8339.4554
16. Rubika J, Sumathi Felicita A, Sivambiga V. Gonial Angle as an Indicator for the Prediction of Growth Pattern [Internet]. Vol. 6, World Journal of Dentistry. 2015. p. 161–3. Available from: http://dx.doi.org/10.5005/jp-journals-10015-1334
17. Lang NP, Schätzle MA, Löe H. Gingivitis as a risk factor in periodontal disease [Internet]. Vol. 36, Journal of Clinical Periodontology. 2009. p. 3–8. Available from: http://dx.doi.org/10.1111/j.1600-051x.2009.01415.x
18. Blankenstein R, Murray JJ, Lind OP. Prevalence of chronic periodontitis in 13-15-year-old children. A radiographic study. J Clin Periodontol. 1978 Nov;5(4):285–92.
19. Lopez R, Fernandez O, Baelum V. Social gradients in periodontal diseases among adolescents [Internet]. Vol. 34, Community Dentistry and Oral Epidemiology. 2006. p. 184–96. Available from: http://dx.doi.org/10.1111/j.1600-0528.2006.00271.x
20. Petruțiu ȘA, Stratul S-I, Soancă A, Roman A, Băciuț M, Kasaj A, et al. The impact of some behavioral aspects on periodontal disease in a group of Romanian students - an epidemiological survey. Rev Epidemiol Sante Publique. 2014 Dec;62(6):367–75.
21. Felicita AS. Orthodontic management of a dilacerated central incisor and partially impacted canine with unilateral extraction - A case report. Saudi Dent J. 2017 Oct;29(4):185–93.
22. Wasserman BH, Thompson RH Jr, Geiger AM, Goodman SF, Pomerantz J, Turgeon LR, et al. Relationship of occlusion and periodontal disease. II. Periodontal status of the study population. J Periodontol. 1971 Jun;42(6):371–8.
23. Felicita A, Shanthasundari KK, Chandrasekar S. Determination of craniofacial relation among the subethnic Indian population: A modified approach - (Sagittal relation) [Internet]. Vol. 23, Indian Journal of Dental Research. 2012. p. 305. Available from: http://dx.doi.org/10.4103/0970-9290.102210
24. Ashley F. The relationship between irregularity of the incisor teeth, plaque, and gingivitis: a study in a group of schoolchildren aged 11-14 years [Internet]. Vol. 20, The European Journal of Orthodontics. 1998. p. 65–72. Available from: http://dx.doi.org/10.1093/ejo/20.1.65
25. Clerehugh V, Tugnait A. Diagnosis and management of periodontal diseases in children and adolescents [Internet]. Vol. 26, Periodontology 2000. 2001. p. 146–68. Available from: http://dx.doi.org/10.1034/j.1600-0757.2001.2260108.x
26. Jensen BL, Solow B. Alveolar bone loss and crowding in adult periodontal patients [Internet]. Vol. 17, Community Dentistry and Oral Epidemiology. 1989. p. 47–51. Available from: http://dx.doi.org/10.1111/j.1600-0528.1989.tb01827.x
27. Krishnan S, Pandian K, Kumar S. Angular photogrammetric analysis of the soft-tissue facial profile of Indian adults [Internet]. Vol. 29, Indian Journal of Dental Research. 2018. p. 137. Available from: http://dx.doi.org/10.4103/ijdr.ijdr_496_16
28. Rajeshkumar S, Kumar SV, Ramaiah A, Agarwal H, Lakshmi T, Roopan SM. Biosynthesis of zinc oxide nanoparticles usingMangifera indica leaves and evaluation of their antioxidant and cytotoxic properties in lung cancer (A549) cells. Enzyme Microb Technol. 2018 Oct;117:91–5.
29. Kavitha M, Subramanian R, Narayanan R, Udhayabanu V. Solution combustion synthesis and characterization of strontium substituted hydroxyapatite nanocrystals [Internet]. Vol. 253, Powder Technology. 2014. p. 129–37. Available from: http://dx.doi.org/10.1016/j.powtec.2013.10.045
30. Vijayakumar GNS, Nixon Samuel Vijayakumar G, Devashankar S, Rathnakumari M, Sureshkumar P. Synthesis of electrospun ZnO/CuO nanocomposite fibers and their dielectric and non-linear optic studies [Internet]. Vol. 507, Journal of Alloys and Compounds. 2010. p. 225–9. Available from:

http://dx.doi.org/10.1016/j.jallcom.2010.07.161

31. Danda AK. Comparison of a single noncompression miniplate versus 2 noncompression miniplates in the treatment of mandibular angle fractures: a prospective, randomized clinical trial. J Oral Maxillofac Surg. 2010 Jul;68(7):1565–7.
32. Lekha L, Kanmani Raja K, Rajagopal G, Easwaramoorthy D. Synthesis, spectroscopic characterization and antibacterial studies of lanthanide(III) Schiff base complexes containing N, O donor atoms [Internet]. Vols. 1056-1057, Journal of Molecular Structure. 2014. p. 307–13. Available from: http://dx.doi.org/10.1016/j.molstruc.2013.10.014
33. Putchala MC, Ramani P, Herald J. Sherlin, Premkumar P, Natesan A. Ascorbic acid and its pro-oxidant activity as a therapy for tumours of oral cavity – A systematic review [Internet]. Vol. 58, Archives of Oral Biology. 2013. p. 563–74. Available from: http://dx.doi.org/10.1016/j.archoralbio.2013.01.016
34. Devi VS, Subathra Devi V, Gnanavel BK. Properties of Concrete Manufactured Using Steel Slag [Internet]. Vol. 97, Procedia Engineering. 2014. p. 95–104. Available from: http://dx.doi.org/10.1016/j.proeng.2014.12.229
35. Dhinesh B, Niruban Bharathi R, Isaac JoshuaRamesh Lalvani J, Parthasarathy M, Annamalai K. An experimental analysis on the influence of fuel borne additives on the single cylinder diesel engine powered by Cymbopogon flexuosus biofuel [Internet]. Vol. 90, Journal of the Energy Institute. 2017. p. 634–45. Available from: http://dx.doi.org/10.1016/j.joei.2016.04.010
36. Danda AK, Tatiparthi MK, Narayanan V, Siddareddi A. Influence of Primary and Secondary Closure of Surgical Wound After Impacted Mandibular Third Molar Removal on Postoperative Pain and Swelling—A Comparative and Split Mouth Study [Internet]. Vol. 68, Journal of Oral and Maxillofacial Surgery. 2010. p. 309–12. Available from: http://dx.doi.org/10.1016/j.joms.2009.04.060
37. Gopalakannan S, Senthilvelan T, Ranganathan S. Modeling and Optimization of EDM Process Parameters on Machining of Al 7075-B4C MMC Using RSM [Internet]. Vol. 38, Procedia Engineering. 2012. p. 685–90. Available from: http://dx.doi.org/10.1016/j.proeng.2012.06.086
38. Venu H, Dhana Raju V, Subramani L. Combined effect of influence of nano additives, combustion chamber geometry and injection timing in a DI diesel engine fuelled with ternary (diesel-biodiesel-ethanol) blends [Internet]. Vol. 174, Energy. 2019. p. 386–406. Available from: http://dx.doi.org/10.1016/j.energy.2019.02.163
39. Adalarasan R, Santhanakumar M, Rajmohan M. Application of Grey Taguchi-based response surface methodology (GT-RSM) for optimizing the plasma arc cutting parameters of 304L stainless steel [Internet]. Vol. 78, The International Journal of Advanced Manufacturing Technology. 2015. p. 1161–70. Available from: http://dx.doi.org/10.1007/s00170-014-6744-0
40. Parthasarathy M, Isaac JoshuaRamesh Lalvani J, Dhinesh B, Annamalai K. Effect of hydrogen on ethanol-biodiesel blend on performance and emission characteristics of a direct injection diesel engine. Ecotoxicol Environ Saf. 2016 Dec;134(Pt 2):433–9.
41. Neelakantan P, Cheng CQ, Mohanraj R, Sriraman P, Subbarao C, Sharma S. Antibiofilm activity of three irrigation protocols activated by ultrasonic, diode laser or Er:YAG laserin vitro [Internet]. Vol. 48, International Endodontic Journal. 2015. p. 602–10. Available from: http://dx.doi.org/10.1111/iej.12354
42. Sajan D, Udaya Lakshmi K, Erdogdu Y, Joe IH. Molecular structure and vibrational spectra of 2,6-bis(benzylidene)cyclohexanone: a density functional theoretical study. Spectrochim Acta A Mol Biomol Spectrosc. 2011 Jan;78(1):113–21.
43. Sharma P, Mehta M, Dhanjal DS, Kaur S, Gupta G, Singh H, et al. Emerging trends in the novel drug delivery approaches for the treatment of lung cancer. Chem Biol Interact. 2019 Aug 25;309:108720.
44. 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.
45. Lekha L, Kanmani Raja K, Rajagopal G, Easwaramoorthy D. Schiff base complexes of rare earth metal ions: Synthesis, characterization and catalytic activity for the oxidation of aniline and substituted anilines [Internet]. Vol. 753, Journal of Organometallic Chemistry. 2014. p. 72–80. Available from: http://dx.doi.org/10.1016/j.jorganchem.2013.12.014
46. Neelakantan P, Grotra D, Sharma S. Retreatability of 2 mineral trioxide aggregate-

based root canal sealers: a cone-beam computed tomography analysis. J Endod. 2013 Jul;39(7):893–6.
47. PradeepKumar AR, Shemesh H, Jothilatha S, Vijayabharathi R, Jayalakshmi S, Kishen A. Diagnosis of Vertical Root Fractures in Restored Endodontically Treated Teeth: A Time-dependent Retrospective Cohort Study. J Endod. 2016 Aug;42(8):1175–80.
48. Glans R, Larsson E, Øgaard B. Longitudinal changes in gingival condition in crowded and noncrowded dentitions subjected to fixed orthodontic treatment [Internet]. Vol. 124, American Journal of Orthodontics and Dentofacial Orthopedics. 2003. p. 679–82. Available from: http://dx.doi.org/10.1016/j.ajodo.2003.05.001
49. Alhaija EA, Al-Wahadni A. Relationship between tooth irregularity and periodontal disease in children with regular dental visits [Internet]. Vol. 30, Journal of Clinical Pediatric Dentistry. 2006. p. 296–8. Available from: http://dx.doi.org/10.17796/jcpd.30.4.gu76270w876250p4
50. Vadiakas G, Oulis CJ, Tsinidou K, Mamai-Homata E, Polychronopoulou A. Socio-behavioural factors influencing oral health of 12 and 15 year old Greek adolescents. A national pathfinder survey. Eur Arch Paediatr Dent. 2011 Jun;12(3):139–45.
51. Dhar V, Jain A, Van Dyke TE, Kohli A. Prevalence of gingival diseases, malocclusion and fluorosis in school-going children of rural areas in Udaipur district [Internet]. Vol. 25, Journal of Indian Society of Pedodontics and Preventive Dentistry. 2007. p. 103. Available from: http://dx.doi.org/10.4103/0970-4388.33458
52. Taani DQ, Quteish Taani D. Trends in oral hygiene, gingival status and dental caries experience in 13-14-year-old Jordanian school children between 1993 and 1999 [Internet]. Vol. 51, International Dental Journal. 2001. p. 447–50. Available from: http://dx.doi.org/10.1002/j.1875-595x.2001.tb00858.x
53. Katz RV. An Epidemiologic Study of the Relationship between Various States of Occlusion and the Pathological Conditions of Dental Caries and Periodontal Disease [Internet]. Vol. 57, Journal of Dental Research. 1978. p. 433–9. Available from: http://dx.doi.org/10.1177/00220345780570030201
54. Gábris K, Márton S, Madléna M. Prevalence of malocclusions in Hungarian adolescents. Eur J Orthod. 2006 Oct;28(5):467–70.
55. Mtaya M, Brudvik P, Astrom AN. Prevalence of malocclusion and its relationship with socio-demographic factors, dental caries, and oral hygiene in 12- to 14-year-old Tanzanian schoolchildren [Internet]. Vol. 31, The European Journal of Orthodontics. 2009. p. 467–76. Available from: http://dx.doi.org/10.1093/ejo/cjn125
56. Nalcaci R, Demirer S, Ozturk F, Altan BA, Sokucu O, Bostanci V. The Relationship of Orthodontic Treatment Need with Periodontal Status, Dental Caries, and Sociodemographic Factors [Internet]. Vol. 2012, The Scientific World Journal. 2012. p. 1–6. Available from: http://dx.doi.org/10.1100/2012/498012

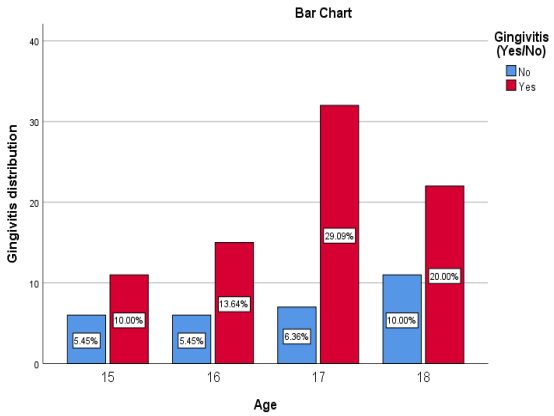

Figure 1: Bar Graph showing the association of age and number of people reported with crowding having gingivitis. X-axis denotes the age of the patient and Y-axis denotes the distribution of gingivitis. Highest number of gingivitis cases were reported in 17 yr old subjects (29.09%). Chi-square test was done and association was found to be statistically not significant. Pearson's chi-square value-2.890, DF-3, p-value-0.393 (>0.05) hence statistically not significant, proving that gingivitis was not associated with any common age group.

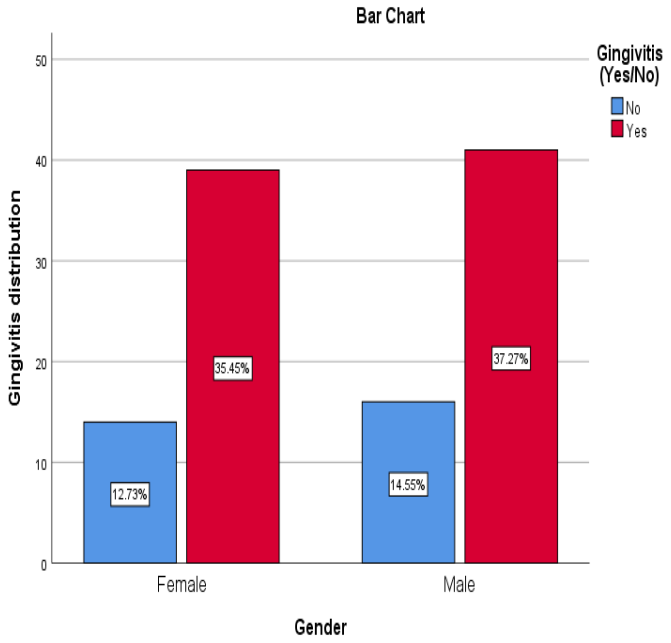

Figure 2: Bar Graph showing the association of gender and number of people reported with crowding having gingivitis. X-axis denotes the gender of the patient and Y-axis denotes the distribution of gingivitis. Males (37.27%) were more commonly diagnosed with gingivitis than females (35.45%) Chi-square test was done and association was found to be statistically not significant. Pearson's chi-square value-0.038, DF-1, p-value-0.846 (>0.05) hence statistically not significant, proving gingivitis was not common between any gender.

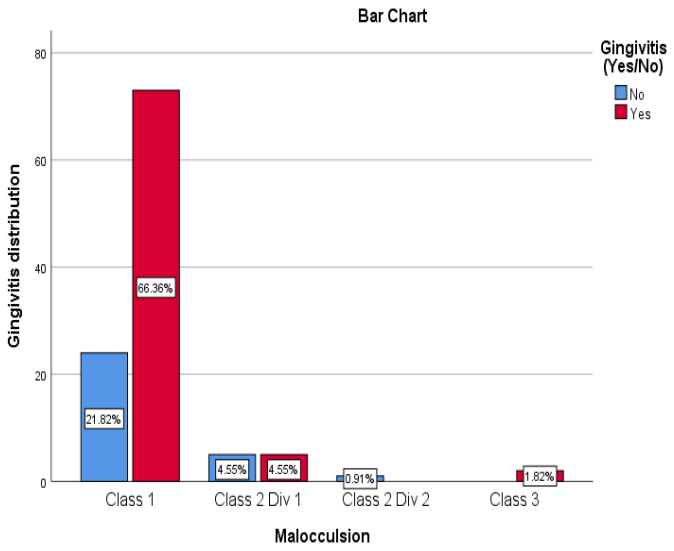

Figure 3: Bar Graph showing the association of Malocclusion and number of people reported with crowding having gingivitis. X-axis denotes the dental malocclusion of the patient and Y-axis denotes the distribution of gingivitis. Subjects with class 1 malocclusion (66.36%) were most commonly diagnosed with gingivitis. Chi-square test was done and association was found to be statistically not significant. Pearson's chi-square value-6.334, DF-3, p-value-0.089 (>0.05) hence statistically not significant, proving gingivitis was not common among any malocclusion.