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PREVALENCE AND ASSOCIATED FACTORS FOR DENTAL CARIES IN SCHOOL CHILDREN WITH MALOCCLUSION

Nur Liyana Hannah Binti Izham Akmal[1] , Ravindra Kumar Jain M.D.S.[2], Revathi Duraisamy M.D.S[3]

[1]*Saveetha Dental College, Saveetha Institute of Medical and Technical Science, Saveetha University,*
[2]*Associate Professor Department of Orthodontics Saveetha Dental College, Saveetha Institute of Medical and Technical Science, Saveetha University,*
[3]*Senior Lecturer,Department of Prosthodontics Saveetha Dental College, Saveetha Institute of Medical and Technical Science, Saveetha University*
[1]*151501092.sdc@saveetha.com*
[2] *ravindrakumar@saveetha.com*
[3]*revathid.sdc@saveetha.com*

ABSTRACT

Malocclusion is one of the common dental problems reported in children that refers to the malalignment of the teeth or improper relationship of the dental arches due to altered developmental systems of the orofacial complex. Several studies have reported on the relationship between malocclusion and dental caries in which the presence of malocclusion such as crowding and spacing may act as predisposing factors in the development of dental caries. The aim of this study is to evaluate the prevalence of dental caries among 12-16 years old school children with malocclusion. It is a retrospective study conducted by reviewing 86,000 patient case records of the Saveetha Dental College and Hospital, Chennai, India. A total of 313 consecutive case records of patients for a period of June 2019 to March 2020 with signed informed consent were retrieved and analysed. Patient's name, patient's identification number (PID), age, gender, malocclusion and dmft score were collected from the patients' case records. Data collection and analysis were done using the SPSS version 23.0. Descriptive analysis was done for the assessment of age, gender, malocclusion and dental caries. Chi square test was used to evaluate the association of dmft score with malocclusion. A total of 134 children with malocclusion were affected by dental caries (42.81%). The overall dmft score was 1.5. Most of the children present with dental caries were within the 12-14 years age group (60.45%), followed by those within the 15-16 years age group (39.55%). High prevalence of dental caries was seen in males (52.24%) as compared to females (47.76%). Most of the children had Class I malocclusion (70.93%), followed by Class II malocclusion (29.07%). In terms of crowding, mandibular crowding (57.19%) was more common among the children when compared to maxillary crowding (38.98%). There is a statistically significant association between maxillary crowding and dental caries. No association of dental caries with mandibular crowding and dental malocclusion. Within the limits of the present study, dental caries is seen in 134 of the patients with an average dmft score of 1.5. There is a positive association between maxillary crowding and dental caries but no significant association of dental caries with dental malocclusion and mandibular crowding.

Keywords: Malocclusion; caries; children; crowding; dmft

INTRODUCTION

Malocclusion is one of the common dental problems reported in children (Mtaya, Brudvik and Astrøm, 2009; Dhar *et al.*, 2007). It refers to the malalignment of the teeth or improper relationship of the dental arches that exceeds the ideal standard due to altered developmental systems of the orofacial complex which may affect the teeth, temporomandibular joints and muscles (Abbas A, Syed IB, Abbas H, Malik F, 2015; Flores XD, Benavides RC, Barrera JC, Rodríguez JD, 2013; Felicita, Chandrasekar and Shanthasundari, 2012). Malocclusion may affect the appearance of an individual along with other problems associated with normal growth and development, abnormal muscle activity, speech difficulty, temporomandibular joint disorders and prevalence of dental caries and periodontal diseases (Proffit and Fields, 1993; Pandian, Krishnan and Kumar, 2018). It may also affect the psychosocial function of an individual due to the impaired aesthetic of the dentofacial structures (Mtaya, Brudvik and Astrøm, 2009; Felicita and Sumathi Felicita, 2018).

Similarly, dental caries is also considered to be a significant public health problem, particularly in children. It is a complex multifactorial microbiological disease characterized by localized dissolution and destruction of calcified tissues of the teeth (Ramesh Kumar *et al.*, 2011). The prevalence of dental caries incidence usually varies with age, gender, socioeconomic factors, geographical location, dietary intake and oral hygiene practices (Saravanan *et al.*, 2005). Dental caries is considered to be the most common dental affliction of childhood that places a financial burden on parents in providing the proper treatment for their children (Shetty, Hegde and Shetty, 2018). The presence and severity of dental caries are often exaggerated in children by their oral habits such as the use of bottles or pacifiers which decreases the flow and neutralization of saliva resulting in exposure to fermentable carbohydrates, consumption of cariogenic diet and even their pattern of sleep (Hallet KB, 2006; Viswanath *et al.*, 2015).

Several studies have reported on the relationship between malocclusion and dental caries in which the presence of malocclusion such as crowding and spacing may act as predisposing factors in the development of dental caries. Other risk factors such as age, gender and dietary habits should also be considered in order to establish the relationship between malalignment of the teeth and dental caries (Abbas A, Syed IB, Abbas H, Malik F, 2015; Roberson, Heymann and Swift, 2006). Various studies have previously reported that there is a positive association between malocclusion and the prevalence of dental caries (Mtaya, Brudvik and Astrøm, 2009; Shivakumar *et al.*, 2009; Baskaradoss *et al.*, 2013; Tseveenjav, Vehkalahti and Murtomaa, 2003; Ferreira *et al.*, 2007; Buczkowska-Radlinska, Szyszka-Sommerfeld and Wozniak, 2012). This finding is usually attributed to the inability to carry out proper oral hygiene which is a common problem among individuals with malocclusion due to the limited access for tooth brushing and natural cleansing by the tongue and saliva. Malocclusion increases the tendency of food and plaque accumulation by providing additional areas of retention which makes it difficult to perform proper oral hygiene leading to the development of dental caries (Disha *et al.*, 2017; Buczkowska-Radlinska, Szyszka-Sommerfeld and Wozniak, 2012). Dental caries is also associated with premature loss of primary teeth which becomes one of the predisposing factors for occlusal and space anomalies in mixed and permanent dentitions (Kolmakow *et al.*, 1991).

Early diagnosis of dental caries and malocclusion helps in providing all the treatments required by an individual at a younger age and prevents the need for invasive therapeutic interventions in the future (Krishnan, 2015; Felicita, 2017b; Vikram *et al.*, 2017). Most malocclusion can be corrected if detected early by various correctional techniques as the complete development of the jaws usually occurs by the age of 16 or 17 which reduces the risk of relapse that may occur during the active growth period of the skeletal tissues (Bhardwaj, Veeresha and Sharma, 2011; Rubika, Sumathi Felicita and Sivambiga, 2015; Dinesh *et al.*, 2013; Jain, Kumar and Manjula, 2014). Proper understanding and awareness of the prevalence of malocclusion help in providing the basis for effective preventive and orthodontic treatment programs especially in children (Felicita, 2017a; Samantha *et al.*, 2017).
This study was done to evaluate the prevalence of dental caries in school children with malocclusion.

MATERIALS AND METHOD

Study Design and Setting

A retrospective study was conducted by reviewing 86,000 patient case records of the Saveetha Dental College and Hospital, Chennai, India for a period of June 2019 to March 2020. A total of two examiners were involved in this study. An effort had been made to confirm that the sorted case records contained information on malocclusion and dental caries. Prior permission use of the case records analysis was obtained from the institutional review board with the ethical approval number of SDC/SIHEC/2020/DIASDATA/0619-0320.

Study Population and Sampling

A total of 313 consecutive case records of patients with signed informed consent were sorted following the assessment of 86,000 case reports. The inclusion criteria of this study were children within 12-16 years of age and both genders. The adult patients and medically compromised patients were excluded from the study. Convenience sampling method was done for this study.

Data Collection

Information on the patients' age, gender, malocclusion and dental caries were collected from the patients' case records. For statistical convenience, age of the patients were categorized as 12-14 years and 15-16 years while dmft scores were categorized as 0-2, 3-4, 5-6, 7-8 and 9-10. Dental malocclusion was classified into Class I malocclusion and Class II malocclusion. Dental crowding was also classified into maxillary crowding and mandibular crowding. Management of incomplete or censored data was done by exclusion.

Statistical Analysis

Tabulation and analysis of the collected data were done using Statistical Package for Social Sciences for Windows version 23.0 (SPSS Inc., Chicago, IL, USA). Descriptive analysis was done to assess the age groups, genders, dental caries and malocclusion. Chi-square test was used to evaluate the association of dental caries with maxillary crowding, mandibular crowding and dental malocclusion. Significant level test was set such that $p>0.05$ is considered significant.

RESULTS AND DISCUSSION

A total of 313 cases are selected in this study based on the inclusion criteria of children within 12-16 years with malocclusion irrespective of gender. Dental caries are reported in 134 of the children (42.81%) while the remaining 179 of them are not affected with dental caries (57.19%) with the overall dmft score reported is 1.5. [Figure 1] A study by Flores et al., reported on 83% and 33% prevalence of dental caries and malocclusion in school children respectively (Flores XD, Benavides RC, Barrera JC, Rodríguez JD, 2013). While another study found a prevalence of malocclusion to be 75.6% and caries prevalence at 64.4% in 11-16 years old school children (Abbas A, Syed IB, Abbas H, Malik F, 2015). A study by Segeur-Serey et al., reported on dental caries observed in 61.8% of children and 36.8% presented with missing teeth due to caries (Segeur-Serey *et al.*, 2020). Prevalence of dental caries and malocclusion in children is often attributed to the lack of dental visit which may be due to various factors such as low socioeconomic and education level of the parents (Mouradian, 2000; Lewis *et al.*, 2000; Sohn *et al.*, 2007; Kamisetty *et al.*, 2015).

Most of the cases showing the presence of dental caries in children with malocclusion is reported in those within 12-14 years of age (60.45%) followed by the 15-16 years age group (39.55%). [Figure 2] A previous study mentioned the prevalence of dental caries in children above 6 years of age (61%). Another

study reported high prevalence of caries in school children with primary dentition (95%) while those with permanent dentition showed 33% prevalence of dental caries (Moreno-Altamirano A, Carreón-García J, Alvear-Galindo G, López-Moreno S, Vega-Franco L., 2001) which was later disagreed by another study with findings of 82% caries prevalence in school children with primary dentition and 90% with permanent dentition (Villalobos-Rodelo *et al.*, 2006). It has been reported previously that the occurrence of dental caries in general tends to increase as the age increases with high prevalence among individuals in the low socioeconomic class (Feldens *et al.*, 2015).

In our study, higher prevalence of dental caries is seen in males (52.24%) as compared to females (47.76%). [Figure 3] Abbas et al., found higher prevalence of dental caries in males (55.7%) than females (44.3%) with malocclusion (Abbas A, Syed IB, Abbas H, Malik F, 2015). This finding can be attributed to the differences in diet between males and females in which males show higher tendency to consume diet with more sweets compared to females and often associated with improper oral and dental care, leading to high risk of dental caries formation.

Most of the children in this study are seen with dental crowding, in which maxillary crowding (38.98%) [Figure 4] is less prevalent than mandibular crowding (57.19%) [Figure 5]. According to Asiry et al., the most common malocclusion trait in school children is crowding (26.6%), followed by spacing (20.6%), increased overjet (19.5%), increased overbite (19.4%), posterior crossbite (8.5%) and anterior open bite (6.1%) (Asiry and AlShahrani, 2019)(Sivamurthy and Sundari, 2016). A previous study mentioned that crowding is the most commonly observed malocclusion (41.2%) in their study, followed by maxillary overjet of >2mm (14%) and spacing (12.4%) (Baskaradoss *et al.*, 2013). Crowding is often caused by a discrepancy between tooth and jaw sizes or by the influence of functional factors on the development of the dentition (Baskaradoss *et al.*, 2013). Previous studies have reported that crowding causes improper contacts between neighbouring teeth, making it difficult for cleaning which increases plaque accumulation and leads to development of dental caries and periodontal diseases (Buczkowska-Radlinska, Szyszka-Sommerfeld and Wozniak, 2012; Feldens *et al.*, 2015; Kukletova *et al.*, 2012).

Majority of the children have Class I malocclusion (70.93%), followed by Class II malocclusion (29.07%). [Figure 6] This is supported by a previous study that found Class I malocclusion to be the most frequent malocclusion observed in the different stages of dentition (67%) (Segeur-Serey *et al.*, 2020). Similarly, several studies have also reported the prevalence of Angle's Class I malocclusion in school children to be 66.8% and 95.5% respectively (Disha *et al.*, 2017; Kaboré WA, Ouédraogo Y, Ouédraogo CN, Bationo R, Ndiaye D, Seck A, Leye-Benoist F, 2017). Baskaradoss et al., observed a high prevalence of Class I malocclusion in 11-18 years old children (96%) (Baskaradoss *et al.*, 2013). A previous study observed Class I relationship in most of the children (61%), followed by Class II relationship (16.3%) and Class III relationship (7.7%) (Asiry and AlShahrani, 2019).

Based on the Chi-Square Test [Table 1], it is concluded that there is a statistically significant association between maxillary crowding and dental caries ($p<0.05$) [Figure 7]. However, another Chi-Square Test [Table 2] revealed no association between mandibular crowding and dental caries ($p<0.05$) [Figure 8]. Similarly, there is no correlation between dental caries and dental malocclusion ($p>0.05$) [Figure 9] based on the Chi-Square Test [Table 3]. A study by Mtaya et al., found that children with caries experience (DMFT>0) are almost two times likely to have any type of malocclusion compared with their counterparts without caries (DMFT=0) (Mtaya, Brudvik and Astrøm, 2009). Several studies have reported that there is a significant correlation between malocclusion and dental caries in their studies (Abbas A, Syed IB, Abbas H, Malik F, 2015; Baskaradoss *et al.*, 2013). Further advancement in diagnosis and newer preventative measures are believed to be helpful in reducing the risk of dental caries, especially in children. Future studies should include clinical examination of these associations to help in better understanding of the condition.

LIMITATIONS

The present study had few limitations of study design. Since it is a retrospective study, follow up of subjects was not possible to extrapolate the study results. This study also failed to assess the other confounding variables such as education, socioeconomic status and habits of the patients. Further prospective study including all possible factors for dental caries and malocclusion have to be investigated to prove the hypothesis.

CONCLUSION

Within the limits of the present study, dental caries was seen in 134 patients with an average dmft score of 1.5. Prevalence of dental caries is seen in females and within 12-14 years age group. Majority of the children have Class I malocclusion, followed by Class II malocclusion. Mandibular crowding is more common among the children than maxillary crowding. There is a positive association between maxillary crowding and dental caries but no significant association of dental caries with dental malocclusion and mandibular crowding with most of the cases show dmft scores of 0-2.

AUTHOR CONTRIBUTIONS

First author (Nur Liyana Hannah Binti Izham Akmal) performed the analysis, interpretation and typing of manuscript. Second author (Dr. Ravindra Kumar Jain) contributed to conception, data design, analysis, interpretation and critical revision of the manuscript. Third author (Dr. Revathi Duraisamy) participated in the study and revision of the manuscript. All authors have discussed the results and contributed to the final manuscript.

CONFLICT OF INTEREST

There was no conflict of interest.

REFERENCES

[1] Abbas A, Syed IB, Abbas H, Malik F (2015) ‘Malocccclusion and its relationship with dental caries in a sample of Paskitani school children’, Pakistan Oral & Dental Journal, 35(4).

[2] Asiry, M. A. and AlShahrani, I. (2019) ‘Prevalence of malocclusion among school children of Southern Saudi Arabia’, Journal of orthodontic science, 8, p. 2.

[3] Baskaradoss, J. K. et al. (2013) ‘Prevalence of malocclusion and its relationship with caries among school children aged 11 - 15 years in southern India’, Korean journal of orthodontics, 43(1), pp. 35–41.

[4] Bhardwaj, V. K., Veeresha, K. L. and Sharma, K. R. (2011) ‘Prevalence of malocclusion and orthodontic treatment needs among 16 and 17 year-old school-going children in Shimla city, Himachal Pradesh’, Indian journal of dental research: official publication of Indian Society for Dental Research, 22(4), pp. 556–560.

[5] Buczkowska-Radlinska, J., Szyszka-Sommerfeld, L. and Wozniak, K. (2012) ‘Anterior tooth crowding and prevalence of dental caries in children in Szczecin, Poland’, Community dental health, 29(2), pp. 168–172.

[6] Dhar, V. et al. (2007) ‘Prevalence of gingival diseases, malocclusion and fluorosis in school-going children of rural areas in Udaipur district’, Journal of the Indian Society of Pedodontics and Preventive Dentistry, 25(2), pp. 103–105.

[7] Dinesh, S. P. S. et al. (2013) 'An indigenously designed apparatus for measuring orthodontic force', Journal of clinical and diagnostic research: JCDR, 7(11), pp. 2623–2626.

[8] Disha, P. et al. (2017) 'Malocclusion and dental caries experience among 8–9-year-old children in a city of South Indian region: A cross-sectional survey', Journal of Education and Health Promotion, p. 98. doi: 10.4103/jehp.jehp_24_17.

[9] Feldens, C. A. et al. (2015) 'Impact of malocclusion and dentofacial anomalies on the prevalence and severity of dental caries among adolescents', The Angle orthodontist, 85(6), pp. 1027–1034.

[10] Felicita, A. S. (2017a) 'Orthodontic management of a dilacerated central incisor and partially impacted canine with unilateral extraction - A case report', The Saudi dental journal, 29(4), pp. 185–193.

[11] Felicita, A. S. (2017b) 'Quantification of intrusive/retraction force and moment generated during en-masse retraction of maxillary anterior teeth using mini-implants: A conceptual approach', Dental press journal of orthodontics, 22(5), pp. 47–55.

[12] Felicita, A. S., Chandrasekar, S. and Shanthasundari, K. K. (2012) 'Determination of craniofacial relation among the subethnic Indian population: a modified approach - (Sagittal relation)', Indian journal of dental research: official publication of Indian Society for Dental Research, 23(3), pp. 305–312.

[13] Felicita, A. S. and Sumathi Felicita, A. (2018) 'Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor – The sling shot method', The Saudi Dental Journal, pp. 265–269. doi: 10.1016/j.sdentj.2018.05.001.

[14] Ferreira, S. H. et al. (2007) 'Dental caries in 0- to 5-year-old Brazilian children: prevalence, severity, and associated factors', International journal of paediatric dentistry / the British Paedodontic Society [and] the International Association of Dentistry for Children, 17(4), pp. 289–296.

[15] Flores XD, Benavides RC, Barrera JC, Rodríguez JD (2013) 'Prevalence of caries, gingivitis and malocclusions in school-age children in Ciudad Victoria, Tamaulipas, and its relationship with their nutritional status', Revista Odontológica Mexicana, 17(4), pp. 221–227.

[16] Hallet KB, O. P. K. (2006) 'Pattern and severity of early childhood caries', Community dentistry and oral epidemiology, 34(1), pp. 25–35.

[17] Jain, R. K., Kumar, S. P. and Manjula, W. S. (2014) 'Comparison of intrusion effects on maxillary incisors among mini implant anchorage, j-hook headgear and utility arch', Journal of clinical and diagnostic research: JCDR, 8(7), pp. ZC21–4.

[18] Kaboré WA, Ouédraogo Y, Ouédraogo CN, Bationo R, Ndiaye D, Seck A, Leye-Benoist F (2017) 'Study of the Prevalence of Dental Caries and Malocclusion in a Population of Primary School Pupils in Ouagadougou, Burkina Faso', Aquatic microbial ecology: international journal, 5(6), pp. 137–140.

[19] Kamisetty, S. K. et al. (2015) 'SBS vs Inhouse Recycling Methods-An Invitro Evaluation', Journal of clinical and diagnostic research: JCDR, 9(9), pp. ZC04–8.

[20] Kolmakow, S. et al. (1991) 'Dento-facial morphology and caries experience: an epidemiological study', The Journal of clinical pediatric dentistry, 16(1), pp. 31–37.

[21] Krishnan, S. (2015) 'Effect of Bisphosphonates on Orthodontic Tooth Movement—An Update', Journal of clinical and diagnostic research. doi: 10.7860/jcdr/2015/11162.5769.

[22] Kukletova, M. et al. (2012) 'Relationship between gingivitis severity, caries experience and orthodontic anomalies in 13-15 year-old adolescents in Brno, Czech Republic', Community dental health, 29(2), pp. 179–183.

[23] Lewis, C. W. et al. (2000) 'The role of the pediatrician in the oral health of children: A national survey', Pediatrics, 106(6), p. E84.

[24] Moreno-Altamirano A, Carreón-García J, Alvear-Galindo G, López-Moreno S, Vega-Franco L. (2001) 'Risk of caries in schoolchildren of Mexico City', Revista Mexicana de Pediatría, 68(6), pp. 228–233.

[25] Mouradian, W. E. (2000) 'Disparities in Children's Oral Health and Access to Dental Care', JAMA, p. 2625. doi: 10.1001/jama.284.20.2625.

[26] Mtaya, M., Brudvik, P. and Astrøm, A. N. (2009) 'Prevalence of malocclusion and its relationship with socio-demographic factors, dental caries, and oral hygiene in 12- to 14-year-old Tanzanian schoolchildren', European journal of orthodontics, 31(5), pp. 467–476.

[27] Pandian, K. S., Krishnan, S. and Kumar, S. A. (2018) 'Angular photogrammetric analysis of the soft-tissue facial profile of Indian adults', Indian journal of dental research: official publication of Indian Society for Dental Research, 29(2), pp. 137–143.

[28] Proffit, W. R. and Fields, H. W. (1993) Contemporary Orthodontics. Mosby Elsevier Health Science.

[29] Ramesh Kumar, K. R. et al. (2011) 'Depth of resin penetration into enamel with 3 types of enamel conditioning methods: a confocal microscopic study', American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics, 140(4), pp. 479–485.

[30] Roberson, T., Heymann, H. O. and Swift, E. J., Jr. (2006) Sturdevant's Art and Science of Operative Dentistry. Elsevier Health Sciences.

[31] Rubika, J., Sumathi Felicita, A. and Sivambiga, V. (2015) 'Gonial Angle as an Indicator for the Prediction of Growth Pattern', World Journal of Dentistry, pp. 161–163. doi: 10.5005/jp-journals-10015-1334.

[32] Samantha, C. et al. (2017) 'Comparative Evaluation of Two Bis-GMA Based Orthodontic Bonding Adhesives - A Randomized Clinical Trial', Journal of clinical and diagnostic research: JCDR, 11(4), pp. ZC40–ZC44.

[33] Saravanan, S. et al. (2005) 'Prevalence pattern of dental caries in the primary dentition among school children', Indian journal of dental research: official publication of Indian Society for Dental Research, 16(4), pp. 140–146.

[34] Segeur-Serey, K. et al. (2020) 'Prevalence of Malocclusion and Dental Caries Among Aymara Children in Colchane, Chile', International journal of odontostomatology, pp. 191–197. doi: 10.4067/s0718-381x2020000200191.

[35] Shetty, R., Hegde, V. and Shetty, P. J. (2018) 'Assessment of malocclusion status, dentition status, and treatment needs among 15-year-old school children of Mangalore', Indian journal of dental research: official publication of Indian Society for Dental Research, 29(1), pp. 109–116.

[36] Shivakumar, K. M. et al. (2009) 'Prevalence of malocclusion and orthodontic treatment needs among middle and high school children of Davangere city, India by using Dental Aesthetic Index', Journal of Indian Society of Pedodontics and Preventive Dentistry, p. 211. doi: 10.4103/0970-4388.57655.

[37] 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. doi: 10.1186/s40510-016-0117-1.

[38] Sohn, W. et al. (2007) 'Determinants of dental care visits among low-income African-American children', Journal of the American Dental Association , 138(3), pp. 309–18; quiz 395–396, 398.

[39] Tseveenjav, B., Vehkalahti, M. and Murtomaa, H. (2003) 'Dental health of dentists' children in Mongolia', International Journal of Paediatric Dentistry, pp. 240–245. doi: 10.1046/j.1365-263x.2003.00467.x.

[40] Vikram, N. R. et al. (2017) 'Ball Headed Mini Implant', Journal of clinical and diagnostic research: JCDR, 11(1), pp. ZL02–ZL03.

[41] Villalobos-Rodelo, J. J. et al. (2006) '[Dental caries in schoolchildren aged 6-12 years in Navolato, Sinaloa, México: experience, prevalence, severity and treatment needs]', Biomedica: revista del Instituto Nacional de Salud, 26(2), pp. 224–233.

[42] Viswanath, A. et al. (2015) 'Obstructive sleep apnea: awakening the hidden truth', Nigerian journal of clinical practice, 18(1), pp. 1–7.

TABLES AND GRAPHS

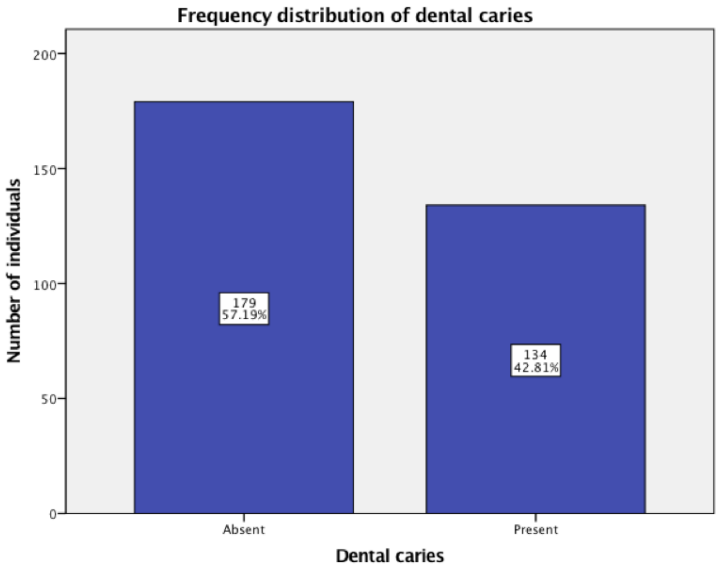

Figure 1: Bar graph showing the frequency distribution of dental caries. X axis represents the presence or absence of dental caries. Y axis represents the number of patients with or without dental caries. Presence of dental caries is seen in some of the children with malocclusion (42.49%) while most of them are not affected by dental caries (57.51%).

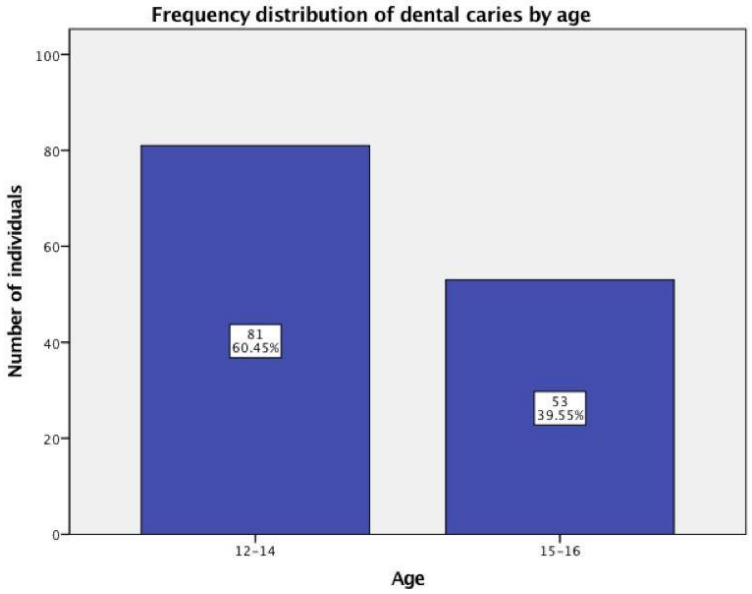

Figure 2: Bar graph showing the frequency distribution of dental caries by age. X axis represents the age groups. Y axis represents the number of patients in each age group. Prevalence of dental caries is mainly seen in children within the 12-14 years age group (60.42%), followed by those in the 15-16 years age group (39.55%).

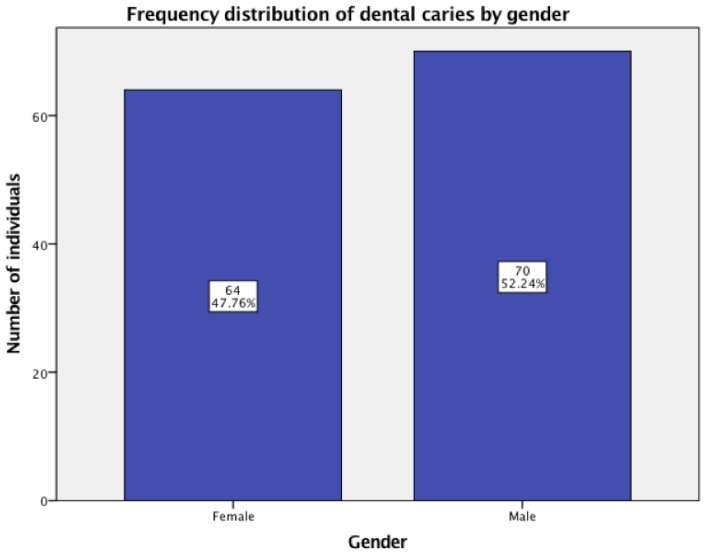

Figure 3: Bar graph showing the frequency distribution of dental caries by genders. X axis represents genders. Y axis represents the number of patients of each gender. Males (52.24%) are more affected by dental caries as compared to females (47.76%).

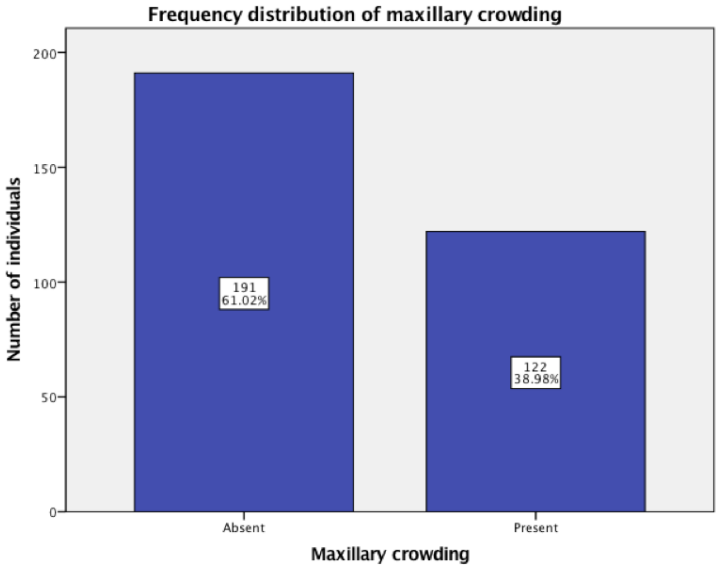

Figure 4: Bar graph showing the frequency distribution of maxillary crowding. X axis represents the presence or absence of maxillary crowding. Y axis represents the number of patients with or without maxillary crowding. Most of the children in this study do not have maxillary crowding (61.02%) and only a small portion of them are present with maxillary crowding (38.98%).

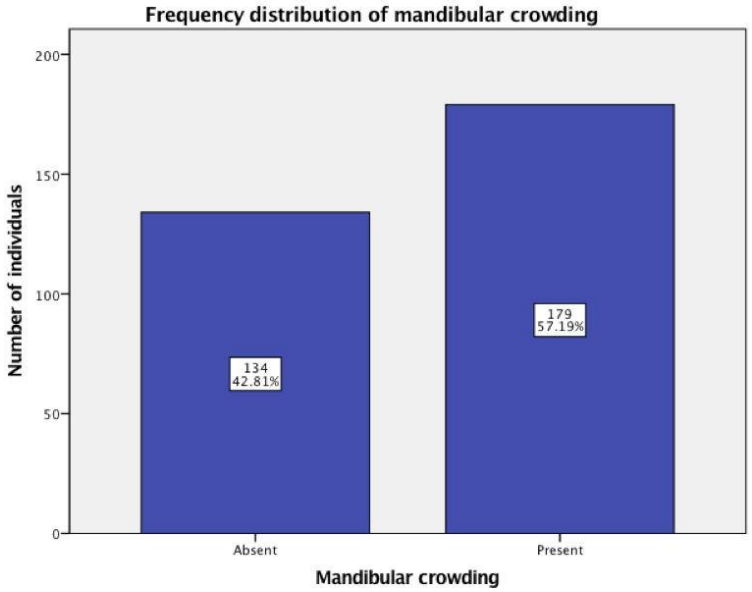

Figure 5: Bar graph showing the frequency distribution of mandibular crowding. X axis represents the presence or absence of mandibular crowding. Y axis represents the number of patients with or without mandibular crowding. Most of the children are present with mandibular crowding (57.19%) while the others are not affected by it (42.81%).

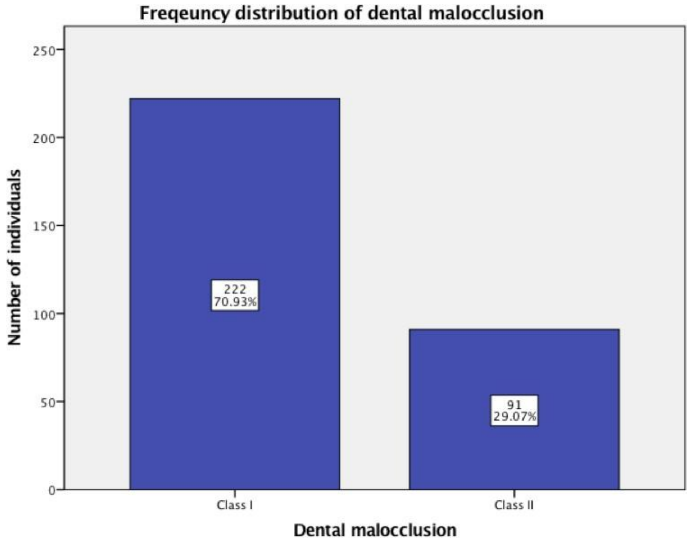

Figure 6: Bar graph showing the frequency distribution of dental malocclusion. X axis represents the types of dental malocclusion. Y axis represents the number of patients of each type of dental malocclusion. Most of the children have Class I malocclusion (70.93%), followed by Class II malocclusion (29.07%).

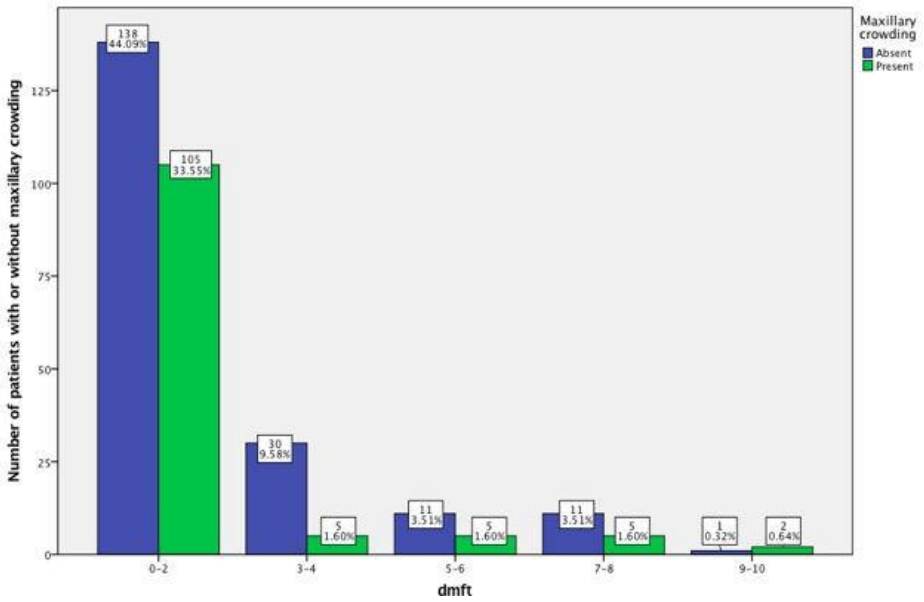

Figure 7: Bar graph showing the association between maxillary crowding and its frequency among different dmft scores. X axis represents the dmft scores. Y axis represents the number of patients with or without maxillary crowding.Chi-square test shows there is a significant association between maxillary crowding and dental caries (Pearson Chi-Square value - 12.572; df= 4; $p = 0.014$; $p<0.05$). Most of the children with maxillary crowding(green) have dmft scores of 0-2 (33.55%).

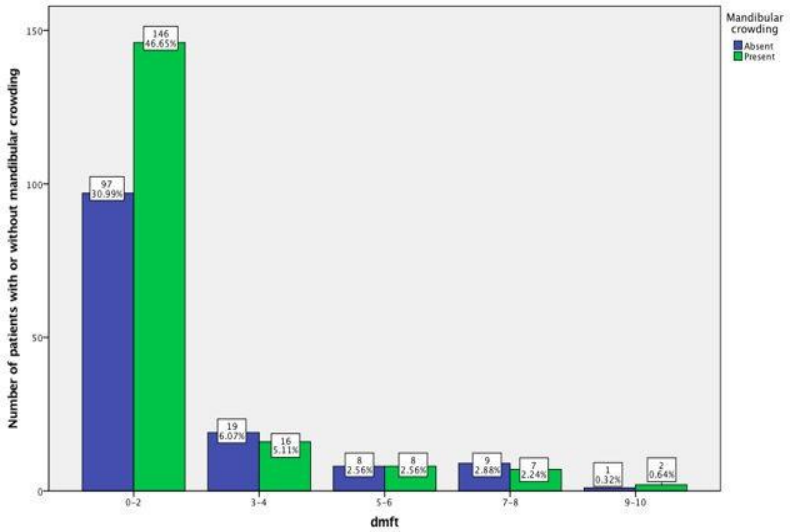

Figure 8: Bar graph showing the association between mandibular crowding and its frequency among different dmft scores. X axis represents the dmft scores. Y axis represents the number of patients with or without mandibular crowding. Chi-square test shows there is no significant association between mandibular crowding and dental caries (Pearson Chi-Square value - 4.341; df= 4; p = 0.362 p>0.05). Most of the children with mandibular crowding(green) have dmft scores of 0-2 (46.65%).

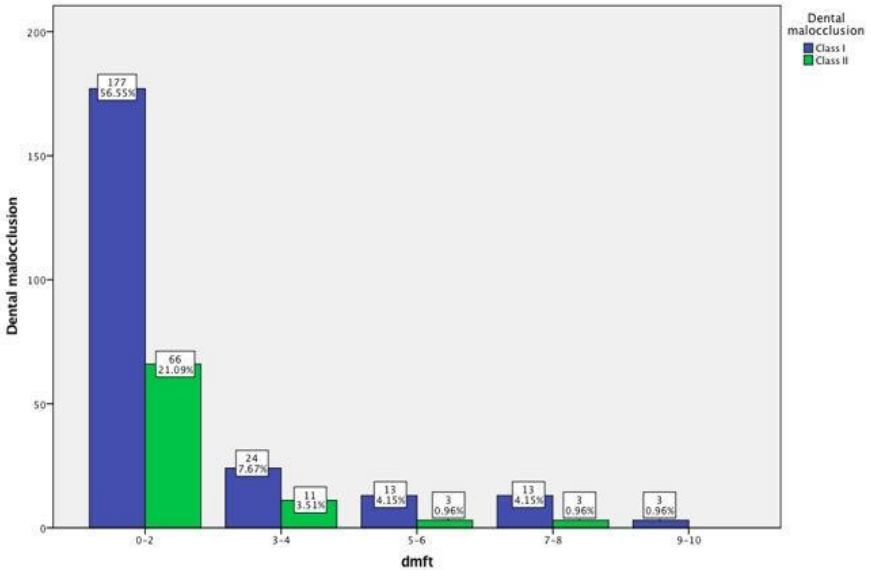

Figure 9: Bar graph showing the association between dental malocclusion and its frequency among different dmft scores. X axis represents the dmft scores. Y axis represents the number of patients with or without dental malocclusion. Chi-square test shows there is no significant association between dental malocclusion and dental caries (Pearson Chi-Square value - 2.558; df= 4; p = 0.634; p>0.05). Most of the patients with Class I malocclusion (56.55%; Blue) and Class II malocclusion (21.09%; Green) have dmft scores of 0-2.