



Prevalence of spacing and crowding in permanent dentition among patients visiting a private dental hospital

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ABSTRACT

Malocclusion can be defined as an occlusion in which there is a mal relationship between the arches in any of the planes or one in which there are anomalies in tooth position beyond the normal limits. The literal meaning of malocclusion is a bad bite. People equate good dental appearance with success in many aspects. With the increasing demand for orthodontic treatment, the epidemiological data of malocclusion is essential in assessing the resources for orthodontic services. To assess the prevalence of spacing and crowding in the permanent dentition of patients visiting a private dental hospital. This study was based on data of patients who reported to the Department of Orthodontics, in a private teaching hospital in Chennai, India which was collected by reviewing patients records and analysing the data of 86000 patients. The data consisted of treatment done for spacing and crowding of permanent teeth in both arches in patients of age 12 to 25 years. Prevalence of crowding (64%) was more common than spacing (36%) indicating that crowding is the most common anomaly in both maxilla and mandible. Both maxilla and mandible showed statistical significance for age and gender. This study reveals that crowding is the most common anomaly in both arches.

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INTRODUCTION

Malocclusion can be defined as one in which there is a mal relationship between the arches in any of

the planes or one in which there are anomalies in tooth position beyond the normal limits. The literal meaning of malocclusion is a bad bite. Malocclusion is not life-threatening (Karaiskos *et al.*, 2005), but it can be considered as a public health problem due to its high prevalence and prevention and treatment possibilities (Marques *et al.*, 2009). Normal teeth alignment contributes not only to oral health but also to the overall well-being and personality of children. Malocclusion and caries are among the most common chronic dental diseases in childhood (Selwitz *et al.*, 2007; Williams *et al.*, 2009). These conditions have increased the demand for orthodontic and restorative treatments in most countries. People equate good dental appearance with success in many aspects. Increased concern for a dental appearance during adolescence to early adulthood

has been observed. With the increasing demand for orthodontic treatment (Dinesh *et al.*, 2013; Krishnan *et al.*, 2018), the epidemiology data on the prevalence of malocclusion is essential in assessing the resources for orthodontic services (Gelgör *et al.*, 2007; Kumar *et al.*, 2011). The prevalence of malocclusion varies between different populations, ethnicities and age groups (Thilander *et al.*, 2001; Samantha, 2017). The variation between the different populations has been noticed, especially in crowding and sagittal, dental arch relationship (Kerosuo *et al.*, 1991). Literature states that, among the malocclusions that exist, crowding is the most common and is a consistent problem in children and adolescents (Helm, 1970; Souames *et al.*, 2006). Spacing was found to be half as common as crowding (Hannuksela, 1977). Helm (1970) and Thilander *et al.* (2001) had divided malocclusion into four classes: 1) Estimate of the total frequency of malocclusion, 2) Typological classification of malocclusion (Angle's malocclusion) 3) Studies focusing on single traits of malocclusion 4) The determinants of malocclusion indices. The focus of this study was on distinguishing the presence or absence of distema, spacing and crowding (Rolling, 1978).

WHO has recommended the Dental Aesthetic Index (DAI) as a method of assessing the dentofacial anomalies. DAI is a cross-cultural index focused on socially defined dental aesthetics (Keay *et al.*, 1993; Jenny and Cons, 1996; Narayan, 2015). Malocclusion prevalence in India varies from 20% to 43 % (Krishnan *et al.*, 2015; Rekhi *et al.*, 2016). Malocclusion has adverse effects on health, and increased prevalence of dental caries and TMJ disorders is also related to malocclusion (Kamisetty, 2015). Malocclusion differs from the country and among different age groups and gender. The prevalence of anomalies depends to a certain extent on exogenous factors such as thumb sucking. The prevalence of malocclusion has been found to vary among different countries (Rubika *et al.*, 2015; Viswanath *et al.*, 2015), ranging from 88.1% in Colombia (Thilander *et al.*, 2001), 62.4% in Saudi Arabia (Al-Emran *et al.*, 1990), 20-35% in the United States (Proffit *et al.*, 1998) and 20-43% in India (Shivakumar *et al.*, 2009) while some studies show that the prevalence in India varies from 11% to 93% (15,16). These significant variations may be due to the difference in registration, ethnicity, social class and age (Felicita *et al.*, 2012; Felicita and Felicita, 2018). However, diagnostic criteria play a key role in determining the prevalence of malocclusion (Jain *et al.*, 2014; Felicita and Felicita, 2017; Vikram *et al.*, 2017). The benefits of taking orthodontic treatment are to prevent tis-

sue damage and correction of aesthetic components and to improve the physical function (Rekhi *et al.*, 2016; Sivamurthy and Sundari, 2016).

It is necessary to carry out epidemiologic studies of malocclusion in different regions and from different geographic areas. Analysis of the prevalence rates of malocclusion in such groups may also contribute to an understanding of the etiology of malocclusion (Helm, 1968; Felicita, 2017). Very few articles assessed the prevalence of malocclusion in permanent dentition among the South Indian population; hence this study was done. Thus the aim of this study was to find the prevalence and incidence of spacing and crowding in permanent dentition of patients visiting a private teaching dental hospital in Chennai, India.

MATERIALS AND METHODS

This was a retrospective study where all the patients' data reported to the Department of Orthodontics in a private teaching dental hospital in Chennai, was collected by reviewing patients records and analysing the data of 86000 patients. This information was collected and compiled for statistical analysis in SPSS software. The data was collected from June 2019 to March 2020 and had a sample size of 6353 (Maxilla = 3003; mandible = 3350), which was cross verified with photographs and reviewing experts. The ethical approval of the current study was obtained from the institutional ethical board (Ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320). Data of treatment done for spacing and crowding in permanent teeth of both maxilla and mandible for patients between age group 12 and 25 years were included in the study. The data of treatment done for other reasons other than spacing crowding and incomplete and censored data were excluded. The data of treatment done for spacing and crowding in both arches was collected from DIAS. Data entry was done in a methodological manner and verified. After the collection of data, it was tabulated in Microsoft Excel and imported to SPSS software for statistical analysis.

RESULTS AND DISCUSSION

The current study shows that Crowding was prevalent in 50.4% of the population and spacing in 49.6% of the population [Figure 1]. While in the mandible, crowding was the most common finding (76%), and spacing was present in only 23.7% of the population [Figure 2]. Chi-square test of age, gender and findings for maxilla and mandible respectively. Chi-square test values of age, gender for maxilla

and mandible were found to be statistically significant ($p=0.00$). Chi-square test values of findings for mandible were found to be statistically significant ($p=0.00$) while it was insignificant for the findings of the maxilla ($p=0.00$). Blue code is for crowding in the maxilla and red code is for spacing in the maxilla. It is evident that crowding is more prevalent in the mandible than spacing.

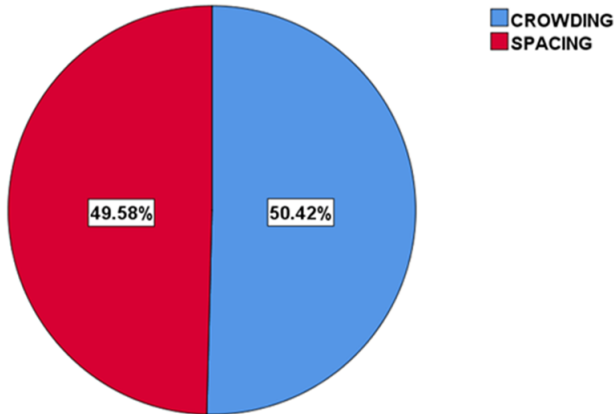


Figure 1: The pie chart depicts the prevalence of crowding and spacing in the permanent dentition on the maxillary arch

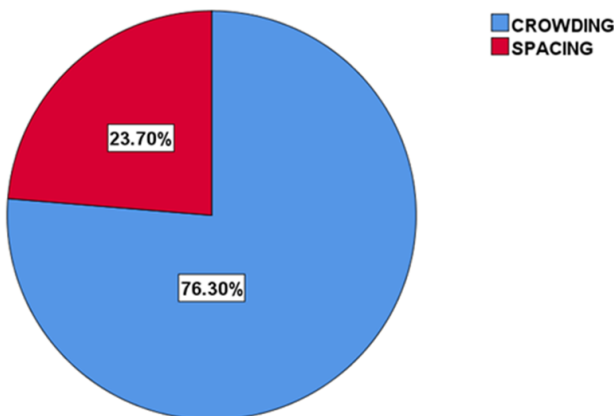


Figure 2: The pie chart depicts the prevalence of crowding and spacing in the permanent dentition on the mandible arch

From Figure 3, The prevalence of crowding in the maxilla where blue code is for males and red code is for females. The age of the patient is plotted along the X-axis and the number of the patients is plotted along the Y-axis. It is evident that crowding in the maxilla was more common among the male of 21 years of age and females of 19 years of age. Chi-square test; $p=0.000$; statistically significant ($p<0.05$).

From Figure 4, The prevalence of spacing in the mandibular arch where blue code is for males and red code is for females. The age of the patients is plotted along the X-axis and the number of the

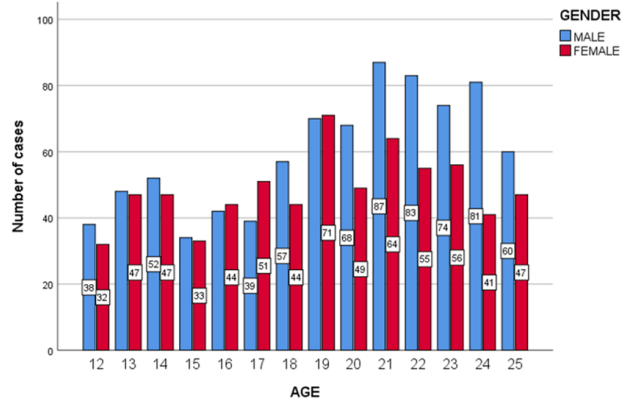


Figure 3: The bar graph shows the association between age, the gender of the patient

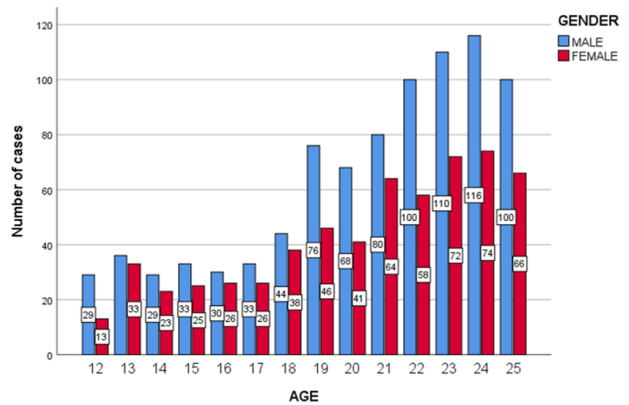


Figure 4: The bar graph shows the association between age, the gender of the patients

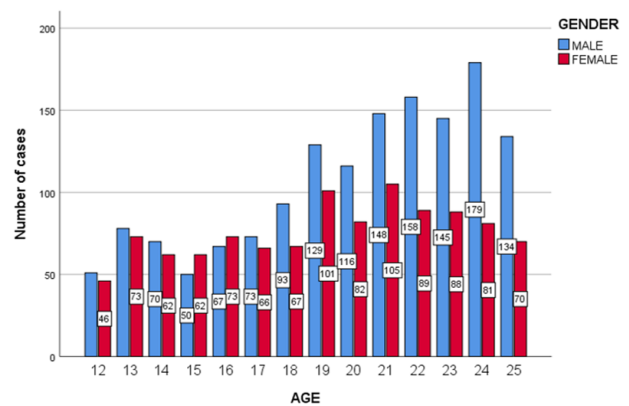


Figure 5: The bar graph shows the association of age, gender of the patients

patients is plotted along the Y-axis. It is evident from the graph that spacing in the maxilla was more common among males and females of 24 years of age. Chi-square test; $p=0.000$; statistically significant ($p<0.05$).

From Figure 5, The prevalence of crowding in the maxillary arch where blue code is for males and red code is for females. The age of the patient is plotted along the X-axis and the number of the patients is plotted along the Y-axis.

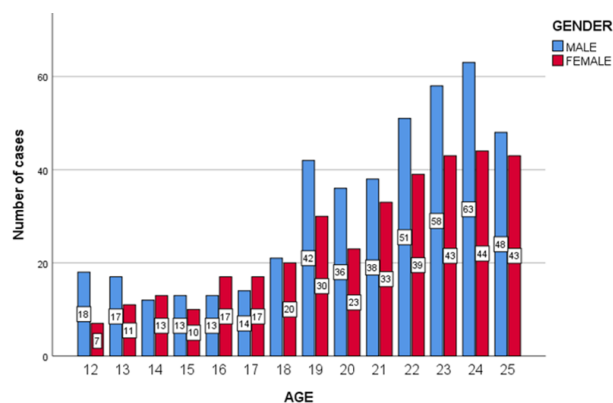


Figure 6: The bar graph shows the association of age and gender

plotted along the Y-axis. It is evident from the graph that crowding in the mandible was more common among males of 24 years of age and females of 21 years of age. Chi-square test ; $p=0.000$; statistically significant ($p<0.05$).

From Figure 6, The prevalence of spacing in the maxillary arch where blue code is for males and red code is for females. The age of the patient is plotted along the X-axis and the number of the patients is plotted along the Y-axis. It is evident that spacing in the mandible was more common among males and females of 24 years of age. Chi-square test; $p=0.000$; statistically significant ($p<0.05$).

Malocclusion affects a large portion of the population and hence known as a Public Health Problem. As in other phases of public health work, it is essential to have adequate information about the prevalence and incidence of malocclusion. From Figure 1, it is evident that crowding (1514 cases) was found to be more prevalent in the maxillary arch than spacing (1489 cases). Blue code is for crowding in the maxilla and red code is for spacing in the maxilla. It is evident that crowding is more prevalent than spacing in the maxillary arch. Crowding was prevalent in 50.4% of the population and spacing in 49.6% of the population.

A study conducted by [Mugonzibwa et al. \(2008\)](#) showed contradictory results stating that spacing is the most common anomaly in the maxilla ([Mugonzibwa et al., 2008](#)). From Figure 2 it is evident in the mandible, crowding was the most common anomaly than spacing. The mandibular crowding in adults can be explained as a result of the change in the distance between the lower canines, although some retainers bonded to the canines may, eventually, be seen with crowding of the incisors. Crowding was reported in 2556 cases constituting 76.3% of the population of the study. Spacing was found to be prevalent in only 23.7% of the population. Similar

results were obtained by [Mugonzibwa et al. \(2008\)](#) but the study conducted by [Vibhute et al. \(2013\)](#), showed contradictory results ([Vibhute et al., 2013](#)). Figure 3 and Figure 4 shows the correlation of age, gender and findings of the patient in the maxillary arch [Figure 3, Figure 4]. The age and gender of the patients under study are statistically significant in the maxillary arch ($p=0.00$). Figure 5 and Figure 6 shows the correlation of age, gender and findings of the patient in the mandibular arch [Figure 5, Figure 6]. The age, gender and findings of the patients under study are statistically significant in the mandible ($p=0.00$). [Vibhute's](#) study shows no statistical significance between different genders. From this study, it is found that crowding is the most frequent anomaly in the upper and lower dental arches (64%). Crowding can be caused by early or late loss of primary teeth, the improper eruption of teeth, or a genetic imbalance between jaw and tooth size. This is in agreement with the study conducted by [Sayin and Türkkahraman \(2004\)](#); [Gelgör et al. \(2007\)](#).

The study was geographically limited and predominantly consisted of the South Indian population. Data which were unclear were excluded, thereby reducing the sample size. Within the limit of the study, it was found that crowding is the most common type of malocclusion and is more prevalent in the mandibular arch. Studying a larger population with people from different ethnicities would give better results. Establishing the proper diagnosis is an absolute prerequisite for the effective treatment of the underlying disease in DG patients. Thus this knowledge of the prevalence of DG and correlation with various parameters is essential for a dentist for clinical implementation.

CONCLUSION

The execution of epidemiologic studies and dissemination of data such as that of the present study seeks to advocate the need to include orthodontics in public dental services. Distribution of various types of malocclusion may greatly vary in a population of different origin and ethnicity. Thus greater population size with patients from different demographic areas will yield better results. This study provides information on the prevalence of spacing and crowding in permanent teeth of patients of age 12 to 25 years who visited a private teaching dental hospital in Chennai. Within the limits of the study, it is evident that crowding is the most common anomaly and is more prevalent in the mandible. The prevalence of malocclusion is very important in determining and planning an appropriate level of orthodontic service.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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