

ASSESSMENT OF SEVERITY OF MANDIBULAR INCISOR CROWDING AMONG LATE MIXED DENTITION SUBJECTS

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ABSTRACT

Dental crowding is defined as a disparity in the relationship between tooth size and jaw size that results in imbrications and rotation of teeth. The causes of mandibular anterior crowding are multifactorial in nature. There are various associated factors that can cause mandibular incisor crowding, mainly mandibular growth, early loss of deciduous molars, incisor and molar inclination along with musculature of oral cavity. The aim of this study was to investigate the prevalence and severity of dental arch crowding among late mixed dentition patients in the subjects visiting a university hospital. About 134 cases were reviewed, which consisted of 60 female patients and 74 male patients. They were divided into two age groups which were, 9-10 years and 11-13 years. For each patient, their dental status and photographs were reviewed and cross verified by two examiners. The severity of mandibular incisor crowding was classified based on the number of teeth involved through observations of photographs of the lower arch. Then, the collected data were recorded in and tabulated. Based upon the severity of mandibular incisor crowding, mild stage (43.37%) of crowding of mandibular incisor was the most prevalent, followed by moderate (28.44%) and severe (28.44%). The results from this study showed male patients (55.2%) had more prevalence towards mandibular incisor crowding in comparison to female patients (44.8%). There was a non statistically significant correlation of severity of crowding with gender (chi square test, $p=0.069$) and age group (chi square test, $p=0.756$). The age group of 11-13 years old (58.2%) was more affected than the age group of 9-10 years (41.8%). Within the limits of study, mild crowding of mandibular incisors was most prevalent, followed by moderate and severe. The present study also showed male patients had more prevalence towards mandibular incisor crowding in comparison to female patients. The age group of 11-13 years old was more affected than the age group of 9-10 years.

Keywords: Dental crowding, Incisor crowding, Mandibular crowding, Mixed dentitions

INTRODUCTION

Dentition is very important to human beings as well as animals. In humans, they are not only used for eating, but also they help in speech and also affect the appearance of an individual. Hence, any malocclusions or abnormalities seen on dentitions, especially anterior teeth should be diagnosed and treated early as possible as they have their own functional and aesthetics value. Anterior teeth crowding is

one of the common chief complaints of most people, when they visit orthodontists. In fact, crowding is also considered as the most prevalent form of malocclusion. However, mild crowding of mandibular incisors has been accepted by most researchers as a normal phenomenon that occurs during developmental stages (Sayin and Türkkahraman, 2004). Thus, they should be treated through orthodontic treatment as it allows teeth to move through the alveolar bone when adequate forces are delivered (Kamisetty *et al.*, 2015; Krishnan, Pandian and Kumar S, 2015; Felicita, 2017b; Vikram *et al.*, 2017) to correct dental crowding.

Dental crowding is defined as a disparity in the relationship between tooth size and jaw size that results in imbrications and rotation of teeth (Al-Sehaibany, 2011). It is a clinical problem that causes changes in the aesthetics, function and health of the dentition (Jain, Kumar and Manjula, 2014; Felicita, 2018). In general, crowding is defined as the deficiency of tooth size arch length which results in limited space available for eruption of permanent dentition. Mandibular incisor crowding is more common to be seen in people in comparison to maxillary anterior crowding. Mandibular incisor crowding can be identified, when crowding of more than 1.6 mm is seen. In normal conditions, there will be 1.6 mm space available for eruption of mandibular incisors into a perfect alignment. However in a slight crowding conditions, it can be treated with slight increase in intercanine width, labial positioning of the permanent incisors relative to the primary incisors, and slight backward movement of the canines into the pri-mate space (Sayin and Türkkahraman, 2004; Al-Sehaibany, 2011).

Mandibular anterior crowding are multifactorial in nature. There are various associated factors that can cause mandibular incisor crowding, mainly mandibular growth, early loss of deciduous molars, incisor and molar inclination along with musculature of oral cavity (Singh *et al.*, 2019). The changes in alignment of lower arch can be noticeable during early mixed dentition in the age of 8 and 12 years old. The crowding can progress to severe state after the eruption of second permanent molars (Richardson and Gormley, 1998). On top of that, lack of space in the arch also may cause partial eruption of teeth (Felicita, 2017a) and results in dental crowding. In addition to this, arch length also can affect the mandibular incisor crowding. Arch length during adolescent period will be smaller compared to during children period. This can be explained with the growth rate of the child as well as closure of available leeway space.

In a study reported by Richardson M. E. *et al.*, crowding was commonly seen in children less than nine years old, but the findings were contradictory to study by Margaret *et al.* where crowding was also seen in the age of above 18 years old (Richardson and Gormley, 1998; Quinzi *et al.*, 2020). Since there were no intermediate diagnoses recorded in previous studies, crowding of the anterior teeth cannot be proven to develop during early mixed dentitions or continue to occur during later age. Next, based on gender predilection, it was reported by Xin Yu *et al.* and Aikins EA *et al.*, that higher incisor crowding was seen more in females compared to male (Aikins *et al.*, 2011; Yu *et al.*, 2019). This is due to growth spurt that occurs early in females rather than male. Therefore, more crowding is seen in females during mixed dentition states.

Hence, this study is important to help in promoting awareness of people on mandibular incisor crowding during mixed dentitions stage. Early diagnosis and interventions of these problems will provide a better and accurate outcome and prognosis (Viswanath *et al.*, 2015) by using computer simulation and modeling technologies (Sivamurthy and Sundari, 2016) as well as long term follow up (Samantha *et al.*, 2017). Radiographic cephalometry also can be used to identify areas of specific deviation, as well as describe the spatial relationship between various parts of the craniofacial structures (Felicita, Shanthasundari and Chandrasekar, 2012). This will help to identify the severity of dental crowding and treat it to fulfil the requirements of treatment efficiency (Dinesh and Saravana Dinesh, 2013). However, the limitations of this study was that there was lack of similar studies done based on Chennai population. Thus, it is difficult to analyse and compare the findings obtained from this study.

Therefore, the aim of this study was to investigate the prevalence and severity of dental arch crowding among late mixed dentition patients in the Chennai population.

MATERIALS AND METHOD

The study was done under university settings. Approval for the study was obtained from the Institutional Ethics Committee with the following ethical approval number SDC/SIHES/2020/DIASDATA/0619-0320. Written consent was obtained from all the participants's parents or their legal guardians. The advantages of this study was it was online based where data can automatically generated. The disadvantages of this study was researcher bias, as it involved examiners observations on the available photograph of the patients. The study was reviewed by two examiners.

The sampling for the study was done from June 2019 till March 2020, by a simple random sampling method. About 86000 case sheets were reviewed and 134 cases were extracted, which consisted of 60 female patients and 74 male patients. They were divided into two age groups which were, 9-10 years and 11-13 years. Measure that be taken to minimise sampling bias, was by focusing on incisor crowding in mandibular arch. The inclusion criteria for this study were incisor crowding of mandibular arch that occur during mixed dentition stage involving Indian population. Whereas, exclusion criteria for this study were permanent dentition (complete) and crowding involving the maxillary arch.

Data collection was done through selection and review of patients dental records. For each patient, their dental status and photographs were reviewed and cross verified by two examiners. The severity of mandibular incisor crowding was classified based on the number of teeth involved through observations of photographs of the lower arch. In the mild stage of crowding, it involved less than one tooth, moderate stage involved two teeth and severe stage involved more than three teeth.

Then, the collected data was recorded in MS excel sheet and tabulated. IBM SPSS version 23 was used for importing data. The descriptive statistic test and Chi square test were used to check the correlation and association of prevalence and severity of mandibular incisor crowding among mixed dentitions. Then, variables definition processes were done by using table and graphical illustrations. Any incomplete data in this study, will be eliminated.

RESULTS AND DISCUSSION

Based on Figure 1, it showed distribution of mandibular incisor crowding among genders. Out of 134 patients, 60 (44.8%) were female and 74 (55.2%) were male. Gender predilection of mandibular incisor crowding was seen more in male. The patients have had an age range of 9-13 years with mean age of 11.2. Next, Figure 2, showed distribution of mandibular incisor crowding among age group. Age group of 11-13 years (58.2%) was more affected with mandibular incisor crowding in comparison to the age group of 9-10 years (41.8%).

Figure 3 demonstrated the prevalence of severity of mandibular incisor crowding. Mild stage (43.3%) of mandibular incisor crowding was the most prevalent followed by moderate (28.4%) and severe stages (28.4%).

The present study showed that mild crowding of mandibular incisors was the most prevalence, followed by moderate and severe crowding. The findings of this study were supported by studies done by Tausche et al, Sayin M O et al (Tausche, 2004; Turkkahraman, Eliacik and Findik, 2016). However, findings in a study reported by González AMG et al, was contradictory with present study findings. He stated that the most common type of crowding was severe. The possible reasons may be due to the amount of space deficit in lower dental arch (Tokarevich and Rublevsky, 2014), growth pattern and also arch length.

Figure 4 showed the association of gender and severity of mandibular incisor crowding. In females, severe stage (n=23) was more prevalent than mild (n=22) and moderate stages (n=15). Whereas in male patients,

mild stage (n=36) was the most prevalent followed in descending order by moderate (n=23) and severe (n=15). The association of gender and severity of crowding was seen to be statistically not significant (Chi Square Test, P = 0.069).

Next, the prevalence of mandibular incisors crowding in males (55.2%) in the study was higher than that of females (44.8%). However, the difference was not significant. This statement coincides with the study reported by Fares AL- Sehaibany et al and βXin Yu et al, although both studies showed significant relation of mandibular incisor crowding and gender (Al-Sehaibany, 2011; Yu *et al.*, 2019). Contrary to the present result, González AMG et al showed female predominance in mandibular incisor crowding (González Amaral and Rodríguez López, 2018). This can be explained due to fewer numbers of samples in present study, associative habits and different growth spurt between male and female individuals. Along with differences in skeletal maturity and/or eruption of permanent teeth of both genders (Yu *et al.*, 2019). Social acceptance, psychological well-being, and self-esteem of an individual are also one of the primary reasons for patients to seek orthodontic treatment is to make their facial appearance more esthetic and pleasing (Krishnan, Pandian and Kumar, 2018).

Based on Figure 5, it showed the association of age group and severity of mandibular incisor crowding. In the age group of 8-10 years, mild stage (n=23) was more prevalent than severe (n=17) and moderate (n=14). While in the age group of 11-13 years, mild stage (n=33) was most prevalent followed by moderate (n=24) and severe (n=21). According to the results obtained, both age groups showed prevalence of mandibular incisor crowding was seen in mild stage. However the results obtained showed no statistical correlation (Chi Square Test, P = 0.756).

The prevalence of mandibular incisor crowding in different age groups provides valuable information about the type of severity and treatment strategies. In the present study, the age group of 11-13 years old (58.2%) was more affected than the age group of 8-10 years (41.8%). Unfortunately there was no statistical significance correlation between severity of crowding and age group, which is consistent with study findings by Xin Yu et al, but contrary to other studies by Fares AL- Sehaibany.et al and Tausche et al (Tausche, 2004; Al-Sehaibany, 2011; Yu *et al.*, 2019). Onyeaso et al, have shown a positive correlation for the crowding in between the primary dentition and the early mixed dentition (Onyeaso and Isiekwe, 2008). This can be correlated with low incidence of crowding to be seen in permanent dentition but more in mixed dentitions (Bhayya *et al.*, 2012).

The limitation of this study was smaller sample size when compared to other reported studies. Thus, the results obtained showed negative correlations. The associative oral habits and patients family history also should be recorded to understand the prevalence of mandibular incisor crowding better. A model cast and standard measurement is required, in order to prevent examiner bias. The future scope of this study is to have a bigger sample size with proper orthodontic diagnosis. Advanced technology like CBCT , lateral cephalometric radiograph and digital measurement should be used (Kumar *et al.*, 2011; Rubika, Sumathi Felicita and Sivambiga, 2015), in order to provide better diagnosis and treatment planning for the patients

CONCLUSIONS

Within the limitations of study, mild crowding of mandibular incisors was most commonly prevalent in the age group of 9 to 13 years in the Chennai based population. Prevalence of mild crowding was followed by moderate and severe in mandibular incisors. This finding was more prevalent among male children than in female children. The age group of 11-13 years old was more affected than the age group of 9-10 years.

AUTHORS CONTRIBUTION

All authors have equal contribution in bringing out this research work.

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CONFLICT OF INTEREST

There were no conflicts of interest as declared by authors.

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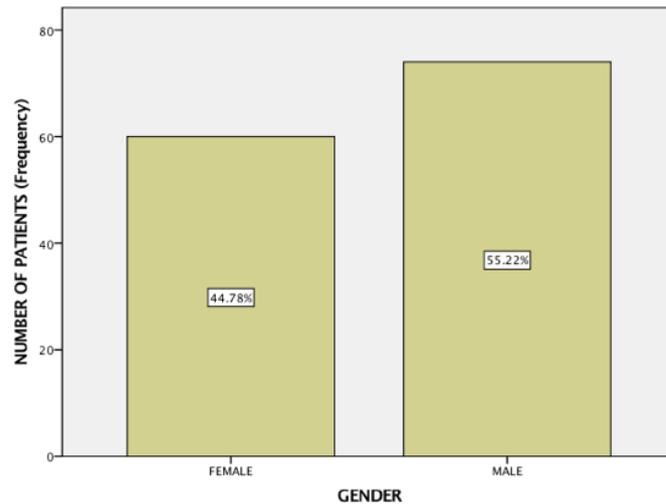


FIGURE 1: Bar graph represents the distribution of mandibular incisor crowding among genders. X-axis represents gender and Y-axis represents number of patients with mandibular incisor crowding. Mandibular incisor crowding was more prevalent in male than female.

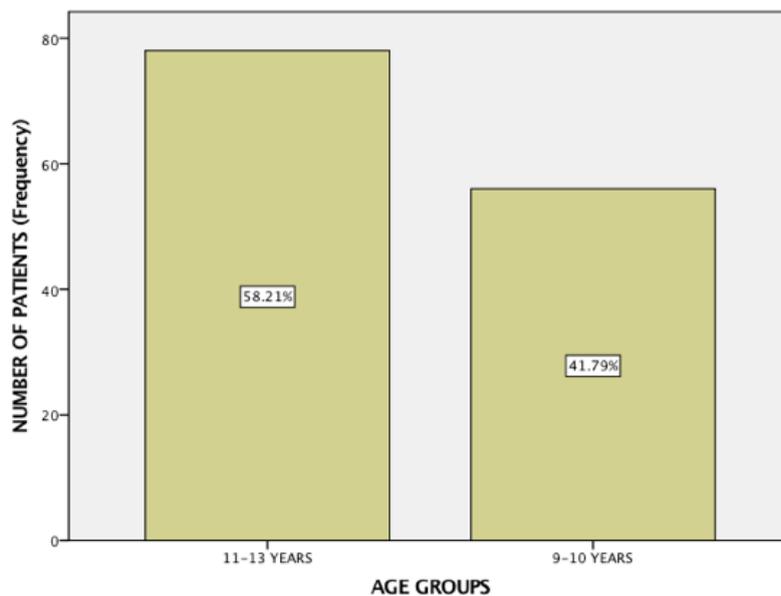


FIGURE 2: Bar graph represents the age distribution of patients with mandibular incisor crowding. X-axis represents age groups and Y-axis represents the number of patients with mandibular incisor crowding. The age group of 11-13 years old was more affected than the age group of 9-10 years.

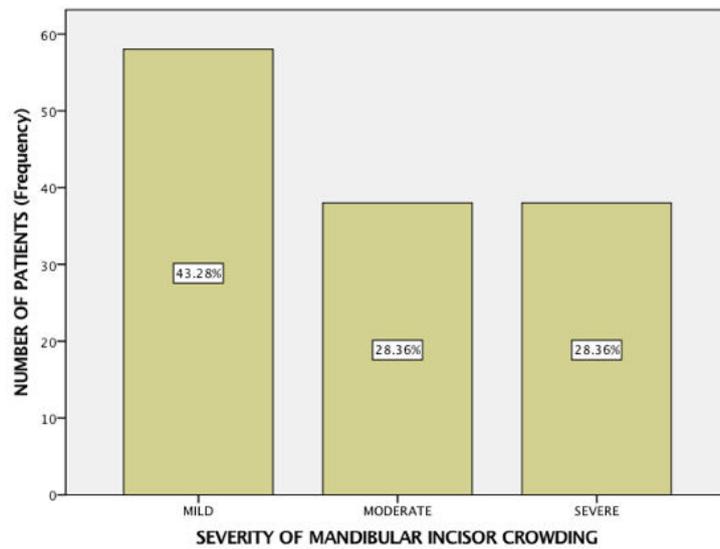


FIGURE 3: Bar graph represents the prevalence of severity of mandibular incisor crowding. X-axis represents severity of mandibular incisor crowding and Y-axis represents number of patients. Mild crowding of mandibular incisors was most prevalent, followed by moderate and severe.

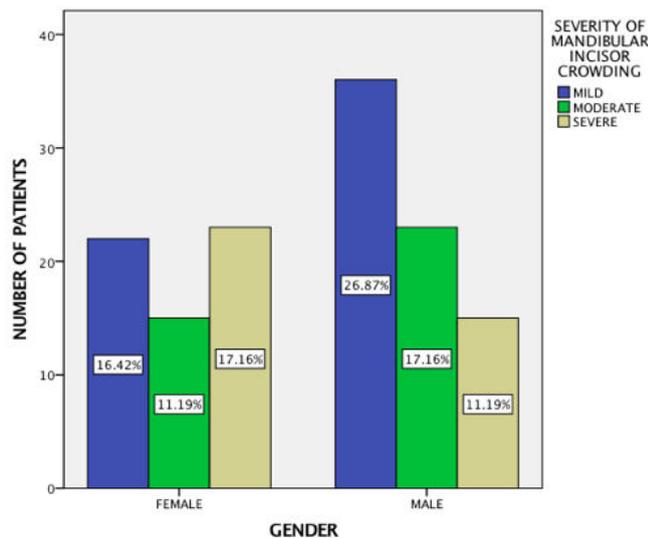


FIGURE 4: Shows association of genders and severity of mandibular incisor crowding. X-axis represents gender and Y-axis represents the number of patients. Prevalence of crowding was more common among male. Mild incisor crowding (Blue) commonly seen in male. Chi square test was done and association was found to be not statistically significant. Pearson's Chi-square value: 5.343, DF:2, p value: 0.069 (>0.05). Hence, gender did not influence the severity of mandibular incisor crowding.

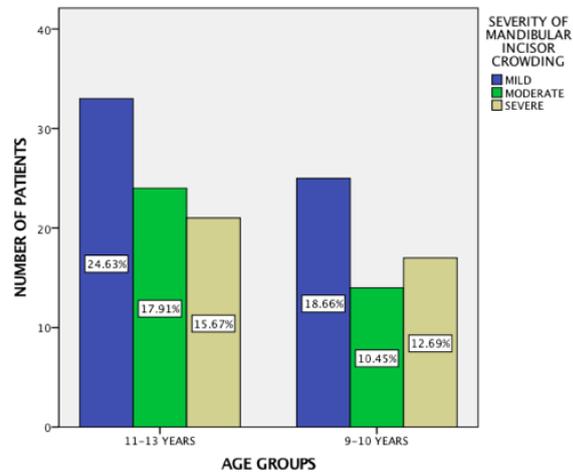


FIGURE 5: Shows association of age group and severity of mandibular incisor crowding. X-axis represents the age groups and Y-axis represents the number of patients. Mandibular incisor crowding more prevalence in 11-13 years age group. Chi square test was done and association was found to be not statistically significant. Pearson's Chi-square value: 0.559, DF:2, p value: 0.756 (>0.05). Hence, age did not influence the severity of mandibular incisor crowding.