

## **Prevalence of Mandibular Incisor Crowding in Early Mixed Dentition Among a group of Egyptian Children Attending Pediatric Dentistry Department, Cairo University / A Cross- Sectional Study**

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### **Abstract**

**Background:** Malocclusion is defined as an irregularity of the teeth or an impaired relationship of the dental arches beyond the range of what is accepted as normal. **Aim of study:** To find out the prevalence of mandibular incisor crowding in early mixed dentition among a group of Egyptian children aged 7-9 years; attending the Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Cairo University. **Subjects and methods:** Children in the age range from 7 to 9 years were recruited from the outpatients' clinic of the Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Cairo University. All the patients at the age range 7-9 years were examined for the evaluation of the presence or absence of mandibular incisor crowding. **Results:** Prevalence of mandibular incisor crowding in the current study sample among the Egyptian children aged 7 to 9 years old was (38.9%). There was no difference in the prevalence of mandibular incisor crowding in both genders. Moderate mandibular incisor crowding (4-7 mm) was the most prevalent form of crowding (35.5%).

**Keywords:** Malocclusion-Crowding-Early mixed dentition.

### **Introduction**

Malocclusion is defined as an irregularity of the teeth or an impaired relationship of the dental arches beyond the range of what is accepted as normal. Although malocclusion is not life-threatening, it can be considered as a public health problem

due to its high prevalence and prevention and treatment possibilities (Karaiskos et al., 2005; Marques et al., 2009; Mtaya et al., 2009). Malocclusions feature the third highest prevalence among oral pathologies, second only to tooth decay and periodontal disease and therefore rank third among world-wide dental public health priorities (Brito et al., 2009).

Anterior crowding is considered the most frequent form of malocclusion in the human dentition and is attributed to a multifactorial etiology. The degree of crowding is the outcome of different, interacting factors with a varying influence both during its primary occurrence and in later life (Staufer and Landmesser, 2004).

The determination of the factors contributing to dental crowding, especially in the early mixed dentition stage, is of great importance for treatment planning. It should also be noted that interceptive orthodontic treatment may be able to reduce the extent of and perhaps also the need for subsequent comprehensive treatment (Al Nimri & Richardson 2000; Primožic et al., 2013). This will allow the regular development of the dental arches which will help to improve the oral health of patients to ensure healthy physical development, healthy psychic state, and for normal development of the permanent dentition of the child (Tausche et al., 2004). In recent years, much attention has been focused on measuring the severity and prevalence of malocclusion and orthodontic treatment need worldwide. Moreover, the importance of oral health related quality of life is particularly relevant for children and adolescents, since younger subjects are more sensitive to a variety of impacts, such as appearance, that may affect their current quality of life and psychological development and ultimately result in influencing their social skills and education (Carmelo et al., 2007).

## Aim of study

Find out the prevalence of mandibular incisor crowding in early mixed dentition

among a group of Egyptian children aged 7-9 years; attending the Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Cairo University.

## Subjects and Methods

**Participants:** Participants were recruited from the outpatients' clinic of the Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Cairo University. All the patients at the age range 7-9 years were examined for the evaluation of the presence or absence of mandibular incisor crowding according to the following criteria:

**Inclusion criteria:** Children in the age range from 7 to 9 years with fully erupted lower permanent incisors, presence of both deciduous lower canines and positive patients' acceptance for participation in the study.

**Exclusion criteria:** Children with congenitally missing mandibular permanent central or lateral incisors, children with loss of tooth dimension of mandibular first and/or second deciduous molars by caries or attrition and children with previous history of interceptive orthodontic approach or orthodontic interference.

**Sample size:** A convenient consecutive sampling method was applied; it included 391 patients of age range 7-9 years, with early mixed dentition, attending Pediatric Dentistry department clinics.

**Ethical approval:** Methodology of this study was primarily revised and approved by the ethical committee of Faculty of Dentistry, Cairo University.

**Consent:** Prior to clinical examination the aim of the study was explained to the parents and only subjects with positive parental acceptance were included in the study.

**Clinical examination:** One single examiner -the researcher- clinically examined all the patients included in the study sample for presence or absence of mandibular incisor crowding. Clinical visual examination was performed in the outpatient clinics of the

Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Cairo University. A detailed coded chart was designed including patients' personal data (name, age, gender, parents' occupation, address and phone number), medical and dental history of the child. Examination was done under daylight using a dental mirror and probe. The general information and the clinical examination findings were recorded and examination took place in the following sequence:

1- Screening: Examined patients were primarily screened based on the inclusion and exclusion criteria determined before the study begins. A total of 391 Egyptian children were included. The children were first examined by visual inspection for presence or absence of crowding in the mandibular incisors area (Johal and Battagal, 1997). Dental crowding was considered to be present in cases that showed slipped contact points of any of the permanent mandibular incisors according to the technique described in Little's Irregularity Index (Little, 1975). Cases that showed spacing in the mandibular incisors area were considered with no dental crowding.

2-Assessment of crowding in the mandibular incisors area was done as follows: For the purpose of quantifying the amount of mandibular incisor crowding, an alginate impression was taken for each patient showing dental crowding using mandibular perforated metal trays and was allowed to set completely. The impression material used was "Cavex Colour ] Change, fast set". After being removed from the mouth, alginate impressions were washed with a water spray, disinfected by 1% sodium hypochlorite, and dried until the shine just disappeared. Each impression was covered with damp cotton pellet and left in a zip-lock plastic bag with patient's name and code written on it until the cast was poured. The procedure of cast fabrication was made on the same day to avoid distortion of the impressions (Ashley, 2005). Later on, the amount of incisors crowding was measured on the dental casts using straightened brass wires and the following measurements were performed on

each mandibular cast as described by Warren and Bishara 2001.

3-Degree of crowding:Furthermore, the dental casts were grouped according to the severity of the condition as described by Šidlauskas and Lopatienė, 2009 as follows: Self-corrected crowding (<2mm), mild crowding (2-4mm), moderate crowding (4-6 mm) and severe crowding (7 mm or more)

## Results

Among the children who were examined to participate in this study, only 391 children met the previously set inclusion criteria, where 197 were females and 194 were males.

### Distribution of subjects by gender

The frequency (n) and percentage (%) of males and females who participated in the study. Among the 391 children, 194 were males (49.6%) and 197 were females (50.4%). The mean age of the participants was 8.23 ( $\pm$  0.80). No statistical significance difference was found between both genders ( $p=0.691$ ).

### Distribution of subjects by age

The frequency (n) and percentage (%) of males and females according to age. The total number of children was 391, with mean age (8.23  $\pm$  0.80). 194 children were males (49.6%) with mean age (8.24  $\pm$  0.79). 48 males (52.2%) were 7 years old, 57 (48.3%) were 8 years old and 91 (50.30%) were 9 years old. Among the 197 (50.4%) females who participated in the study, with mean age (8.21  $\pm$  0.82), 44 (47.8%) were 7 years old, 61 (51.7%) were 8, and 90 (49.7%) were 9 years old. There was no statistical significance difference ( $p=0.691$ ) between gender in age.

### Crowding:

The frequency (n) and percentage (%) of males and females with and without mandibular incisor crowding. The number and percentage of children with crowding and without crowding was 152 (38.9%) and 239 (61.1%) respectively. There was a statistically significant

difference between both groups ( $p \leq 0.001$ ). Among the 194 males who were included, 122 (61.9%) showed no crowding while 75 (38.1%) showed crowding in their teeth with a statistical significance difference ( $p = 0.001$ ). In the females ( $n = 197$ ), 119 (60.4%) showed no crowding while 78 (39.6%) showed crowding in their teeth with a statistical significance difference ( $p = 0.003$ ).

### **The distribution of the crowding by age:**

The frequency (n) and percentage (%) of males and females. The total number of children was 391, with mean age ( $8.23 \pm 0.80$ ). The males were 194 (49.6%) with mean age ( $8.24 \pm 0.79$ ). 48 males (52.2%) were 7 years old, 57 (48.3%) were 8 years old and 91 (50.30%) were 9 years old. Among the 197 (50.4%) females who participated in the study, with mean age ( $8.21 \pm 0.82$ ), 44 (47.8%) were 7 years old, 61 (51.7%) were 8, and 90 (49.7%) were 9 years old.

### **The distribution of the severity of the crowding:**

The number (n) and percentages (%) of children with difference in crowding severity. The number and percentage of children with self-corrected, mild, moderate and severe mandibular incisor crowding were 50 (32.9%), 42 (27.6%), 54 (35.5%) and 6 (3.9%) respectively. There was a statistical significant difference between the four grades of severity ( $p = 0.001$ ).

### **The distribution of the severity of the crowding by gender:**

The number (n) and percentages (%) of males and females with difference in crowding severity. Among the 75 males who showed mandibular incisor crowding, 23 males (31.1%) had self-corrected crowding (0-2mm), 22 (29.7%) had mild crowding, 25 (33.8%) had moderate crowding (4-7mm) and 4 (5.4%) had severe crowding (More than 7mm) with a statistical significance difference ( $p = 0.002$ ).

Moreover, in the 78 females who showed crowding, 27 females (34.6%) had self-corrected crowding (0-2mm), 20 (25.6%) had mild crowding (2-4mm), 29 (37.2%) had moderate crowding (4-7mm) and 2 (2.6%) had severe crowding (More than 7mm) with a statistical significance difference ( $p = 0.001$ ).

## **Discussion**

The large expansion of the concept of interceptive orthodontics highlights the importance of having sufficient data for evaluating the treatment need in each community. In the recent years, many studies all over the world focused on tracing the prevalence and severity of different types of malocclusion and orthodontic treatment need in different populations.

Despite the tremendous amount of literature on the prevalence and severity of different types of malocclusion in general, only few studies investigated dental crowding as a separate entity. The current study was designed to evaluate the prevalence of mandibular incisor crowding together with the assessment of the amount of crowding in early mixed dentition among Egyptian children.

Mandibular incisor crowding in the mixed dentition is one of the most common problems presenting to the orthodontist (Bell and Sonis, 2014). The reason for focusing on dental crowding in the early mixed dentition stage in the present study was to distinguish between young children who will develop future problems of deficiency of space for the mandibular incisors and children who only have temporary problems which will be alleviated by the time of closure of the leeway space.

The present study was carried out in the outpatients' clinic of the Department of Pediatric Dentistry and Dental Public Health, Faculty of Dentistry, Cairo University due to the high rates of flow of children seeking dental treatment which made the sample selection easy. It is a cross-sectional study, which allowed the evaluation of the previously calculated

study sample during a reasonable period of time with the advantage of low risk of loss of study material which may be encountered with longitudinal studies.

Among the Egyptian children; in the age range 7 to 9 years, who were examined in this study, only 391 children met the previously set inclusion criteria. Children who were younger than 7 years and those older than 9 years were excluded from the sample because they were not in the early mixed dentition stage. Moreover, children with incomplete eruption of one or more lower permanent incisors (n= 109), or those with history of previous orthodontic interference or who had space maintainers in their lower arches (n= 13) were excluded from the sample. The presence of untreated proximal decay or attrition in one or more primary molars was also a reason for exclusion of subjects (n= 62). These children were not included in the study because these factors might have a negative effect on the arch length.

Traditionally, TSALD assessment is performed by measurements on dental casts with the aid of either calipers; whether manual or digital, or brass wire and needle pointed dividers. The present study utilized the brass wire and divider method. This method does not present errors for reliability under the same conditions. However, it only presents errors when repeated under different conditions, which was not needed in this study (Machado et al., 2012). In this study, the prevalence of mandibular incisor crowding was found to be 38.9%, which was consistent with those reported by Keski-Nisula et al., 2003 who similarly reported the prevalence of mandibular incisor crowding as 38.9 % in children with early mixed dentition. Likewise, Šidlauskas and Lopatienė, 2009 described the prevalence of crowding in the lower arch with a prevalence of 40.3% which is close to a great extent to our findings. Furthermore, Steinmassl et al., 2017 reported that 31.8% of their study sample showed anterior crowding in the lower jaw, which was close enough to the findings of Da Silva & Gleiser, 2008, who reported a less prevalence of mandibular incisor crowding in

mixed dentition stage of 29%. On the other hand, Tausche et al., 2004 reported prevalence of incisor crowding during the early mixed dentition period as 12%, which was also much less than the findings of the present study.

The higher prevalence shown by the present study might be attributed to several factors, such as the difference in sample size. Also, difference in race and ethnicity might affect the prevalence of crowding as well as the prevalence of caries in the primary dentition among different populations. It is well known that carious lesions if not detected early and restored, might lead to early loss of deciduous molars which is considered as a factor to affect the development and the severity of anterior dental crowding. On the contrary, the results stated by Al-Sehaibany, 2011 revealed a higher prevalence of mandibular incisor crowding in Saudi children in the age group 7-9 years, which was 62.3 %. This higher prevalence might be related to the sample selection from children referred to orthodontic clinics; that are expected to have comparatively higher prevalence of incisors crowding than those included in the current study; who were selected from the outpatients' clinic of the department of pediatric dentistry.

In the current study, no statistical significance difference was found between both genders regarding the prevalence of dental crowding in the lower anterior segment. This was contradictory with the results of Keski-Nisula et al., 2003 and Danaie et al., 2006 who confirmed more frequent mandibular incisor crowding in girls, which was explained by the authors to be a result of the early growth spurt in girls, which is considered a critical element in incisors crowding. The higher prevalence of crowding in girls in both studies might be due to the larger sample size in comparison to that of the current one. In addition, the number boys and girls who participated in this study were almost equal, which might have affected the significance between both genders.

Concerning the severity of mandibular incisor crowding, out of the 152 participants in which crowding was verified in the present

study, 32.9% were categorized as cases with self-corrected crowding, 27.6% with mild crowding, 35.5% with moderate crowding and 3.9% with severe crowding. The findings of the present study were different from those reported by Thailander et al., 2001, whose results showed that 33.2% of subjects with mandibular incisor crowding in the early mixed dentition stage had mild crowding (1-3 mm), 14.9% had moderate crowding (4-6 mm) and only 2.5% had severe crowding (>6 mm). Also, the findings were different from those revealed by Šidlauskas and Lopatienė, 2009, who reported the severity of mandibular incisor crowding as 69.5%, 17.4%, 9.69% and 3.32% respectively. This difference may be due to variation in the distribution of the severity of the condition under investigation, or may be due to difference in the frequencies of dental visits and dental services offered in Egypt than in Columbia and Lithuania, which is an influential factor in the early diagnosis of dental crowding.

Accordingly, based on the current study, mandibular incisor crowding is considered of a relatively high prevalence, which in turn, throws the light on the importance of the early diagnosis of such cases, which will allow an earlier intervention that is more beneficial for patients than a delayed one.

## Conclusions

Under the limitations of the present study the following conclusions could be derived: Prevalence of mandibular incisor crowding in the current study sample among the Egyptian children aged 7 to 9 years old was (38.9%). There was no difference in the prevalence of mandibular incisor crowding in both genders. Moderate mandibular incisor crowding (4-7 mm) was the most prevalent form of crowding (35.5%).

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