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Assessment of Prevalence and Gender Distribution of Hypodontia in Maxillary Dentition

Running title**:** Prevalence and gender distribution of hypodontia of maxillary teeth.

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Abstract:
Congenitally missing teeth or as usually called hypodontia, is a highly prevalent and common developmental dental anomaly where there is congenital absence of one or more teeth. It is the most prevalent dental malformation in humans that could affect and influence the orthodontic diagnosis and treatment planning. Besides an unfavorable appearance, patients with missing teeth may suffer from malocclusion, periodontal damage, insufficient alveolar bone growth, reduced chewing ability, inarticulate pronunciation and other problems.The purpose of this retrospective study was to assess the prevalence and gender distribution of hypodontia in maxillary teeth, excluding the third molars. Orthopantomogram of orthodontic patients above the age group of 14 years were examined for evidence of hypodontia. The casts were used as an additional means of confirming the diagnosis. Retrospective data of patients were collected and those patients who had missing teeth were first segregated. From among those the patients details with congenitally missing teeth were then sorted. 15 patients with congenitally missing teeth excluding third molars were found fulfilling all the inclusion and exclusion criteria. The data was analysed using SPSS statistical software, descriptive and analytical statistics was done with Chi square test. It was observed that hypodontia of maxillary teeth was more predominant in maxillary lateral incisors (n-12;80%)followed by maxillary premolars (n-2;13.4%) and canines(n=1;6.7%).Occurrence of hypodontia was more predominant in females(53.3%) when compared to males (46.7%) ($p>0.05$); hence statistically not significant. Early diagnosis and appropriate management might help in the attainment of ideal occlusion without the need for extensive orthodontic therapy.

Keywords: *Anomaly;Congenitally missing;Hypodontia;maxillary.*

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INTRODUCTION:

Hypodontia, or congenital missing of teeth has been the most common dental anomaly. It is one of the most common dental anomalies.(Altug-Atac and Erdem, 2007; Goya *et al.*, 2008). It may detrimentally affect the aesthetics, patients self confidence and alter the function.(Altug-Atac and Erdem, 2007; Coster *et al.*, 2008; Behr *et al.*, 2011; Amini, Rakhshan and Babaei, 2012) It might negatively affect both the esthetics and function(Afshari, Eslamipour and Najimi, 2018). Esthetics itself is an important factor and its problems might affect patients' self-esteem, communication behavior, professional performance and quality of life.(Meaney *et al.*, 2012) Patients with missing permanent teeth may suffer from complications such as malocclusion, which itself can lead to mastication problems, periodontal damage, lack of alveolar bone growth, reduced chewing ability, inarticulate pronunciation, changes in skeletal relationships and an unfavorable appearance.(Khosravanifard *et al.*, 2011)

Absence of anterior teeth or congenital missing of more than two teeth in the same quadrant may be an indication for the existence of a need for early orthodontic treatment(Polder *et al.*, 2004)(Sisman, Uysal and Gelgor, 2007). Therefore early diagnosis and effective treatment planning is essential in investigating the prevalence of hypodontia(Meza and Silva Meza, 2003)(Tarpey *et al.*, 2007). It is essential to address the scenario at the earliest to prevent complications of hypodontia, including periodontal damage, malocclusion, and lack of alveolar growth.The literature consists of numerous studies on the prevalence of hypodontia (excluding third molars) in the permanent dentition, among different populations reporting prevalence rates of up to 11.3%.(Tarpey *et al.*, 2007; Acev and Gjorgova, 2014)(Goya *et al.*, 2008)

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Most studies report that girls have a higher prevalence of hypodontia than boys. Most previous studies show that the most frequent missing teeth are either the mandibular second premolars or the maxillary lateral incisors, although other studies reported that the mandibular incisor was the most frequently absent tooth in Japanese and Chinese populations, respectively.(Niswander and Sujaku, 1963)

These studies highlight the importance of creating awareness on replacement of missing teeth or orthodontic correction ,numerous high quality articles have been published in this domain over the past 3 years. With this inspiration we planned to pursue research on prevalence and gender distribution in hypodontia of maxillary teeth.(Sivamurthy and Sundari, 2016) (Samantha *et al.*, 2017) (Krishnan, 2015) (Dinesh *et al.*, 2013) (Vikram *et al.*, 2017) (Kamisetty *et al.*, 2015) (Viswanath *et al.*, 2015) (Felicita, 2017b) (Rubika, Sumathi Felicita and Sivambiga, 2015) to intrude the maxillary incisors (Jain, Kumar and Manjula, 2014) (Ramesh Kumar *et al.*, 2011; Samantha, 2017) (Felicita, 2017a)(Felicita, Chandrasekar and Shanthasundari, 2012)(Felicita and Sumathi Felicita, 2018)

Hence, the aim of this retrospective study was to assess the prevalence and gender distribution of hypodontia in maxillary teeth, excluding the third molars.

MATERIALS AND METHODS:

Study design and setting:

The study was conducted after ethical approval was obtained from the institutional review board. (SDC/SIHEC/2020/DIASDATA/0619-0320.) A retrospective study was done to evaluate the prevalence of hypodontia of maxillary teeth in patients who visited Saveetha dental College. The study population included all patients who had missing teeth when was then sorted to cases only with hypodontia of maxillary teeth. The advantage of this study was the flexible data that could be obtained. However the drawback of this study is that there were geographic limitations and the people involved in the study were from an isolated population and belonged to the same ethnic group. The internal validity of the study was carried out by analysing the gender and missing teeth due to other reasons The external validity was determined by hypodontia of maxillary teeth.

Inclusion and Exclusion criteria:

Patients in permanent dentition stage(14 years and above) who had missing teeth either due to hypodontia or any other reasons were involved in the study. The exclusion criteria was any incomplete data without proper records and those who did not have missing teeth and completely edentulous patients.

Data collection

About 86,000 patient records were reviewed and analysed between June 2019 -March 2020 and 24,044 samples were included in the study. All available data was included in the study to minimise sampling bias. Patients of all age groups were involved in the study. Collected data was cross verified using case sheets, casts and photographs. Data collected was completed and it was tabulated in microsoft excel.

Statistical Analysis

After tabulation using MS Excel, the data was exported to IBM SPSS software [Version 19: IBMCorporation NY USA] for statistical analysis. Descriptive statistics was done to assess the prevalence of hypodontia of maxillary teeth. Pearson chi square test was done to statistically analyze the data. Pearson chi square test was used to identify gender association; the significance level was set at 0.05.

RESULTS AND DISCUSSION :

It was observed that the prevalence of congenital missing teeth was much lesser about (0.1%) when compared to that of missing teeth due to any other reasons.(Figure 1)

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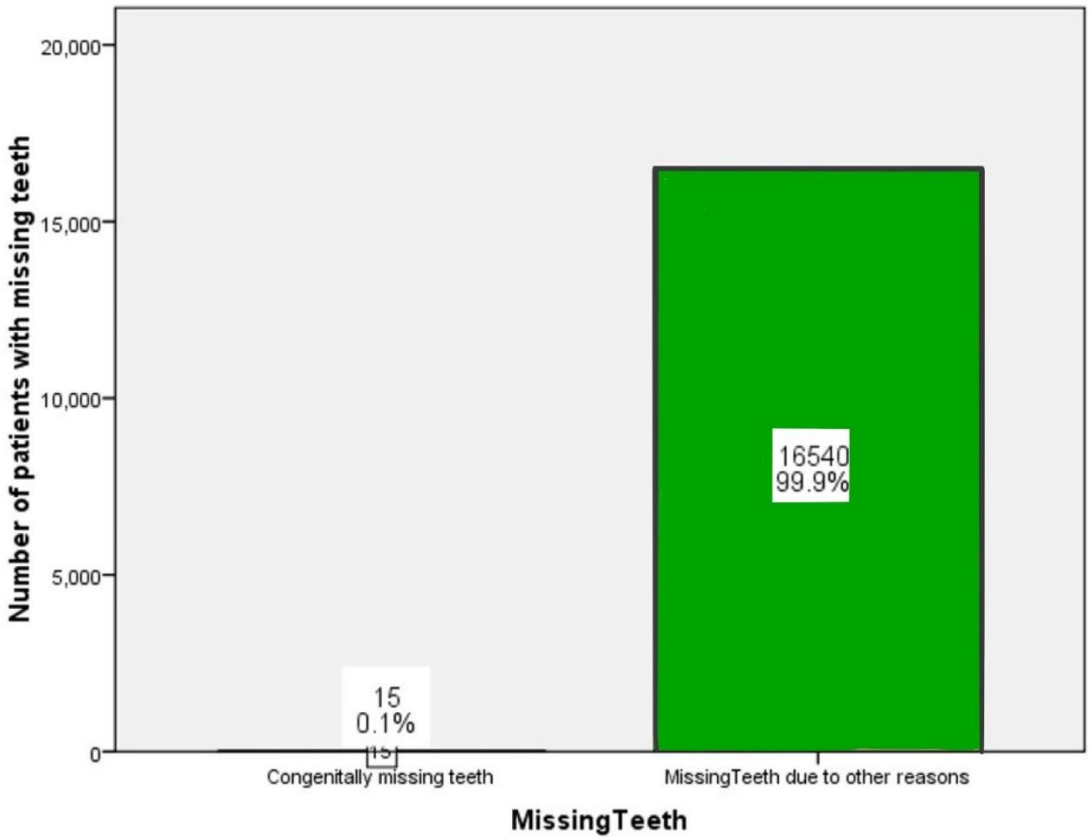

Figure 1: Bar graph depicts the frequency distribution of missing teeth which is congenitally missing teeth and missing teeth due to other reasons. It was observed that congenital missing teeth was less when compared to that of missing teeth due to other reason(Green)

Also in the present study occurrence was higher in the females(n=8;53.3%) when compared to that of males.(n=7;46.7%) (Figure 2)

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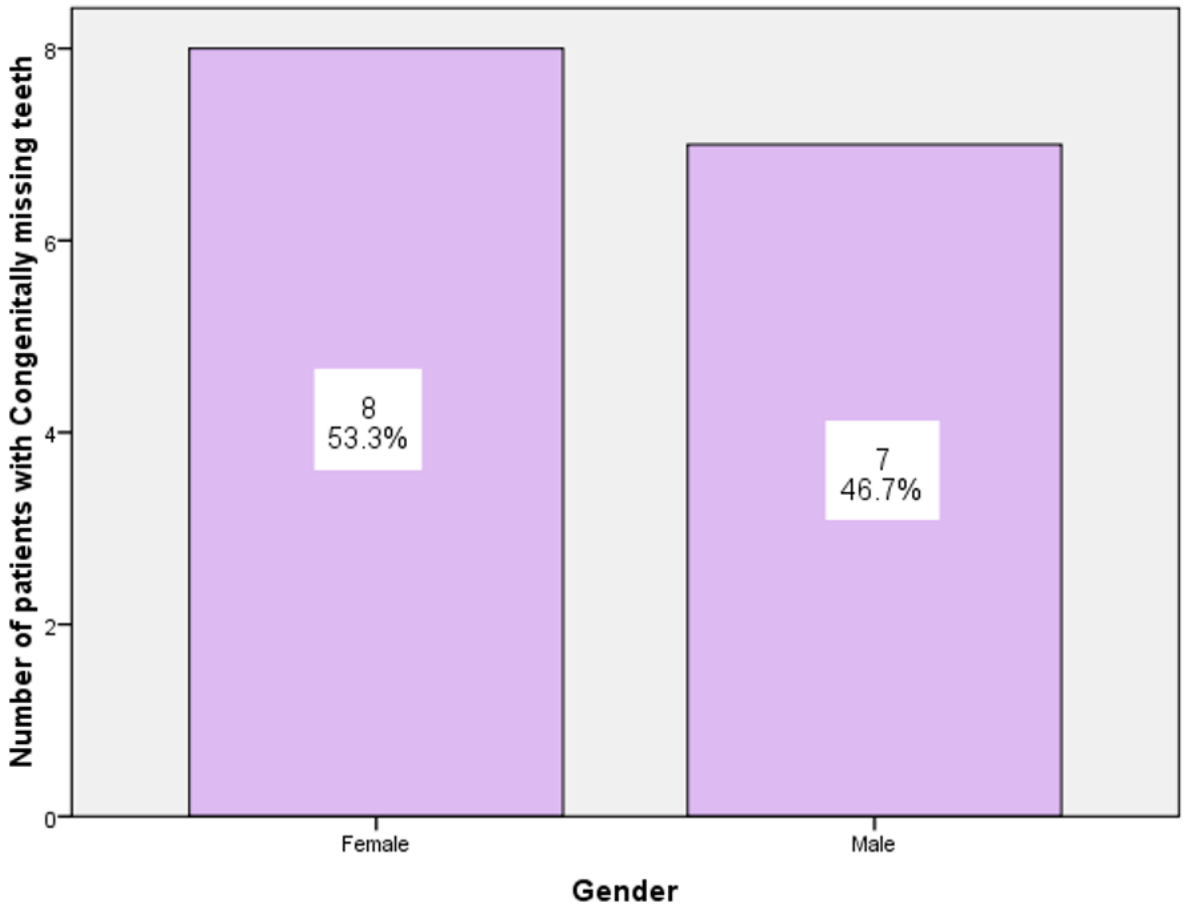

Figure 2: Bar chart depicts the frequency distribution of gender in congenitally missing teeth. It was observed that it was more predominant in the females when compared to that of males.

Among the congenitally missing teeth, mostly noted was maxillary lateral incisors(12 (n=8;53.3%) and 22(n=4;26.7%).(Figure 3)

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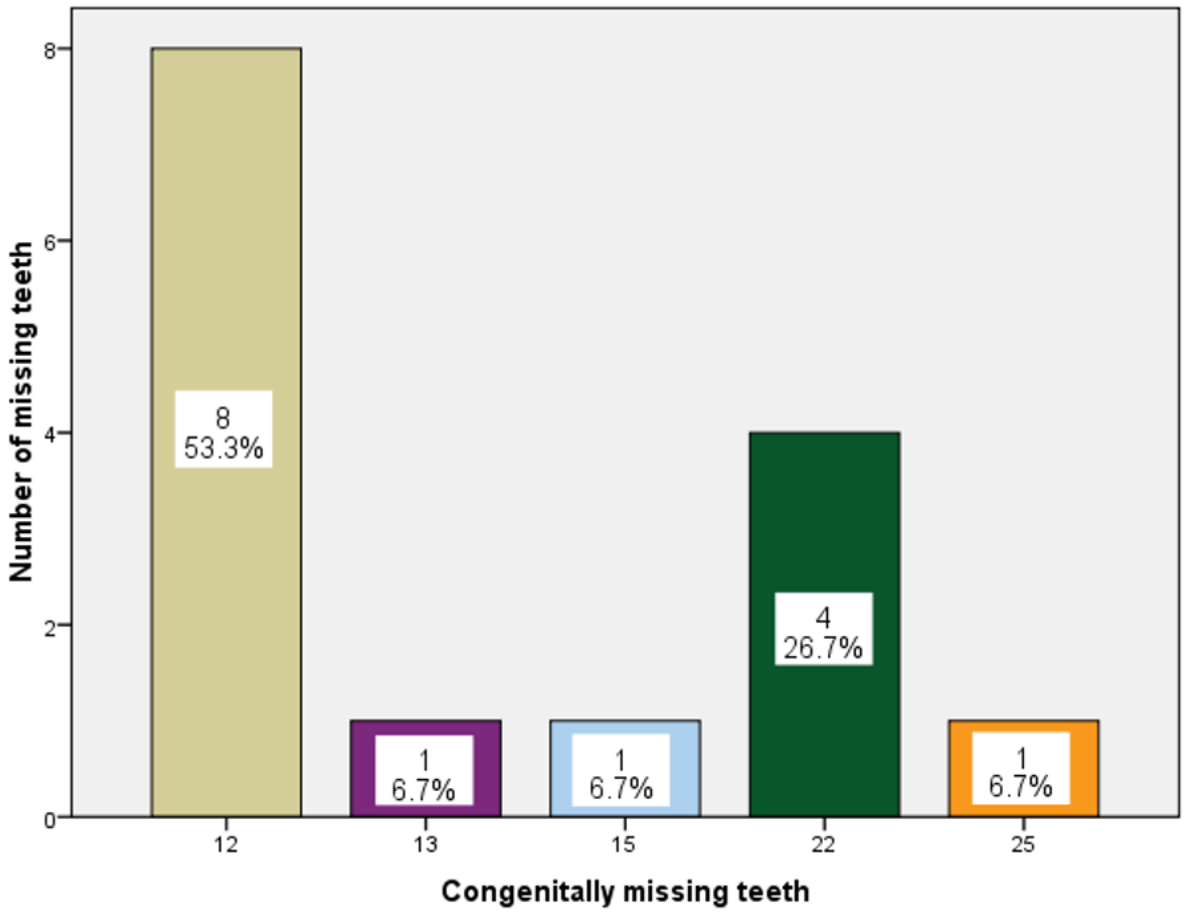

Figure 3: Bar chart depicts the frequency distribution of in congenitally missing Among the congenitally missing teeth, mostly noted was maxillary lateral incisors(12 and 22).

It was observed that congenitally missing teeth, tooth number 12 was predominantly missing in both the genders; male(green) and in females(blue). Pearson's Chi square value = 2.946; df =4; p-value: 0.567 ($p>0.05$); hence statistically not significant.(Figure 4)

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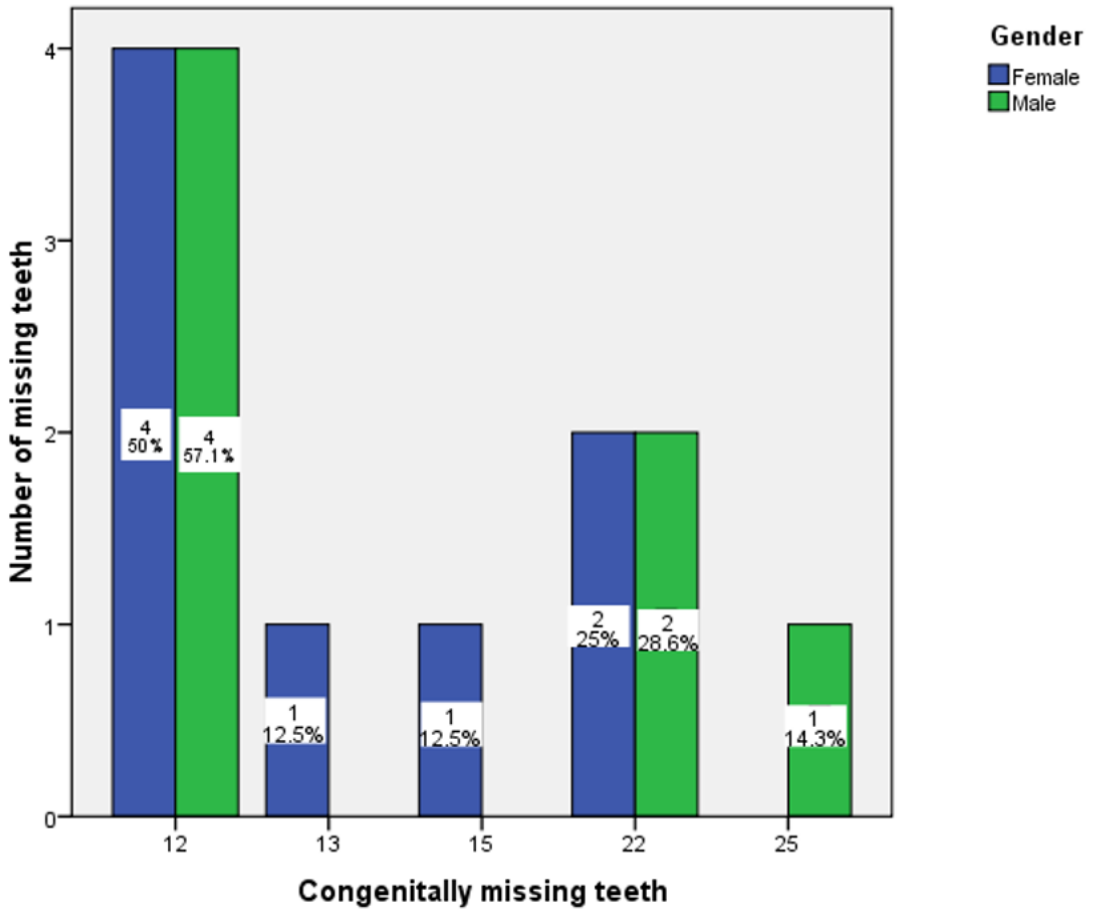

Figure 4: Bar graph depicts association between gender and Congenitally missing teeth. X axis represents gender and Y axis represents Congenitally missing teeth. It was observed that congenitally missing teeth, tooth number 12 was predominantly missing in both the genders; male(green) and in females(blue). Pearson's Chi square value = 2.946; df =4; p-value: 0.567 (p>0.05); hence statistically not significant.

Gender association of congenitally missing teeth showed that the difference was not statistically significant.(p value- 0.796; >0.05)(Figure 5)

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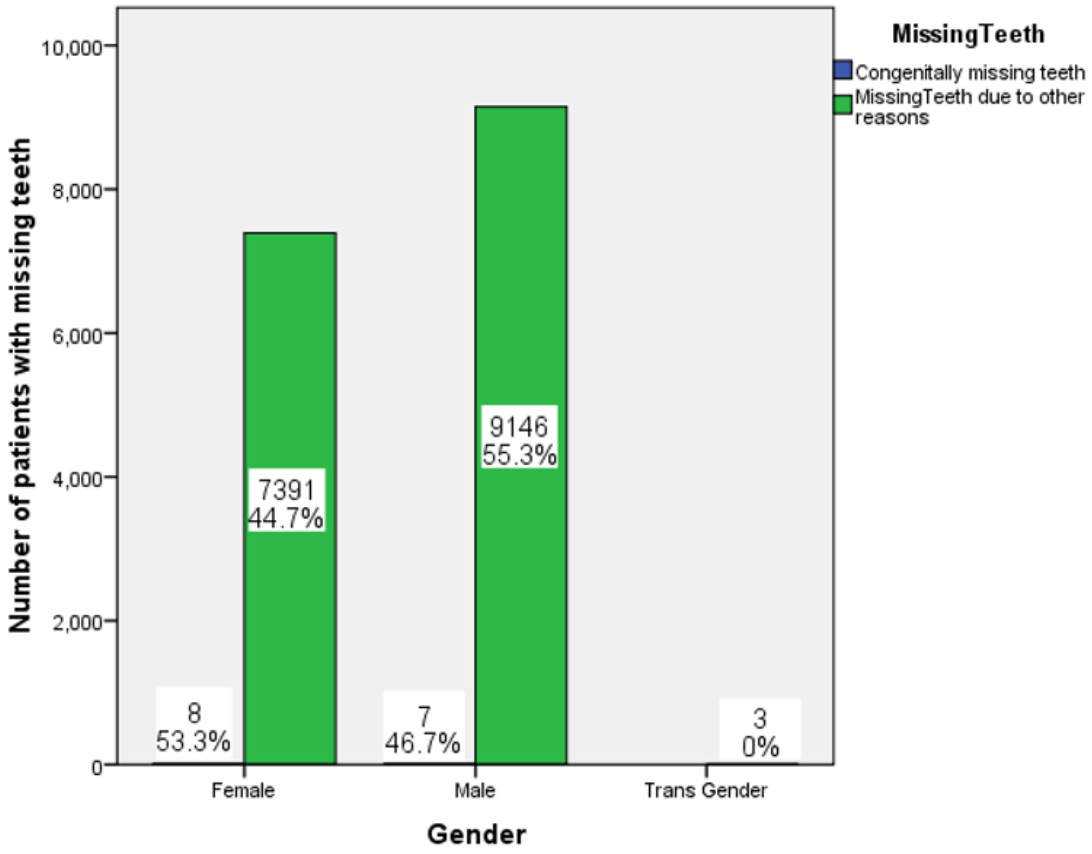

Figure 5: Bar chart depicts the gender association between congenitally missing teeth and missing teeth due to other reasons. The X axis depicts gender and the Y axis represents the number of patients with missing teeth. It was observed that missing teeth due to other reasons were more common(Green) when compared ro congenitally missing teeth. Pearson's Chi square value = 0.455; df =2; p-value: 0.796 (p>0.05); hence statistically not significant.

Few studies have evaluated the difference between hypodontia rates in the anterior and posterior segments(Endo *et al.*, 2006)(Afshari, Eslamipour and Najimi, 2018)(Ng'ang'a and Ng'ang'a, 2001)(Celikoglu *et al.*, 2010) which should be considered in future studies.On the other hand, it is suggested that the permanent maxillary first premolars, canines and first molars, which are likely to be more stable, have a relatively greater rate of CMT in children with five or more teeth missing(Movahhed *et al.*, 2015) Most studies showed higher predominance in the anterior segment (Afshari, Eslamipour and Najimi, 2018)(Dixon, Hoyte and Ronning, 2017) and the few remaining researches found no significant differences. Some investigators suggest that in mild cases of hypodontia, the anterior segment might be more involved while the posterior segment might be predominant in severe cases(Gowri Sankar and MDS, no date))Many studies did not calculate or report the anterior versus posterior missing and many of them did not present raw data.(Gowri Sankar and MDS, no date)(Folayan, 2019)

Most craniofacial traits result from complex interactions between genetic and environmental

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factors. Heritability can be expressed as a ratio that estimates the extent to which genetic characteristics affect the variation of a trait (Harris, 2008). It can range from 1 (complete genetic control) to zero (complete environmental control(Harris, 2008) but can exceed theoretical thresholds if dominant gene effects and acquired environmental effects are included (Behr *et al.*, 2011). Many studies have demonstrated a strong genetic influence in hypodontia. Twin and family studies have determined that agenesis of lateral incisors and premolars is inherited via an autosomal dominant gene, with incomplete penetrance and variable expressivity (Acev and Gjorgova, 2014)(Nieminen *et al.*, 2001; Acev and Gjorgova, 2014)(Alvesalo and Portin, 1969) There is no consensus, however, on whether hypodontia is a result of a polygenic or single gene defect, although the former appears to be largely supported in the literature (Townsend, Kanazawa and Takayama, 2012)

Most important is the assessment of the complaints of the patients and the parents, an experienced team of dental specialists should be involved in the treatment process. Treatment plans needed to manage the missing teeth of hypodontia patients are complex and require an interdisciplinary approach, which usually comes at a financial cost to both the patient and their family. Therefore, it is highly recommended to state all the numbers of all the missing teeth according to tooth types, jaws and sides, etc., in each study.(Nohl, 2012)

Another problem which should be avoided in future research is the lack of proper report of every finding in many studies. Future studies are recommended to report not only the prevalence of CMT, but also the prevalence of cases with different numbers of missing teeth [for example how many subjects had two, three, or more missing teeth, etc.] This is valuable, since definitions of hypodontia might differ from study to study.(Aktan *et al.*, 2010)(Goya *et al.*, 2008; Gomes *et al.*, 2010)

CONCLUSION:

Within the limitations of our study, it was observed that the overall prevalence of hypodontia was 0.1% and hypodontia of maxillary right lateral incisors was most common followed by left lateral incisors and then premolars and canines. Occurrence of hypodontia was slightly more in females when compared to males but the association between gender and occurrence of hypodontia was not significant.

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