

## Etiological Factors Of Midline Diastema - A Retrospective Study

Research Article

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### Abstract

Aesthetics has become one of the major concerns worldwide, in children, adolescents and adults. Malocclusion is a morphological variation that may or may not be associated with pathological conditions. Anomalies in the tooth position, number, form and developmental position of the teeth beyond normal limits will all contribute to malocclusion. A “diastema” is the space between adjacent teeth. Maxillary midline diastema is a common esthetic problem in both mixed and permanent dentition. It can occur as either a transient malocclusion or due to developmental, pathological and iatrogenic causes. Some other causes include genetic, physiological, supernumerary teeth, abnormal frenum attachment, habits, tooth material, pathology, iatrogenic, etc. The aim of this study was to assess the common etiological factors that are associated with midline diastema. With this knowledge, it would be easier for dentists to diagnose cases with better understanding of the cause and also formulating an ideal treatment plan. They can eliminate the malocclusion at earlier stages. A retrospective study was done in an institutional setting to study the various etiological factors in the occurrence of a midline diastema. Among patients who visited the dental facility, the records of patients within the time period of June 2019 to March 2020 were chosen for this study. The patients detailed case sheets were analyzed using parameters such as age, gender and etiology. The data was sorted and was tabulated in excel. Analysis of the data was done in SPSS software. The association between age with etiology and gender with etiology were evaluated. A total of 236 patients were considered for this study. 69.9% being males and 30.1% being female patients with midline diastema. Midline diastema was seen to be more prevalent in the age groups of 20-40 years. It was least prevalent in 61-75 years age groups. The most common etiological factor that seemed to cause a midline diastema in the population was due to a high frenum attachment (39.83%). 23.31% of the patients had this as a generalized spacing due to habits, 12.29% of the patients had the presence of mesiodens. 10.17% of the patients were partially edentulous, 1.69% of the patients had peg laterals. Rotation of 11 and 21 was seen in 12.71% of the patients. Majority of the patients within the age group of 20-40 years had high frenum attachment. Patients within the age group of 61-75 years had a midline diastema due to their partial edentulism. The most common etiology for midline diastema was the presence of a high frenum attachment. The presences of various etiological factors have been overlooked. Regular dental visits can prevent such negligence and aid in improving esthetics.

**Keywords:** Diastema; Esthetics; Etiology; Malocclusion; Midline.

### Introduction

Esthetic concern is a major factor that drives patients to seek orthodontic correction may it be children, adolescents and adults. Most people equate their success in many pursuits to be associated with their appearance. An acceptable, normal and attractive appearance is socially acceptable by many individuals [1, 2]. Mal-

occlusion is a morphological variation which may or may not be associated with pathological conditions.

Malocclusion can occur when the relationship between the upper and lower arch is altered. Anomalies in tooth position, number, form and developmental position of teeth beyond normal limits can cause malocclusions, along with factors such as genetics, envi-

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ronmental factors and various deleterious oral habits [3].

Malocclusion is not a single condition rather this may lead to development of further complications such as functional limitations, physical pain, social disability, poor maintenance of oral hygiene etc.,[3-7]. It brings several fold increase in periodontal health, chances of dental caries, any other traumatic dental injuries or in worst cases it can even lead to TMJ problems [8-10].

A “diastema” is the space between two adjacent teeth. Maxillary midline spacing occurs in many individuals both mixed and permanent dentition. It can occur either as a transient malocclusion or created from developmental, pathological or iatrogenic factors [11]. The etiology factors involved in the causation of midline diastema include: genetics, physiological, supernumerary teeth, abnormal frenum attachment, tooth material abnormalities, habits, midline pathologies, or iatrogenic causes [12-16]. Studies have shown that it occurs 98% in patients at 6 years of age and decreases as they grow. Such a self-correcting malocclusion is also termed as Ugly duckling stage.

The growing concern with regard to midline diastema is esthetics and speech [1, 17]. It was found to be more prevalent in male patients than in female patients, between 6-12 years of age. Treatment of a midline diastema should take the patients esthetic appearance and function into consideration [18, 9]. In case of growing children, under the age of 8, routine dental visits and follow ups should be made in order to detect the pathologies associated with diastema at an early stage [17, 19]. Restorative treatment can also be considered for mild space closure [20, 6]. Moderate and severe cases can be treated with a combination of orthodontic therapy, esthetic restoration and prosthetic restoration in a few cases.

Orthodontic correction and any other dental treatment are usually initiated by eliminating the etiology. Knowledge regarding the

various causes can help dentists better understand the problem and can treat the patient accordingly. The aim of this study was to assess the various etiological factors involved in the causation of midline diastema among patients visiting the dental fraternity for dental and orthodontic consultations. Previously our team has a rich experience in working on various research projects across multiple disciplines [21-34]. Now the growing trend in this area motivated us to pursue this project.

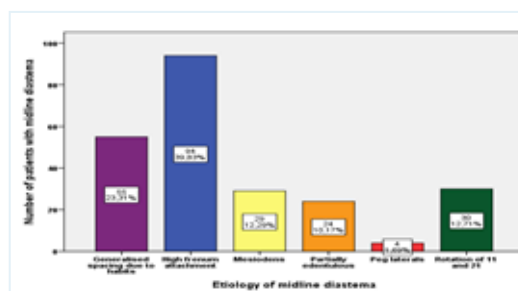
### Materials and Methods

A retrospective study was conducted in an institutional setting. The ethical approval for the study was obtained from the Institutional Scientific Review Board. Records of patients who visited the dental facility between June 2019 to April 2020 were collected. From the available data, further data of all patients with midline diastema were chosen. Inclusion criteria for the study were patients of all age groups; patients who were not undergoing any treatment to correct the diastema. Exclusion criteria were patient records that were incomplete or repetitive and patients who already had undergone orthodontic therapy and had a relapse of the midline diastema. There were three people involved in this study- the guide, reviewer and researcher. All available data was collected and sorted. The patients detailed case sheets were analyzed using the parameters such as age, gender and etiology. Cross verification of the data was done by the second reviewer in order to avoid any missing or repetitive data. Further verification was done with the aid of intraoral photographs and radiographs. The data was manually retrieved and tabulated in excel after sorting.

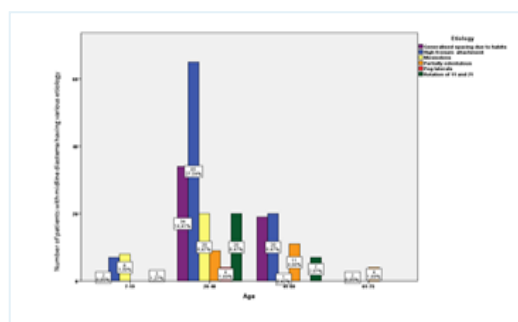
### Statistical analysis:

The tabulated data were analyzed using SPSS software (IBM SPSS statistics 26.0). “Chi square test” was used to determine the statistical significance of the results obtained.

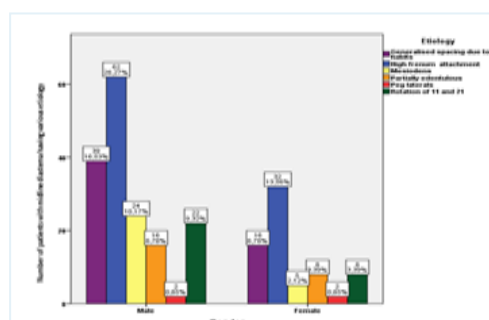
**Figure 1.** Bar graph represents frequency of various etiological factors of midline diastema. X-axis represents the various etiologies of midline diastema and Y-axis represents the number of patients with midline diastema. It is seen that a high frenum attachment causing a midline diastema was the most common etiology, and peg laterals were the least common.



**Figure 2.** Bar graph represents association between age and etiological factors in midline diastema. X-axis represents the age groups (7-19 years, 20-40 years, 41-60 years and 61-75 years). Y-axis represents the number of patients with midline diastema. Chi-square test was done and was found to be statistically significant [p value- 0.000 (<0.05)]. Maximum prevalence of midline diastema (Blue) was observed in the age group between 20-40 years (blue).



**Figure 3.** Bar graph represents gender distribution of etiological factors in midline diastema. X-axis represents the gender (Male and Female). Y-axis represents the number of patients with midline diastema. Chi-square test was done and was found to be statistically (p value- 0.543 (>0.05 - not significant)) The most common etiology was due to a high frenum attachment in and was more common in males (26.27%) than females (13.56%).



## Results & Discussion

The present study was done to assess the various etiologies of midline diastema.

A total of 41190 patient records were analyzed. 275 patients were diagnosed with midline diastema, out of which 236 patients had a relevant etiology for midline diastema. Among those with a specified etiology 189 patients were male (69.9%) and the remaining 86 were females (30.1%).

The various etiological factors that were found to be associated with midline diastema were: Generalized spacing due to habits, high frenum attachment, mesiodens, partially edentulous, peg laterals, rotation of 11 and 21. 94 patients (39.83%) had a high frenum attachment that was the most common etiological factor of midline diastema. The least common cause was due to peg laterals. (4 patients- 1.69%)(Figure 1).

Majority of the etiologies were seen within the age group of 20-40 years. 94 patients (39.83%) seemed to have high frenum attachment, 55 patients (23.31%) had generalized spacing due to habits in their upper and lower arch, 4 patients (1.69%) had peg laterals and 24 patients (10.17%) were partially edentulous, and 30 patients (12.71%) had rotation in 11 and 21. The age groups with the least number of etiologies were within 61-75 years. Majority of the patients in this age group were partially edentulous, as seen in Figure 4 (p value< 0.05)(Figure 2).

Male patients were seen to have more prevalence of midline diastema in this study. Both male (26.27%) and female patients (13.56%) had a higher number of cases with high frenum attachment as an etiological factor. (p value>0.05).(Figure 3).

The present study assessed the various etiological factors that affect midline diastema. From the results above, it was evident that midline diastema is more common in males than in females. There was a significant difference in the age distribution and it was more prevalent in the 20-40 years age group. The most common etiological factor that affects midline diastema is the presence of a high frenum attachment.

The maxillary midline diastema is a common esthetic problem that's faced in both mixed and permanent dentition. The major causes that can influence its occurrence are genetic, physiologi-

cal, high frenum attachment, bony clefts, dental anomalies/tooth anomalies, etc. It is considered both an esthetic and functional complication[20]. It is a normal growth characteristic during the primary and mixed dentition and closes as the canines erupt. For few patients however, it doesn't close spontaneously [35].

The etiology of the diastema must be determined through medical/dental history, proper clinical examination and radiographic findings. Medical conditions (hormonal imbalance), oral habits, previous dental treatments, family history of diastema, etc, can be considered while diagnosing.

Treatment for the closure of midline diastema depends on the treatment phases of: diagnosis of specific etiology, pretreatment considerations, treatment of the etiology and long term stability [35, 36]. No treatment is done in case of physiological/ transient diastema as they will close when the canines erupt. Pathological causes such as supernumerary teeth, midline soft tissue abnormalities, etc can be eliminated with surgical procedures. Orthodontic intervention in the form of fixed or removable appliances can be suggested to correct the malocclusion. When considering the treatment, esthetics, function and speech must be given importance [37, 38].

Midline diastema can occur both in male and female patients. The malocclusion is said to have a tendency to happen more in females than in males. In the present study, it was seen that the number of patients who were diagnosed with midline diastema that were males were more than females. 68.7% of the subjects in the study were males. A similar study done in Nigeria stated that females were more likely to be diagnosed with midline diastema. In the study, 58.9% of the patients that were diagnosed were females (Umanah et al. 2015) [39]. In some countries, artificial midline diastemas were created with the help of cosmetic dentistry, following a fashion trend and peer pressure. Moullas et al., [40] stated in his review that females exhibit a higher tendency to have midline diastema than males.

In a study conducted by Jeng Fen Liu et al., [41] in 2012 stated the prevalence of midline diastema decreases with age. Older aged individuals mostly have midline diastema due to missing teeth and migration of the remaining teeth.

There are many etiologies for a midline diastema to occur. Some of the common ones included in the present study were generalized spacing, high frenum attachment, increased overjet, maxillary proclination, mesiodens, partially edentulous, peg laterals,

rotation of 11 and 21. The most common cause was seen to be the presence of a high frenum attachment. A similar study done in 2016 (Israa Elfadel et al) [42] also stated that the most common cause for a midline diastema was due to a high frenum attachment. Our institution is passionate about high quality evidence based research and has excelled in various fields [43-53]. We hope this study adds to this rich legacy.

## Study Limitations

The study was limited to a certain population and had a small sample size with an unequal number of male and female patients. The study could focus more on the particular age groups instead of generalizing it. It could have a larger sample size.

## Conclusion

Within the limits of the study, it was seen that the prevalence of midline diastema was higher in male patients in the 20- 40 year age group, than in female patients. The most common etiology in both the gender was found to be due to a high frenum attachment. Followed by that generalised spacing due to habits was in male and female patients. In elderly patients mostly the etiology was partial edentulism with resulting migration of the tooth. The other etiological factors were peg laterals and mesiodens.

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