

Prevalence and Etiology of Midline Diastema among Sudanese University Students

Israa I. Elfadel*, Amal H. Abuaffan**

Abstract

Background: Maxillary midline diastema is one of the common esthetic problems appearing in deciduous dentition and affecting adults irrespective of gender and ethnicity. This study aimed to determining the prevalence, etiological factors and acceptance of midline diastema among a sample of Sudanese university students in Khartoum city. **Materials and Methods:** A cross sectional descriptive study carried out for 2200 (1706 females, 494 males) Sudanese university students 18-23 years old. A radiograph taken for each student diagnosed with midline diastema to prohibit the etiological factors. **Results:** The prevalence of midline diastema was recorded 7.3% (7% maxillary, 0.2% mandibular and 0.1% both maxillary and mandibular). It occurs more frequently in females (8%) than male (4.7%). Majority of students 112(70%) have family history of midline diastema (70.1% female and 69.6% male). Fifty six percent of the students were not considering midline diastema as an esthetic problem (52.6% female and 78.3% male). Only 10.6% from the students with midline diastema had speech problem (11.7% female and 4.3% male). **Conclusion:** The prevalence of midline diastema in this sample is evident and analogous to the conclusion reported in previous studies among different populations. The result gives evidence regarding the enormity of the midline diastema. However, burly conclusion not strained since the studied sample is not envoy to the entire Sudanese population. Additional study is obligatory with a great sample collected from different areas in Sudan.

Keywords: Midline Diastema; University Students; Maxillary Teeth.

Introduction

Midline diastema is a dento alveolar disorders that cause special concern to parents and patients [1]. It is also known as open teeth or gapped teeth [2]. It is defining as anterior midline spacing greater than 0.5 mm between the proximal surfaces of adjacent teeth [3].

Nainar define true midline diastema as one without periodontal/periapical involvement and with the presence of all anterior teeth in the arch [4]. Whereas, Attia described it as spaces of varying magnitude between the crowns of fully erupted maxillary or mandibular central incisors [5].

Worldwide, the Prevalence of midline diastema in early mixed dentition is normal condition appears in 48.8% of children and decrease with age [6,7]. Whereas, among adults it ranges from 1.6 to 28% [2,4,8-12], and more common in maxillary arch and among males [5].

Mandibular midline diastema occurred more in male (90.9%) than female (9.1%), in contrast maxillary midline diastema occurred more in females (65.3%) than males (34.7%) [2].

It well known that black population has higher incidence of maxillary midline diastema (5.5%) compared to the White population (3.4%) and Chinese (1.7%) [13].

The etiological factor of midline diastema is multi-factorial phenomenon [4, 5, 14, 15]. It occurs as results of dental defect such as abnormality in the size, shape or number of teeth, periodontal defect; hypertrophic fibrous frenum or muscular defect in the size of tongue [5]. A possible genetic basis as well suggested, with greater role of environmental factors in the black than the white population [15]. If diastema persist after the eruption of permanent canines, etiologic factors

Author's Affiliation: *Orthodontist, Orthodontics Department, Faculty of Dentistry, University of Khartoum, Sudan. **Associate Professor, Head department of Orthodontic, Pedodontics and Preventive Dentistry, Faculty of Dentistry, University of Khartoum, Sudan.

Reprints Requests: Amal H. Abuaffan, Associate Professor, Head department of Orthodontic, Pedodontics and Preventive Dentistry, Faculty of Dentistry, University of Khartoum, Sudan.
E-mail: amalabuaffan@yahoo.com

must be identified and eliminated so the space can be closed with stable results [5].

The esthetic role of maxillary midline diastema varies among different population according to culture and race [4], among Nigerian population it is a sign of beauty and attractive dental feature, mainly in females [16].

Midline diastema can diagnosed by Dental history, radio graphical, clinical examinations and possibly tooth size evaluation [17].

Treatment of midline diastema mainly attributed to esthetic and psychological reasons, rather than functional one [1]. Treatment should not initiate if the diastema is physiological and usually if the canines have not erupted [18].

Worldwide numerous studies on the prevalence and etiological factors of midline diastema had been conducted among different populations [2-4,8-12,19]. Consequently, the present study was design to identify the prevalence and etiological factors among a sample of Sudanese university students since no studies concerning these phenomena was available.

Materials and Methods

This cross-sectional study was carried out to determine the prevalence, etiological factors and acceptance of midline diastema among students of the University of Khartoum, Medical Campus. This is university has students from different ethnic backgrounds and is well populated with students and for this reason was selected for this study.

First permission and approval obtained from the University of Khartoum to carry out the study (faculties, registrars of faculties).

Sample Size

The target population was found to be 4059 students from which the sample size was extracted as below formula

The sample size was calculated according to the following equation:

$$n = z^2 p q / d^2$$

n = sample size

z = 1.96 Value in normal curve corresponding to level of confidence 95 %.

p = 0.5 Probability of target group individual.

q = (1-P) = 0.5 Probability of failure.

d = 0.02 Margin of error.

$$n = (1.96)^2 \cdot 0.5 \times 0.5 / (0.02)^2$$

$$n = 2401$$

$$n = 2401 \quad n = 2401 \times 2 = 4802$$

$$n = 4802 \quad N = 4059 \text{ (total student number)}$$

$$\text{sample size} = \frac{4802}{1 + \frac{4802}{4059}} = \frac{4802}{2.183} = 2200$$

A list of the attending university students obtained for each faculty year and students randomly selected. This study only took into account Sudanese male or female students who agreed to participate in the study. It excluded the students who refused to participate, students with previous or present treatment regarding orthodontic or prosthodontic, students with loss of anterior teeth material due to caries, attrition, fracture or any congenital defect, student with history of restoration or loss of anterior teeth and students who were absent on the day of examination.

The research was divided into two stages. In the first stage, 2200 students (were randomly selected and approached). Each student was informed about the aims, advantages and process of the study and it was ensured that any radiograph taken will only be used for research purposes. Verbal and/or written consent forms were being taken from students who agreed to participate. Students then underwent analysis for presence or absence of the midline diastema by clinical examination through direct inspection of the oral cavity with the use of sterile disposable gloves under natural daylight and/or artificial light.

In the second stage, those with midline diastema underwent periapical radiograph taken in the X rays center at the faculty of dentistry, clinical examination and a questionnaire which was self-constructed and filled by the main investigator.

The questionnaire consisted of three parts; part one included personal data, part two was to determine the etiological factor of midline diastema; highly attached frenum, presence of spacing, flared or rotated central incisors, midline pathology, peg shape lateral incisor and family history of diastema and part three was to assess level of awareness about appearance and speech.

Data Analysis

Computer program used was Statistical Package for Social Sciences (SPSS) for Windows, version 20 and Microsoft Excel for cross tabulation. Chi square test was used to study the prevalence and etiological factor of midline diastema, in association with gender and level of awareness of appearance and speech. For all statistical tests, a P-value of less than 0.05 was

considered to be significant.

Data grouped and analyzed using frequencies and percentages thus the results grouped in forms of tables.

Strengths and Limitations

The study was simple to carry out- short quick clinical examination followed by a brief questionnaire. It is Doable, time efficient and economical. It was not represent the Sudanese population as a whole. It only considered university students and no other category.

Results

A total of 2200 students (1706 females and 494 males) 17 to 23 years old were included in this study. Midline diastema were reported in 160 (7.3%) students with more prevalence in females (8.0%) than males (4.7%), It was more frequent in the maxilla (7%) than in the mandible (0.2%) (Table1).

Table (2) revealed that, more than half of the students 56.2%(18male and 72 female) were not consider midline diastema as an esthetic problem, whereas only10.6% (1 male and 16 female) complain from the speech problem.

Table 1: Prevalence of midline diastema among gender (%)

Jaw	Male	Female	Total	p-value
Maxilla	23 (4.7)	131 (7.7)	154 (7.0)	0.004
Mandible	0	4 (0.2)	4 (0.2)	
Maxilla and mandible	0	2 (0.1)	2 (0.1)	
Total	23 (4.7)	137 (8.0)	160 (7.3)	

Table 2: The effect of midline diastema on appearance and speech among gender (%)

Midline Diastema	Male	Female	Total	p- value
Effect on appearance	Yes	5 (21.7)	65 (47.4)	0.021
	No	18 (78.3)	72 (52.6)	
Total	23 (14.4)	137 (83.6)	160 (100)	
Effect on speech	Yes	1 (4.3)	16 (11.7)	0.0291
	No	22 (95.7)	121 (88.6)	
Total	23 (14.4)	137 (83.6)	160 (100)	

Table 3: Family history of mid line diastema (%)

Family History of Mid Line Diastema	Male	Female	Total	p-value
Yes	16 (69.6)	96 (70.1)	112 (70.0)	0.961
No	7 (30.4)	41 (29.9)	48 (30.0)	
Total	23 (100)	137 (100)	160 (100)	

Table 4: Distribution of etiological factors of midline diastema (%)

		Male	Female	Total	P-value
High attach frenum	Yes	8 (34.8)	75 (54.7)	83 (51.9)	0.076
	No	15 (65.2)	62 (45.3)	77 (48.1)	
Supernumerary teeth	Yes	2(8.7)	1 (.7)	3 (1.9)	0.009
	No	21(91.3)	136 (99.3)	157(98.1)	
Missing teeth	Yes	7 (30.4)	12 (8.8)	19(11.9)	0.003
	No	16 (69.6)	125 (91.2)	141(88.1)	
Generalize spacing	Yes	11 (47.8)	67 (48.9)	78(48.8)	0.924
	No	12 (52.2)	70 (51.1)	82(51.3)	
Flared or rotated central Incisors	Yes	4 (17.4)	24 (17.5)	28(17.5)	0.988
	No	19 (82.6)	113 (82.5)	132(82.5)	
Peg shape lateral incisors	Yes	3 (13.0)	10 (7.3)	13(8.1)	0.351
	No	20 (87.0)	127 (92.7)	147(91.9)	

In table 3, it noted that the majority of students (70%) had family history of mid line diastema High attach frenum was the most common etiological factor (51.9%) followed by generalize spacing (48.8%) where as supernumerary teeth was the least one 3(1.9%). (Table 4).

Discussion

This is a cross sectional study conducted to investigate the prevalence and etiology of midline diastema among Sudanese University students, the results revealed a prevalence of 7.3% (7% in maxilla

and 0.2% in the mandible).

In previous studies, variations in the prevalence of midline diastema among people of different racial background, age-group, and gender are well documented [4,8-10,16,20].

In the present study, the prevalence of midline diastema was 7.3% which slightly more than the result reported in US population (6%) [11], whereas very small prevalence 1.9% were observed among South Indian population [4].

In contrast most of the previous studies shown high prevalence of midline diastema; 9% in Sinhalese population, 12.59% in Pakistani patients, 26% in Tanzanian patients and 28% in Iraqi population [21,8,22,10].

This variation in midline diastema prevalence could be attributed to the differences in genetic and environmental factors, age group, gender and sample size for study population.

Concerning genders, female had approximately twice percentage of the male midline diastema, which in agreement with previous studies by Oji, Obiechina and Hameed Allah Jan [16,8], in contrast, Master Luqman et al found it more in male [9].

Maxillary midline diastema was recorded more frequently than mandibular one in most of the previous studies [2,4,8,10,16,19,22], which in constant with the present result, this may have explained by the fact that a greater incidence of spacing was exist in the anterior region of maxilla compared to other areas in the oral cavity [4].

In the present study, the prevalence of mandibular midline diastema was found to be 0.2% which was twice the number in both arches (0.1%), which in consistent with results obtained by Athumani and Mugonzibwa in Tanzanian population [22], however it is inconsistent with studies among Baghdadis and South West Nigerian population where diastema in both arches was more frequent than in mandibular one [2,10].

In some previous studies, maxillary midline diastema occurred more in females than males, and vice versa the mandibular one [2,10]. Whereas, in the present result female had more prevalence of midline diastema of both jaws.

Worldwide midline diastema was considered as a disfiguring dental feature requiring treatment [23-26]. Although among other population it had advantage to the personality, an enhancement of beauty and admirable look on smile [5,16,27]. In this study, more than half of students (56.2%) satisfied with midline diastema, not affecting the

beauty and reject to receive treatment, and the remaining (43.8%) unpleasant with midline diastema. The same findings had been reported among Saudi population [9].

In contrast, study among Baghdadis adults reveal that the percentage of individuals dissatisfied with persisted midline diastema were more than the other who satisfy [10].

Females with midline diastema in this study show high dissatisfaction (47.4%), and less than half of this percentage (21.7%) were reported among males, this may be attributed to gender differences in concern and thought about esthetic.

Vivek Govila and Smita Govila, suggested that midline diastema may lead to phonetic problem particularly with S sound [18]. Furthermore, Koora stated that diastema can affect the speech in "S" sound [28]. Although the current result showed that in the majority of the students (89.4%) the midline diastema had no influence on speech.

It well documented that the etiological factor of midline diastema is multifactorial phenomenon [4,14]. Numerous studies by Hashim Nainar [4], G.Oliaiya [2], Nikolaos et al [1], Gass et al [15], Mehdi Abdul Hadi [10], Hadeel Al-Hashimi [19] and Master Luqman et al [9] revealed a significant hereditary cause of midline diastema in families and their findings were consistent with the present result where 70% of the students had family history of midline diastema.

Several Factors have been also implicated as the possible etiology of diastema among which are the presence of a superior labial frenum, a mismatch between teeth and jaws (spacing), supernumerary teeth, missing teeth and peg shape lateral incisors [28].

In this study, the high labial frenum attachment was found to be the most common cause which found in about 51.9% of the students, while a lesser percentage 33.03% and 30% reported in Pakistani and Saudi population respectively [8,9]. Furthermore, Shashua and Artun found that there was a correlation between the width of the diastema and the presence of an abnormal frenum [29].

This can be justify by the fact that the frenum attachment does not "migrate nasally" or changes minimally with age and it should not be expected to close spontaneously with the eruption of the maxillary lateral incisors and canines, as it usually happens [1].

In the present study, about 48.8% of students with midline diastema had generalize spacing, while slightly less percentage 44.4% and 39% had been

reported by Al Hashimi [19] and Master Lugman [16] respectively. Similarly, Hashim Nainar [4] described that generalize spacing was a significant etiological factor for midline diastema, this mainly due to teeth-jaw size discrepancy.

On the other hand, Oesterle [10] suggested that distal inclination of maxillary central incisors is an etiological factor of midline diastema, these were consistent with the present result as it shown that about 17.5% of the sample had flared or rotated central incisors.

In the existing study, 11.9% of midline diastema is mainly due to missing lateral incisors, the same result (11%) had been achieved by Moyer [30] Whereas, Hameedalla Jan reported this cause only in 5.4% of their cases [8]. This can be clarifying by the distal movement of maxillary central incisors to occupy the existing space leading to midline diastema.

In the current study, 8.1% of the students had midline diastema due to beg shape lateral incisors, half of this percentage (4%) had been found by Master Lugman in Saudi population [9], and lower percentage (1.35 %) were reported among Pakistani population [8].

Supernumerary teeth (mesiodens) were the least etiological factor found in this study which represent about 1.9% of the study sample, whereas Moyer found double this percentage (3.7%) among his population and he concluded that Occurrence of mesiodens between central incisors lead to midline diastema [30].

Conclusion

Variation abound in the occurrence of midline diastema from one population to the other.

Mid line diastema is a common problem with prevalence of 7.3% in our sample.

This study shows that maxillary midline diastema occurs more than mandibular one, and it occur in female more than male.

More than half of the sample (56.2%) satisfied with appearance of midline diastema, not affecting their beauty, and has little effect on speech.

Midline diastema run in families.

Midline diastema is commonly associated with multi factorial etiology.

Among the observed etiological factors, the high attach labial frenum was the most common etiological factor.

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