

# Midline Diastema: A Retrospective Presentation in a Tertiary Hospital, South-South, Nigeria

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## ABSTRACT

**Background:** Midline Diastema is a common malocclusion trait with various aetiological factors which timely clinical intervention is important. Its presentation varies among age groups and gender. The objective of the study was to assess the pattern of midline diastema among patients at a tertiary hospital, South-South, Nigeria.

**Methods:** An eight-years (2017-2024) retrospective study of four hundred and sixty patients who presented to the Child Dental Health department at the University of Port Harcourt Teaching Hospital during the period. Relevant information regarding their socio-demographic data, midline diastema and other occlusal characteristics were collected from their medical records. Only records of patients with complete information were included in the study. The data was analyzed using IBM SPSS version 26. Association between parameters were determined with chi square test and the level of significance was set as  $p < 0.05$ .

**Results:** Four hundred and sixty subjects, comprising of 182 males and 278 females, with a mean age of 15.3 ( $\pm 8.2$ ) years, were seen during the study period. One hundred and forty-one (30.7%) had midline diastema ( $\geq 0.5$ mm). Majority of the subjects were in the 10-19 years age group. Most (75.2%) had midline diastema in the upper jaw only. Many (48.5%) had intermediate type of diastemata. There were no statistically significant differences in the types of diastemata in gender and age. The association of diastema and the occlusal characteristics showed more prevalence in Angle's Class I malocclusion, Skeletal pattern I, increased overjet and deep overbite with no statistically significant associations.

**Conclusion:** Midline diastema is found more in the upper jaw and among females. It is more prevalent among adolescents.

**Keywords:** Midline Diastema, Presentation, Overjet, Overbite, Gender

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## INTRODUCTION

During the developmental stages of mixed dentition, it is expected that there will be spaces between the

teeth, which later are replaced by the permanent dentition to achieve acceptable occlusion. Sometimes, spaces can be left behind, which is

undesirable and considered an anomaly. A space or gap between two or more adjacent teeth is called a diastema when it exceeds 0.5mm between the proximal surfaces of the teeth.<sup>1</sup> This space can occur in either the upper or lower arches. It usually appears in the midline between the central incisors, hence the term midline diastema, or it can also be called median or central diastema.<sup>1,2</sup> Although midline diastema can occur in both maxillary and mandibular arches, it is more commonly found in the maxillary arch and rarely in the mandibular arch.<sup>2</sup> It may be viewed as a malocclusion trait.

Various factors have been linked to the development of midline diastema.<sup>3-6</sup> These include physiological causes, dentoalveolar issues, missing teeth, peg-shaped lateral incisors, midline supernumerary teeth, proclination of the upper labial segment, a prominent frenum, and self-inflicted causes such as tongue piercing.<sup>7,8</sup> It has been reported that the primary cause of mandibular diastema is tongue thrusting in a low rest position.<sup>9</sup> Midline diastema can be classified in various ways. It can be categorized as maxillary or mandibular based on the arch affected. It can also be classified into three categories—Simple, Intermediate, and Complex—based on the size of the diastema (distance between the mesial surfaces of the central incisors).<sup>10,11</sup> A simple diastema has a space of 1.0mm or less, an intermediate diastema ranges from 1.0 to 3.0mm, and a complex diastema is defined as having a space greater than 3.0mm.

Understanding the cause of midline diastema is important,<sup>1-2,4-5</sup> since closing a maxillary midline diastema is often successful when the underlying cause is properly addressed.<sup>12</sup> One study noted that maxillary midline diastema becomes problematic when it exceeds 4mm.<sup>13</sup> Generally, the prevalence of midline diastema decreases significantly between the ages of 9 and 11 and then gradually declines up to age 15.<sup>14-16</sup> Another study revealed that about 50% of children between 6 and 8 years old have maxillary midline diastema, which decreases in size and prevalence with age, following the normal eruption pattern of the permanent maxillary lateral incisors and canines.<sup>17</sup>

Spontaneous closure of midline diastema after eruption of the lateral incisors and canines is unlikely if the diastema exceeds 2mm.<sup>18</sup> The group most affected by midline diastema is generally those aged 12 to 18, with some cases resolving during this period without intervention.<sup>19</sup> Females tend to have a higher prevalence at ages 6–8, while males show a higher rate by age 14.<sup>20</sup> Midline diastema has been

reported with a 97% incidence in 5-year-olds, decreasing with age.<sup>21</sup> It is more common in females than males.<sup>22</sup> A Nigerian epidemiological study found an incidence of 26.1%, with 21.0% having maxillary midline diastema and 1.9% mandibular, and a higher occurrence in females.<sup>23</sup> Among students at the University of Port Harcourt, the prevalence was 73.6% in the maxillary arch and 4.8% in the mandibular arch.<sup>24</sup>

Previous Nigerian studies have focused on prevalence<sup>24-26</sup>, perceptions of midline diastemas among Nigerians<sup>25-28</sup>, and among Nigerian dentists.<sup>29,30</sup> However, there is limited knowledge about the distribution pattern of midline diastema among patients seeking treatment at tertiary hospitals. Understanding this distribution within our environment is crucial, as it will serve as baseline data and aid in managing orthodontic patients with midline diastema. As stated by Profitt, midline alignment and facial balance are important aspects of orthodontics.<sup>31</sup> This study aimed to evaluate the pattern of midline diastema among patients attending the Child Dental Department of a tertiary teaching hospital in South-South Nigeria.

## MATERIALS AND METHODS

An eight-year (2017-2024) retrospective study of four hundred and sixty patients who presented to the Child Dental Health department at the University of Port Harcourt Teaching Hospital during this period. Relevant information regarding their socio-demographic data, midline diastema, Angle's malocclusion, skeletal pattern, overjet, and overbite was collected from their medical records. Only case notes of patients with complete information were included in the study.

Sociodemographic information retrieved from the case notes were the gender; Males or Females, age as at the last birthday. This was further grouped into 0 to 9 years, 10 to 19 years, 20 to 29 years, 30 to 39 years, 40 to 49 years, 50 to 59 years.

Information of patients with midline diastema was further classified according to size in millimeters; where Simple was less than 1mm, Intermediate was 1-3mm and Complex was greater than 3 mm. also, whether the diastemata were in the upper arch or lower arch or both arches. Molar relationship: Class I is when the mesiobuccal cusp of the first permanent maxillary molar occludes on the buccal groove of the first permanent mandibular molar; Class II is when the mesiobuccal cusp of the first permanent maxillary molar occludes anterior to the buccal groove of the first permanent mandibular molar with

at least half a unit. Class III is when the mesiobuccal cusp of the first permanent maxillary molar occludes posterior to the buccal groove of the first permanent mandibular molar with at least half a unit, where a unit is the width of the first premolar.<sup>32</sup> The Skeletal pattern was noted as either Class I, Class II, or Class III. Overjet, which is the horizontal distance between the incisal edge of permanent maxillary central incisors and the labial surface of the mandibular central incisors, was classified as normal, when the measurement was 2-4 mm, increased, when the value was greater than 4 mm, and reduced when less than 2 mm.<sup>32</sup> Overbite was measured as the vertical distance between the incisal edges of upper central incisor and the incisal edges of lower central incisor at maximum intercuspation.<sup>33,34</sup> Normal overbite was classified when the overlap is within 1/3 to 1/2. Reduced overbite classified when the overlap is less than 1/3, and Deep overbite was classified when the vertical overlap is greater than 1/2.

The data obtained was imputed into a spreadsheet and the IBM SPSS package was used for analysis using descriptive statistics (frequencies, percentages). In addition to descriptive statistics, Chi-square test was employed to determine the relationship between two parameters. P value of <0.05 was regarded as being significant. Ethical approval for the study was obtained appropriately from the Ethics and Research Committee of the University of Port Harcourt Teaching Hospital with

the registration number: (UPTH/ADM/90/S.11/VOL.XI/1986).

## RESULTS

Four hundred and sixty subjects, comprising of 182 (39.6%) males and 278 (60.4%) females, with a mean age of 15.3 (±8.2) years, range of 4 to 58 years, were seen during the study period. One hundred and forty-one (30.7%) had midline diastema; (≥0.5mm). One hundred and thirty-four (29.1%) subjects had diastemata in the maxilla, while 24 (5.2%) had on the mandibular arch. The distribution of the midline diastema according to gender and age, is shown in Table 1.

The majority of the subjects were in the 10-19 years age group (adolescents). There were no statistically significant gender (p=0.07) and age (p=0.06) differences. The diastemata were further classified into simple, intermediate, and complex according to their width in millimeters. See detailed distribution in Table 2. There were no statistically significant differences in the types of diastemata in gender and age, except in the association between age and types of diastemata in the maxillary arch (Table 2).

The majority (75.2%) had midline diastema in the upper jaw only (figure 1). The association of diastema and the occlusal characteristics showed more prevalence in Angle's Class I malocclusion, Skeletal pattern, increased overjet and deep overbite with no statistically significant association.

Table 1: The association between the gender and age groups of the subjects and mid line diastema

Variable	Midline diastema		Total n (%)	P -value
	Yes	No		
<b>Gender</b>				0.07
Male	47 (33.3)	135 (42.3)	182 (39.6)	
Female	94 (66.7)	184 (57.7)	278 (60.4)	
<b>Age groups(years)</b>				0.06
0-9	24 (17.0)	82 (25.7)	106 (23.0)	
10-19	84 (59.6)	177 (55.5)	261 (56.7)	
20-29	20 (14.2)	40 (12.5)	60 (13.0)	
30-39	11 (7.8)	14 (4.4)	25 (5.4)	
40-49	1 (0.7)	6 (1.8)	7 (1.5)	
50-59	1 (0.7)	0 (0)	1 (0.2)	
Total	141 (100.0)	319 (100.0)	460 (100.0)	

## DISCUSSION

Midline diastema was observed in both the upper and lower jaws in this study, with a higher prevalence in the upper jaw. This finding aligns with previous studies<sup>23,24,35</sup> where midline diastema was more frequently seen in the upper jaw. The current study also showed that midline diastema occurring in both arches is more common than in the mandibular arch

alone, as noted in another Nigerian study<sup>24</sup>, but a contrasting finding to a previous Tanzanian study that revealed mandibular midline diastema occurring more than both arches. Sutuna et al.<sup>36</sup> found midline diastema to be more bidentally which was not similar in this study. Additionally, intermediate midline diastema was more prevalent in this study, similar to the results of a previous study.<sup>22</sup>

Table 2: The association between the size of the diastemata and age/gender of the subjects.

	Maxillary diastemata			Mandibular diastemata		
	S	I	C	S	I	C
<b>Age groups(years)</b>						
0-9	6 (17.6)	11 (16.9)	4 (11.4)	0	1 (10.0)	0
10-19	24 (70.6)	40 (61.5)	17 (48.6)	8 (88.9)	7 (70.0)	2 (40.0)
20-29	2 (5.9)	11 (16.9)	6 (17.1)	1 (11.1)	2 (20.0)	2 (40.0)
30-39	2 (5.9)	2 (3.1)	7 (20.0)	0 (0.0)	0 (0.0)	1 (20.0)
40-49	0 (0.0)	1 (1.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
50-59	0 (0.0)	0 (0.0)	1 (2.9)	0 (0.0)	0 (0.0)	0 (0.0)
P-value			0.01*			0.07
<b>Sex</b>						
Male	9 (26.5)	23 (35.4)	10 (28.6)	3 (33.3)	1 (10.0)	2 (40.0)
Female	25 (73.5)	42 (64.6)	25 (71.4)	6 (66.7)	9 (90.0)	3 (60.0)
P-value			0.61			0.32

S: Simple I: Intermediate C: Complex

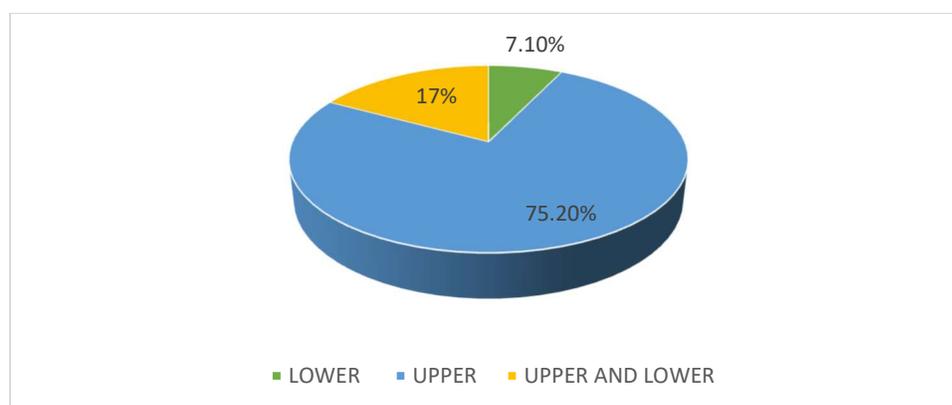


Figure 1: The location of the diastema among the subjects

Table 3: Association between the diastema and occlusal characteristics of the subjects

	Diastema Upper arch			Diastema Lower arch		
	S n(%)	I n(%)	C n(%)	S n(%)	I n(%)	C n(%)
<b>Angles Classification</b>						
Class I	24(70.6)	48(75)	27(77.2)	5(55.6)	6(60.0)	5(100.0)
Class II div 1	8(22.5)	9(14.4)	6(17.4)	3 (33.3)	2 (20.0)	0 (0.0)
Class III	2 (5.9)	7(11.0)	2(5.8)	1 (11.1)	2 (20.0)	0 (0.0)
P-value			0.7			0.3
<b>Skeletal pattern</b>						
Class I	25(73.5)	50(78.2)	29(82.8)	7(77.8)	8(80)	5(100.0)
Class II	6(17.6)	7(10.9)	4(11.4)	2(22.2)	2(20)	0(0.0)
Class III	3(8.8)	7(10.9)	2(5.7)	0(0.0)	0(0.0)	0(0.0)
P-value			0.4			0.1
<b>Overjet</b>						
Normal	6(20)	9(15.3)	7(22.6)	1(11.1)	2(20.0)	1(50)
Increased	20(66.7)	42(71.2)	22(71)	8(88.9)	6(60.0)	1(50.0.0)
Reduced	4 (13.3)	8(13.6)	2(6.5)	0 (0.0)	2(20)	0 (0.0)
P-value			0.5			0.7
<b>Overbite</b>						
Normal	11(37.9)	9(15.0)	12(34.3)	3(30.0)	2(22.2)	3(60)
Deep	7(24.1)	28(46.7)	13(37.1)	5(50.0)	4(44.4)	0(0.0)
Reduced	11(37.9)	23(38.3)	10(28.6)	2(20.0)	3(33.3)	2(40)
P-value			0.7			0.9

S: Simple I: Intermediate C: Complex

The occurrence of midline diastema differed between the age groups as the highest was found among 10-19 years age group. Conversely, this was different from a previous finding.<sup>32</sup> where the occurrence of midline diastema was highest among patients aged  $\geq 30$  years and high among  $< 15$  years patients. The difference in presentation seen in our study could be due to differences in the races involved in the two studies. Midline diastema was found to be more prevalent among female patients than males. The current finding supports the finding of a previous study<sup>19</sup> which found that the age group most commonly seen with midline diastema is between 12 and 18 years. A similar female prevalence was seen in previous Nigerian studies<sup>22,23</sup> and others.<sup>35,37</sup> However, this finding was a contrast to findings of previous studies<sup>38-40</sup>, which found the prevalence of midline diastema in males than in females. This research revealed a prevalence of 30.7% for midline diastema, which is high compared to a prevalence of 23.3% in Kurdistana<sup>41</sup>, 1.5% in Madras<sup>42</sup>, 16.9% in Mumbai.<sup>43</sup>The difference in prevalence as seen in our study could be due to the population involved in our study.

Midline diastema was found to be associated more with Angle's Class I malocclusion also Skeletal pattern 1 malrelationship in this study. It was also associated more with increased overjet and deep overbite. This finding was inconsistent with a previous study<sup>12</sup> where the prevalence of midline diastema was found to decrease as the amount of overbite and overjet increased. The difference seen in our study could be due to the diverse ages involved in our study.

## CONCLUSION

Midline diastema is a common malocclusion trait, and its presentation varies among population studied. It is more commonly found in the upper jaw and is more prevalent among females. The occurrence of midline diastema differs among age groups, with adolescents age group being the most affected.

## RECOMMENDATION

Further research can be done to ascertain if midline diastema has genetic basis in Nigeria which gender is most likely to inherit the trait.

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