

Biracial Study of the Maxillary Midline Diastema

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The maxillary midline diastema has been of great interest to the clinician for a long period of time. Farrer¹ described a treatment for it in 1882. Keene² defined a diastema as a space greater than 0.5 mm between the proximal surfaces of adjacent teeth. Stedman's Medical Dictionary³ defines diastema as a "natural space between two succeeding teeth, or an interval between teeth, not occurring naturally in man." The literature revealed that the midline diastema has been discussed in the past, mostly from the point of view of etiology and treatment, but with very little emphasis on prevalence, racial and sexual differences.

Angle⁴ described the midline diastema as a somewhat common form of malocclusion distinguished by a space between the upper central incisors and occasionally, though very rarely, between the lower centrals. The space varies in width with the diastema being from one to four, and sometimes five millimeters wide, always presenting an unpleasing appearance and interfering with speech in proportion to its width.

The so-called "ugly duckling" stage was described by Broadbent⁵ as a normal developmental phenomenon. Erupting central incisors show an initial transitory diastema which is sub-

sequently closed with the eruption of the lateral incisors and canines. The "ugly duckling" stage should not be confused with malocclusion.

Taylor⁶ examined 516 children ranging from 5.5 to 11 years of age. He found that 66 out of 68 (97%) of the 6 year olds observed showed spacing between the incisors. In another group of 6 to 7 year olds, he found 29 out of 33 children (87.7%) with midline diastemas. In a group of 10 to 11 years of age, Taylor found 18 out of 37 (48.7%) showing midline diastemas. He further examined 1067 high school students ranging from 12 to 18 years and found 75 (7%) to show midline maxillary diastema. There was no mention of sex and race differences in Taylor's study.

Moyers⁷ enumerated various causes of excessive spacing between the upper central incisors in 83 patients. He found that 23.2% had spacing as a part of the normal growth process and 24.4% showed spacing due to a malposed labial frenum. Age, sex and race was not given.

Keene² reported the frequency of diastemas in 183 white male naval recruits selected from a total of 641. The age ranged from 17 to 25 years. He recorded all the diastemas which were more than 0.5 mm in the maxillary and mandibular arches. He found 8.3% (27 men) to show a maxillary midline diastema.

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Gardiner⁸ based his findings on the survey of 1000 school children in Sheffield, England. The ages ranged from 5 years to 15 years. His findings on the prevalence of the midline diastema were as follows:

Age (years)	6	7	8	9	10	11	12	13	14	15
Percent	46	48	43	33	10	11	18	12	20	7

Weyman⁹ quoted Jakobsson who carried out a study on 1243 Swedish children, age 7-13. Jakobsson found that 90% of the children with only central incisors erupted had a space more than one mm between these teeth. Only 25% of children with all incisors and canines erupted had a similar space. Weyman made an assessment of the maxillary midline diastema based on actual age of 751 British children. His findings on the prevalence of maxillary midline diastema were as follows:

Age	No. of Children	No. with Diastema	Percent with Diastema
6	18	8	44.4
7	152	79	52.0
8	165	81	49.1
9	86	39	45.8
10	106	19	17.7
11	33	7	21.2
14	134	10	7.4
15-16	57	3	5.3
Total	751	246	

Sanin and associates¹⁰ conducted a cross-sectional study on 151 children. Using dental casts, they concluded that 20% of the cases had midline diastema even after the eruption of the permanent canines and second permanent molars.

Lavelle¹¹ studied the distribution of diastema in different human populations. The study was conducted on 656 subjects belonging to the three major racial groups which included 266 Cau-

casoids (British), 218 Negroids (West Africa) and 172 Mongoloids (Chinese from Hong Kong and Malaya), ranging in age from 18-25 years. The sample included approximately equal numbers of males and females. The percentages of midline diastema distributions in the three different races were found to be 3.5 in Caucasoids, 5.2 in Negroids and 3.4 in Mongoloids.

Horowitz¹² reported his findings on the study of occlusal relations on 712 children, 397 Negroes and 321 whites ranging from 10 to 12 years. He found that the prevalence of the maxillary midline diastema was greater in Negro children than it was in white children. Nineteen percent of the total Negro sample had midline maxillary diastemas (2 mm or more) as opposed to 8% in white children. Horowitz did not report the sexual differences.

The purpose of the present study was to determine the prevalence of the maxillary midline diastema in a large biracial population at different age levels and to assess the racial and sexual differences and similarities.

MATERIALS AND METHODS

Five thousand, three hundred and seven children participated in this study. The sample included all elementary classes of the city school system of Jackson, Tennessee. The ages ranged from six to fourteen years. Socioeconomically, the sample included lower, middle and upper middle income groups. Ethnically, the sample was divided into 2554 blacks and 2753 whites. This included 1253 black males, 1301 black females, 1288 white males and 1465 white females (Table 1).

TABLE I

Summary of population studied showing the racial and sexual distribution.			
Race	Males	Females	Total
Blacks	1253	1301	2554
Whites	1288	1465	2753
Total	2541	2766	5307

The examination consisted of an over-all evaluation of the oral condition using disposable mouth mirrors. Measurements of the midline diastema were made to the nearest 0.5 millimeter using standard millimeter rulers; a brief history was taken to elucidate the presence of oral habits and current or prior orthodontic treatment. The measurements were recorded according to age, race and sex, counting only those diastemas larger than 0.5 mm.

The examining group consisted of five dentists, dental assistants and a social worker. These were divided into two working teams.

Criteria used in selecting the students to participate in this study were:

1. No history of previous or present orthodontic treatment.
2. The presence of either permanent or primary central incisors.
3. No obvious dental or dentofacial abnormalities.
4. No obvious loss of anterior tooth material due to caries, attrition, fracture, or any congenital or developmental defects.

The data were subjected to statistical analysis relative to prevalence, size of the maxillary midline diastema at different age levels, racial and sexual similarities or differences.

FINDINGS

The findings of this study were

divided into three headings:

1. Prevalence of maxillary midline diastema
2. Racial and sexual differences in prevalence of maxillary midline diastema
3. Size of the diastema.

Prevalence of Maxillary Midline Diastema

In the total group the prevalence of the midline diastema increased with age from 6 to 8 years, then the prevalence gradually decreased until 14 years of age (Table II).

Racial and Sexual Differences

Both racial groups followed the same general pattern; however, there were racial differences. In the black children the prevalence of maxillary midline diastema was found to be 51.6% at the age of 6 years increasing to a maximum of 55.1 at the age of 8, and then dropping to 22.8 at age 14. In the white children 26.8% showed maxillary midline diastemas at the age of 6 increasing to a maximum of 58.1 at age 8, and then dropping to 14.01 at 14 years of age (Table II).

Sexual differences were also seen in the prevalence of the maxillary midline diastema in both groups. Females in both races showed a higher prevalence than males at age 6. In white males the prevalence was 20.7%, and in white females it was 31.6 at 6 years of

TABLE II
Prevalence of maxillary midline diastema (percentage) in two races and the total group.

Age	WHITES		BLACKS		TOTAL	
	Number	Prevalence	Number	Prevalence	Number	Prevalence
6	304	26.8	290	51.6	594	38.6
7	310	48.5	285	53.3	595	50.7
8	301	58.1	284	55.1	585	56.8
9	323	40.2	293	52.2	616	45.8
10	323	34.8	281	37.6	604	36.1
11	334	20.9	302	36.4	636	28.2
12	295	18.6	278	24.6	573	21.5
13	300	15.1	289	24.6	589	19.6
14	263	14.1	252	22.8	515	18.3

TABLE III
Prevalence of maxillary midline diastema (percentage) according to age, race and sex.

Age	WHITES		BLACKS	
	Male	Female	Male	Female
6	20.7	31.6	44.9	58.7
7	44.9	51.1	50.0	56.1
8	59.9	56.4	57.7	53.1
9	37.1	42.5	58.8	45.5
10	39.5	30.1	38.7	37.5
11	24.0	11.9	36.1	36.8
12	16.8	20.1	24.6	24.6
13	17.8	12.8	27.2	21.7
14	16.7	11.7	26.3	19.4

age. In the 6 year old black males the prevalence was 44.9% and in black females of the same age it was 58.7. The opposite was true at age 14, where males had a greater prevalence than females in both the races (Table III).

Size of the Diastema

There was a general trend for the mean size of the maxillary midline diastema to reduce with age. This was demonstrated by the mean width of the diastema of the total group which was 1.78 mm at 6 years of age, reducing to 1.45 mm at 14 years of age. There was a relatively constant decrease in the width of the midline diastema up to 10 years of age, after which the curve became somewhat more erratic, showing slight increases and decreases to age 14. No statistically significant racial or sexual differences were seen in the size of the diastemas between 6 and 9 years of age. Starting with the 10 year age level and going through to 14 years, excluding age 13, the mean width of the midline diastema in black children was larger than the mean width in white children. These differences were statistically significant at the .01 level of confidence. The mean widths were as follows: 1.57 mm at age 10 for black children and 1.17 mm for white children. At age 11, it was 1.60 mm for black children and 1.31 mm for white. At the age of 12, it was 1.63 mm for black children and 1.16 mm

for white. At age 13, it was larger in white children with 1.55 mm and 1.50 mm for black. At age 14, it was 1.67 mm for black children and 1.10 mm for white children.

The black children also tended to have a wider range than white children had at most age levels. The maximum range was found from 0.5 mm to 10.50 mm at age 7 in the black group.

DISCUSSION

This study points out several findings that are somewhat different from past beliefs. First, it was noted that the greatest prevalence of the midline diastema in the population studied occurred at the 8 year age level. It was previously generally believed that the greatest prevalence was at age 6. Though the investigators did not try to assess the causes of the presence of the diastema, it was noted that the greatest prevalence of the midline diastema occurred concomitantly with the eruption of the secondary maxillary central incisors.

In the children studied, there was a significant number of midline diastemas present in the 14 year olds, the total group prevalence being 18.31%. This finding indicates that the midline diastema is more than just a stage of development that is automatically eliminated with time, since a significant number of diastemas remain open. It

would be interesting to study this phenomenon further to diagnose the cases that will not close spontaneously with the complete eruption of the secondary dentition. This study does not deny the fact that there is a reduction in the prevalence of the midline diastema with age, but it does indicate that the condition is not always spontaneously eradicated with age. The data concurred with other studies regarding the prevalence of the maxillary midline diastema at the 14 year age level.^{8,9,10}

At all age levels the black children showed a higher incidence of maxillary midline diastema as compared with the white children, except at the age of 8 years, as evident from Table II. At 8 years the white children had a prevalence of 58.13%, as compared with 55.11% in the black children. The prevalence of the maxillary midline diastemas was relatively close between 8 and 10 years. At age 11 a great difference was observed in the prevalence. This greater prevalence in the occurrence of the maxillary midline diastema in black children agrees with other studies of this phenomenon.^{11,12} However, a significant variable entered the picture, i.e., a larger number of white children wearing orthodontic appliances or having had prior orthodontic treatment were eliminated from the study, while only a few black children were eliminated for the same reasons. The investigators wondered in what way the findings were affected by the number of children eliminated for wearing orthodontic appliances in the above ten year old group.

Sexual differences in prevalence were also noted in this study as shown in Table III. Females showed a higher incidence of maxillary midline diastemas at the 6 and 7 year age levels; the opposite was true at age 14 years where males showed a higher incidence. The black females had the

greatest percentage at age 6 and 7 years, while at ages 13 and 14 black males had the highest percentage among all the groups. No significant racial or sexual differences were found in the size of the maxillary midline diastemas between 6 to 9 years of age. Between 10 to 14 years, except at age 13, the size of the midline diastema was larger in black children than in white children. The sexual differences tend to reflect the earlier maturation of the females. It also raises the question as to whether the reduction in the prevalence would cease to occur if the study were extended to 16 to 18 year olds.

SUMMARY AND CONCLUSIONS

A biracial study of the maxillary midline diastema was conducted on 5,307 children of the Jackson, Tennessee school system. The sample included 2,554 black children and 2,753 white children. The purpose of the study was to determine the prevalence of the maxillary midline diastema in a large biracial group and to assess the racial and sexual differences and similarities observed. The findings are as follows:

1. The highest prevalence of the maxillary midline diastema was found to be at the 8 year age level.
2. The prevalence in both the races and the total group increased from the 6 year level to the 8 year level, and then it gradually decreased up to 14 years of age.
3. The black group showed higher prevalence of maxillary midline diastema than the white group at all age levels, except at age 8.
4. The females in both the groups showed greater prevalence at 6 and 7 years of age, but the opposite was true at 14 years where males showed greater prevalence.
5. No significant difference was

found in the mean widths of the diastemas from 6 years to 9 years, but beginning at age 10 up to 14 years the mean widths of the diastemas were larger in black children than in white children.

6. The size of the midline diastema had a tendency to reduce with age.

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