Malocclusion in Black Americans and Nyeri Kenyans
An Epidemiologic Study

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An epidemiologic study of the incidence of malocclusion in Black Americans and in Nyeri Kikuyu Kenyans. Caries incidence and missing teeth are also reported.

KEY WORDS: • Black African • Black American • Caries • Kenyan • Malocclusion • Missing Teeth •

Various attempts have been made to identify characteristics which typify certain population groups on the basis of such physical features as stature, skin pigmentation, and hair texture and color. Medical science has classified population groups in terms of disease prevalence, such as the high incidence of sickle cell anemia in Blacks and thalassemia in Jews.

Epidemiologic studies of the incidence of malocclusion in particular populations date back to the early 1900s.

In 1899 Angle first established his classification of occlusion based on molar relationships which is still used today (Angle 1907). His sample of 1000 Caucasians showed 69% to have normal occlusion or Class I malocclusion, 19% Class II[1], 4% Class II[2], 3.4% Class III malocclusions, and the remaining 4.6% had asymmetric occlusions.

Chiavaro (1915), Korkhaus (1928) and Hill, Blayney and Wolf (1959) published surveys showing general agreement with the findings in the Angle study on the distribution of malocclusions.

The earliest such study of Black Americans was reported by Altemus (1960). He found that of 3,280 Black children residing in Washington, D. C. and ranging in age from 12-16 years, 83% had normal occlusion or Class I malocclusion; 12% were Class II and 5% Class III. No description of the method of assessment is reported.

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A population of Black children in Ypsilanti, Michigan was examined in 1964 by BOWBEER AND DAY (1969), who reported similar findings of 83% normal or Class I malocclusion.

ENRICH, BRODIE AND BLAYNEY (1965) reported on an examination of 1,476 Black American children between the ages of 12 and 14 years in the Evanston-Oak Park area of Illinois. Their reported incidence of normal/Class I malocclusions (84%) and Class III (3%) were similar to those of Altemus; however, they reported only 7% Class II malocclusions compared to 12% reported by Altemus.

HOROWITZ (1970) compared 410 Black Americans in grades 5-7, age 9-14 years, with 349 Caucasians. He found more advanced dental development in the Blacks. Distribution of malocclusion was — Normal/Class I, 71% of Blacks, 53.6% of Whites; Class II 11.4% of Blacks, 33.6% of Whites; and Class III 6.3% of Blacks and 4.7% of Whites.

INFANTE (1975) compared 141 Black children, 2-5 years of age, with 680 Caucasians. The sample was derived from 36 states and the District of Columbia. Among the Black children 87% were normal/Class I and 13% Class II. Incidence among the White children was 77% normal/Class I and 21.4% Class II.

KAPILA (1983) recently reported on a comparison of 991 Asian children and 686 African children, all living in Nairobi, Kenya. He reported that the African children had "more normal" occlusions than the Asians. No specifics were given.

The present article reports on a survey of malocclusion incidence among Black children of Junior High school age in Indianapolis, Indiana, and a companion study of a similar age group of African school children of the Kikuyu tribe in Kenya. The purpose was to determine what differences might exist between the groups in the incidence of malocclusion, caries and missing teeth, in an effort to enhance our understanding of occlusal relationships in Black children.

— Materials and Methods —

The Black-American sample consisted of 209 males and 236 females 13-15YRS of age, drawn from four Junior High schools in the Indianapolis area. All were of Black American background based on skin color and "apparent lineage". Indianapolis had a population of 730,000 inhabitants in 1980, with Black Americans representing about 38% of that total.

The Kenyan sample was taken by the second author from nine schools in Nyeri Town, a district of Central Kenya. All of the children in this study were Kikuyu, one of the predominant tribes of Kenya. The other major tribe in Kenya is the Masai. The reason for studying the Kikuyu tribe was its homogeneity. The population of the Nyeri area in 1979 was 486,477, of whom more than 96% were Kikuyu and 57.7% under 15 years of age. The 13-14YR group represents 6% of the total population.

To assure accuracy in examination and recording, two examinations were done on each patient, with the data compared for uniformity. All patients were examined in their school room, in a standing position, with their backs against a wall. A tongue blade, flashlight and millimeter ruler were used, with an assistant present to record information.

The data collected included —

- Age to nearest month
- Mesiodistal molar occlusal relationship A, B, C, D, E. An ideal relationship was recorded as "C", a full-cusp Class II relationship as "A", and a full-cusp Class III as "E". Intermediate relationships were recorded as "B" or "D".
- Number of carious teeth
- Number of missing teeth
- Presence of crossbite

Statistical evaluation of the tabulated data included sex differences, means, standard error of difference, Z-values and P-values for significance at the .05 level of confidence.

— Results and Discussion —

Of the 445 Black Americans, 122 (27%) had acceptable occlusion, and 197 (44%) Class I malocclusion, for a combined Normal/Class I total of 71% (Table 1 and Fig. 1). These values are close to those of Horowitz and Infante. Class II malocclusion was found in 73 (16%) and Class III in 34 (8.7%), slightly higher but close to the values reported by Altemus.

The Kenyan sample included 85 (16.8%) acceptable occlusions and 261 (51.7%) Class I malocclusion, for a combined Normal/Class I total of 78.5%. Class II[1] was found in only 40 (7.9%), with no Class II[2] reported. The incidence of Class III was higher in the Kenyans than in any other Black sample reported, with 85 (16.8%).

Z-scores showed significant differences between the two populations. Black Americans showed a greater prevalence of Class II malocclusion, and Kenyans a stronger Class III tendency, at the .05 level of confidence.

The Authors feel that differences in the ancestral background of the Black American accounts for the higher incidence of Class II malocclusions. The ancestors of Black Americans originated in Africa, England, Ireland, Germany and many parts of the Caribbean. European dental traits are often described as retrognathic, small mandible and narrow facies, with crowded arches. The Kikuyu Kenyan, on the other hand, has a much more homogeneous and harmonious ancestral background.

The survey found no Class II[2] malocclusion in the Nyeri population and only 5 individuals (1.9%) in the Black American sample.

Differences between right and left molar occlusions were common in the Nyeri sample, less so among the Black Americans. Asymmetrical premature loss of deciduous teeth was the most commonly assumed reason for the asymmetry in right and left molar occlusions. Early loss of deciduous teeth quite often leads to mesial migration of permanent molars, resulting in a greater likelihood of Class II molar relationships.

Displaced second bicuspids accounted for most of the crossbites in the Kenyan sample, and this is often related to asymmetric molar relationships.

Table 1

Sample Distribution

N=950

Black American (445)		Occlusion	Kikuyu Kenyan (505)	
122	27%	Acceptable	85	16.8%
197	44%	Class I	261	51.7%
73	* 16%	Class II	40	* 7.9%
34	* 8.7%	Class III	85	* 16.8%
19	4.3%	Asymmetrical	34	6.8%

* Difference significant at .05%

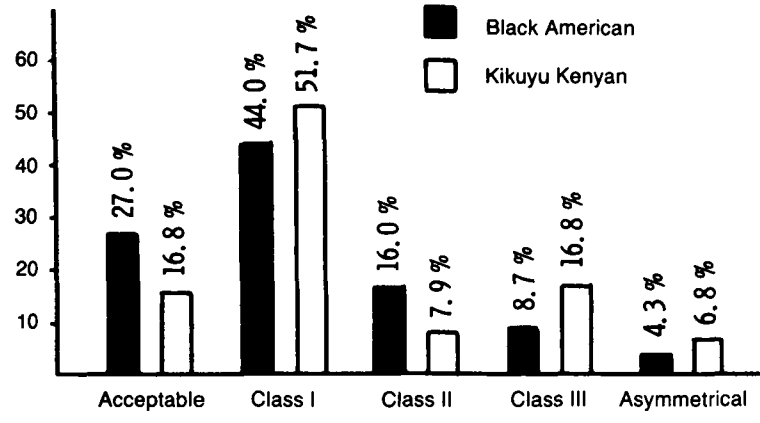

Fig. 1 Distribution of malocclusions in American and Kenyan Blacks

Anterior crossbites of lateral incisors were seen in the Black American sample with about the same frequency as in the Kenyan. These observations were based on clinical observation, without cephalometric information.

Table 2 and Fig. 2 show a total of 421 (94.6%) of Black American children and 476 (94.3%) of the Kenyan children with all permanent teeth present from 2ND molar to 2ND molar. One tooth was found to be missing in 11 (2.5%) of the Black Americans and 21 (4.2%) of the Kenyan children.

Z-scores showed no significant difference between the two groups. A general overview of Table 2 shows that congenital absence of permanent teeth is not a major affliction of either population. The Black American sample showed 43 teeth missing in the 445 children examined, and the Kenyan sample 38 teeth missing teeth in 505 children.

The only statistically significant difference at the .05% level was for 3 and 4 missing teeth, but this represents only the difference between 0.4% and 0.2%, and between 0.5% and 0, which is negligible from a clinical point of view.

Regarding the incidence of carious teeth, 292 (66.3%) of the Black Americans were caries-free, compared to 341 (67.5%) of the Kenyans (Table 3). Single cavities were found in 56 (12.6%) of the Black Americans and in 23 (4.6%) of the Kenyan children. Thirty-nine (8.8%) of the Black Americans had 2 carious teeth, compared to 55 (10.9%) of the Nyeri children.

Table 3 and Fig. 3 show the incidence of carious teeth. Significance of differences is greater for larger numbers of carious teeth, but the number of individuals involved is very small. Caries is a problem strongly related to civilized man's diet, which may account for the fact that the Kikuyu are relatively free of caries.

A few other observations made on the Black American sample are reported in

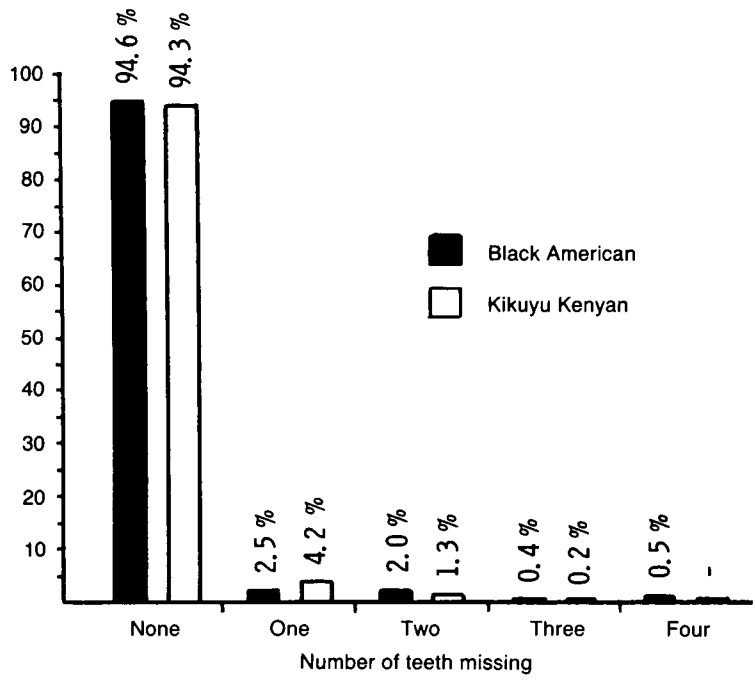

Fig. 2 Incidence of missing teeth (percent)

Table 2

Number of Subjects with Teeth Missing

Number of Teeth Missing	Black American			Kikuyu Kenyan	
421	94.6%	0		476	94.3%
11	2.5%	1		21	4.2%
9	2.0%	2		7	1.3%
2	* 0.4%	3		1	* 0.2%
2	* 0.5%	4		0	* -

* Difference significant at .05%

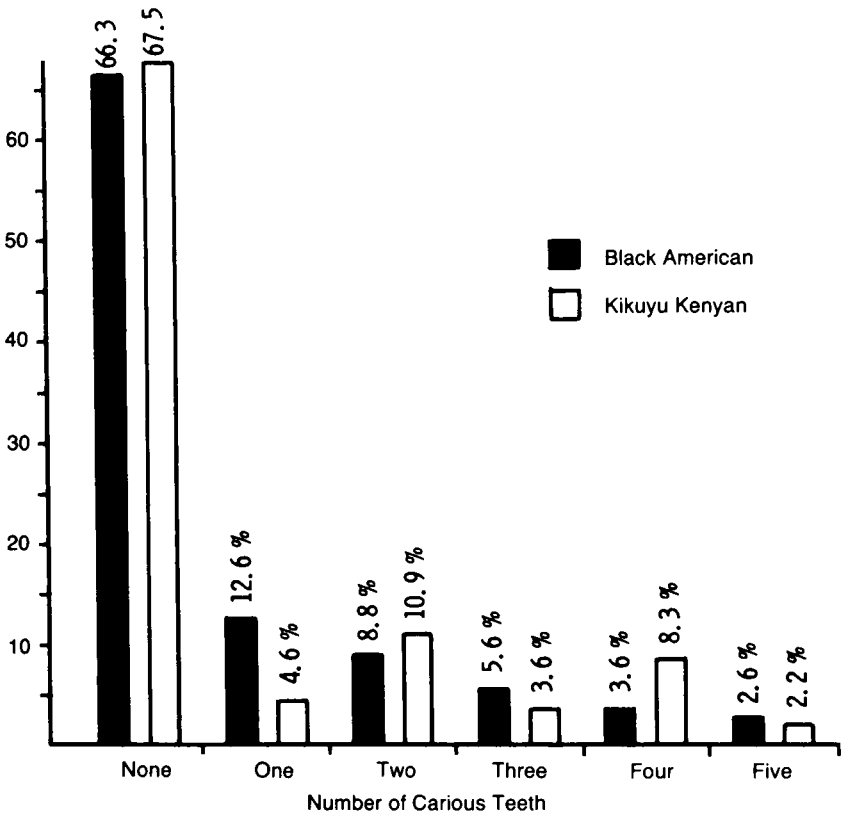

Fig. 3 Incidence of carious teeth (percent)

Table 3

Number of Subjects with Carious Teeth

Black American		Number of Carious Teeth	Kikuyu Kenyan	
292	66.3%	0 (P=.60)	341	67.5%
56	12.6%	1 (P=.78)	23	4.6%
39	8.8%	2 (P=.19)	55	10.9%
25	5.6%	3 (P=.13)	18	3.6%
16	3.6%	4 (P=.002)	42	8.3%
12	2.6%	5 (P=.92)	11	2.2%
4	0.9%	6 (P=.36)	6	1.2%
1	0.2%	7 (P=.073)	3	0.6%
-	-	8 (P=.015)	4	0.8%
-	-	9 (P=.50)	1	0.2%
-	-	10 (P=.50)	1	0.2%

Z-Scores P < .05 are considered significant

Table 4

Questionnaire Responses
(Black American Children)

How often do you visit a dentist?		
Never	121	27.2%
Less than yearly	115	25.9%
Once a year	123	27.6%
More than once a year	86	19.3%
Have you ever worn braces?		
No	401	94.8%
Yes (retainer)	17	4.0%
Yes (bandsand wires)	5	1.2%
Has your dentist or doctor ever told you that your teeth need straightening?		
Yes	73	16.4%
No	360	83.6%

Table 4. When asked whether they had ever visited a dentist, 121 (27.2%) said "no", and 209 (46.9%) reported at least annual visits. Of these same children, 401 (94.8%) had never worn braces, and 360 (83.6%) had never been told that they needed braces.

The Kenyan children commonly exhibited enamel fluorosis due to the high concentration of fluoride in the water (how much was not ascertained). Many of these children had white spots or brown or orange color attributed to fluorosis.

Dental development and eruption patterns were much more advanced in the Kenyan children than in the Indianapolis group. It was not unusual to find 32 teeth erupted and in good occlusion in a child only 13 or 14 years old, with spaces distal to the third molars.

— Conclusions —

Black Americans and Kikuyu (Nyeri Town children) have less crowded jaws than Caucasians and a lower incidence of Class II malocclusion. In both groups rampant caries appears to be a disease of the past. However, in Nyeri Town the Kikuyu children do not live in the bush as the Masai, and do occasionally present with civilized man's caries due to carbohydrates and refined sugars. Natural fluoride in the area seems to play a role in keeping caries incidence low.

It may be speculated that the heterogeneous ancestry of the Black Americans may play a significant role in their high incidence of Class II malocclusion. The much more advanced eruption patterns of the Kenyans at 13-14 years of age might be attributed to genetic or climatic factors.

References on next page

References

Altemus, L. A. 1959. Frequency of the Incidence of Malocclusion in American Negro Children Aged Twelve to Sixteen. *Angle Orthod.* 29:189-200.

Angle, E. H. 1907. *Malocclusion of the teeth* 7th ed. Philadelphia; S. S. White Mfg. Co.

Bowbeer, G. R. N., and Day, R. L. 1969. *An assessment of the Orthodontic Needs of a Junior High School Population.* Masters Thesis, University of Michigan, Ann Arbor, Michigan.

Chiavaro, A. 1915. Malocclusion of the Temporary Teeth. *Int. J. Orthod.* 1:171-79.

Enrich, R. E., Brodie, A. G., and Blayney, J. R. 1965. Prevalence of Class I, Class II, and Class III malocclusions (Angle) in an urban population. An Epidemiological study. *J. Dent. Res.* 44:947.

Hill, I. N., Blayney, J. R., and Wolf, W. 1959. The Evanston Dental Caries Study. XIX. Prevalence of Malocclusion of Children in a Fluoridated and Control Area. *J. Dent. Res.* 38:782-94.

Horowitz, H. S., and Doyle, B. S. 1970. Occlusal Relations in Children Born and Reared in an Optimally Fluoridated Community. II Clinical Findings. *Angle Orthod.* 40:104.

Infante, P. F. 1975. Malocclusion in the Deciduous Dentition in White, Black and Apache Indian Children. *Angle Orthod.* 45:213.

Kapila, S. 1983. Distribution of Malocclusions in Africans and Asian Children in some Nairobi Schools. *Odontostomatol. Trop. VI* 3:131.

Korkhaus, G. 1928. The Frequency of Orthodontic Anomalies at Various Ages. *Int. J. Orthod.* 14:120-35.