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ERUPTION TIMES OF THE PERMANENT TEETH IN 622 UGANDAN CHILDREN

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Summary—In a survey of oral conditions carried out in Uganda in 1966, eruption times of the permanent teeth were established for 622 children. Using both the mean and the median as expressions of central tendency, it was found that girls erupted their teeth earlier than boys, with the exception that the first tooth was erupted at an earlier age in boys than in girls. Neither the fluoride content of drinking water, nor the caries prevalence, nor ritual extractions of primary teeth in the geographic regions surveyed could account for the accelerated eruption of the permanent teeth. Earlier reports that eruption of permanent teeth is accelerated in Negro as compared with Caucasoid populations was corroborated by the present study.

INTRODUCTION

A SURVEY of oral conditions was carried out in Uganda in 1966 in order to evaluate the need for dental manpower in Uganda. Some of the results have been published; periodontal condition (SKOUGAARD, PINDBORG and ROED-PETERSEN, 1969), dental mutilations (PINDBORG, 1969), dental fluorosis (MØLLER *et al.*, 1970) and dental caries, enamel hypoplasias and enamel opacities (MØLLER *et al.*, 1971). In the present report, the eruption times of permanent teeth are analysed.

MATERIAL AND METHODS

General information on Uganda and details on selection of study samples are given by SKOUGAARD *et al.* (1969). Of the 1399 persons, 835 were under 15 yr of age. Two hundred and thirteen of these were excluded because they were non-Africans (of Asian descent).

The age was recorded as that reached by the latest birthday. It should be noted that recording age is difficult, as birth records are not always kept in Uganda and a person's age is not considered to be of particular significance. However, great efforts were made to establish the time of birth and the data are reasonably correct. A tooth was considered to be erupted when any portion of it had pierced the mucosa.

The eruption times were computed according to Kärber's method, as described by HAYES and MANTEL (1958), and was carried out for each of the 28 teeth of the permanent dentition; the third molars have been excluded. The data were analysed by electronic data processing and the median eruption times were calculated for each pair of homologous teeth by the graphic method.

RESULTS

Distribution by age and sex of the 622 children is shown in Table 1. Only the group of seven children, two years of age, showed an absence of erupted permanent teeth.

The eruption times obtained by Kärber's method were the mean eruption times. The computations are shown in Table 2.

Table 3 shows the mean eruption times in boys and girls for 28 permanent teeth. It will be noted that there were only slight differences between the right and left side. Table 4 gives the median eruption times for 14 pairs of teeth in boys and girls separately. Comparison between Tables 3 and 4 showed that the median in all cases was lower than the mean. The average difference for all teeth in both sexes was 0·5 yr.

DISCUSSION

When evaluating differences in tooth eruption times between various geographic areas or races, both fluoride content in drinking water and caries prevalence should be considered. Thus, SHORT (1944) found a significant retardation of the eruption of permanent teeth in areas with a fluoride content above 2·6 ppm F^- in the drinking water, compared to areas with lower concentrations. MØLLER (1965) made an extensive study of dental fluorosis and caries in Danish children. Although the data for

TABLE 1. DISTRIBUTION BY AGE AND SEX OF 622 NATIVE UGANDAN CHILDREN

Age	Boys	Girls	Both sexes
1	0	0	0
2	1	6	7
3	14	9	23
4	16	23	39
5	17	25	42
6	15	16	31
7	19	18	37
8	15	18	33
9	17	17	34
10	27	38	65
11	20	21	41
12	36	34	70
13	36	30	66
14	35	28	63
15	43	28	71
Total	311	311	622

Mean ages:
Boys 10·8 yr, ± S.D. 3·7.
Girls 10·1 yr, ± S.D. 3·7.
Both sexes 10·5 yr, ± S.D. 3·7.

TABLE 2. COMPUTATION BY KÄRBER'S METHOD OF THE MEAN ERUPTION TIME OF LOWER CANINE IN 311 UGANDAN GIRLS

Age	Number of girls	Number of girls with erupted canine	Proportion of girls with erupted canine (p)	Cumulated p
1	0	0	0	0
2	6	0	0	0
3	9	0	0	0
4	23	0	0	0
5	25	2	0·080	0·080
6	16	5	0·312	0·392
7	18	5	0·278	0·670
8	18	10	0·556	1·226
9	17	15	0·882	2·108
10	38	38	1·000	3·108
11	21	21	1·000	4·108
12	34	33	0·971	5·079
13	30	29	0·967	6·045
14	28	28	1·000	7·045
15	28	28	1·000	8·045 = S_1
			Sum of cumulated p	= 37·908 = S_2

M = 7·9546.
S.D. = 1·7441.
The above values were computed as follows:
$X_s = 15 + 0{\cdot}5 = 15{\cdot}5$
$d = 1$ yr
$M = d(X_s - S_1 + \frac{1}{2}) = 7{\cdot}9546$

$$\text{S.D.} = \sqrt{\frac{2S_2 - S_1(S_1 + 1) - 1}{d^2}} = 1{\cdot}7441.$$

some pairs of teeth seemed to corroborate the results of Short, the differences were so small as to be negligible. Møller suggested that a higher fluoride concentration would result in lower caries prevalence in deciduous teeth and these would be retained until the time of physiological shedding. The higher prevalence of caries in areas with low fluoride concentration would result in early loss of the primary teeth and premature eruption of the permanent dentition. Nevertheless, in a survey in Uganda by MØLLER *et al.* (1970) the fluoride content of drinking water in 75 per cent of the population examined was below the optimal concentration for Uganda (0·6 ppm), and yet the prevalence of dental caries was very low, not exceeding 0·3 DMF teeth per person. The caries prevalence and fluoride content in the drinking water may reasonably be excluded as likely causes of the accelerated eruption of permanent teeth found in the present survey. Ritual extractions of primary teeth were reported by PINDBORG (1969), but the overall rate of extraction of primary teeth was so low as to be negligible.

There was little difference in the mean eruption times of teeth of the right and left side in Ugandan children. This is in agreement with the findings of CLEMENTS, DAVIES-THOMAS and PICKETT (1953).

TABLE 3. MEAN ERUPTION TIMES FOR PERMANENT TEETH IN 311 BOYS AND 311 GIRLS IN UGANDA

			Boys		Girls	
			Mean	S.D.	Mean	S.D.
Maxilla	Right	7	10·5	1·9	9·7	1·6
		6	5·1	1·1	5·4	1·5
		5	10·4	2·0	9·6	1·6
		4	9·0	2·0	8·7	1·5
		3	10·1	1·9	9·3	1·9
		2	7·3	1·5	6·8	1·4
		1	6·1	1·0	6·2	1·2
	Left	1	6·1	1·2	6·1	1·5
		2	7·3	1·5	6·9	1·6
		3	10·0	1·8	9·2	1·7
		4	9·1	1·9	8·8	1·6
		5	10·5	1·7	9·6	1·4
		6	5·1	0·9	5·4	1·4
		7	10·5	1·9	9·8	1·5
Mandible	Right	7	10·2	2·1	9·3	1·5
		6	5·2	1·1	5·4	1·9
		5	10·3	2·0	9·8	1·8
		4	9·6	1·8	8·8	1·6
		3	9·5	1·9	8·0	1·7
		2	6·2	1·3	6·0	1·0
		1	5·5	1·0	5·3	0·8
	Left	1	5·5	0·8	5·3	1·0
		2	6·2	1·1	5·9	0·9
		3	9·6	2·1	8·0	1·9
		4	9·6	1·9	9·0	1·2
		5	10·5	2·0	9·8	1·9
		6	5·3	1·7	5·3	1·9
		7	10·1	2·1	9·4	1·5

Permanent teeth erupted slightly earlier in girls than in boys, as was found in 11 out of 14 pairs of homologous teeth. It is, however, peculiar that boys erupt the remaining 3 pairs of teeth (the first teeth to erupt) before the girls. SUK (1919) made similar observations but they have not been confirmed in other studies. In Caucasoids, however, there is no doubt that in girls, eruption of all pairs of teeth starts before the boys (ADLER, 1959).

A comparison of the eruption times in this study and in other Negro populations as well as Caucasoids is presented in Table 5. All these surveys used comparable criteria for eruption and the median was used as an expression of eruption times by all except STEGGERDA and HILL (1942), and HURME (1949) who used the mean. However, MACKAY and MARTIN (1952) give no indication of how they arrived at the

TABLE 4. MEDIAN ERUPTION TIMES IN YEARS IN 622 UGANDAN CHILDREN

Boys	Teeth	Girls
	Maxilla	
5·6	1 | 1	5·6
6·8	2 | 2	6·3
9·5	3 | 3	9·1
8·5	4 | 4	8·3
9·9	5 | 5	9·0
4·6	6 | 6	4·9
10·4	7 | 7	9·2
	Mandible	
5·1	1 | 1	4·9
5·7	2 | 2	5·6
9·0	3 | 3	7·5
9·1	4 | 4	8·2
9·5	5 | 5	9·1
4·8	6 | 6	4·6
9·5	7 | 7	8·8

"average eruption times". It may facilitate comparison that HURME (1957) stated that the mean age of eruption is 0·05–0·1 yr higher than the median age. CARR (1962) found that this difference is 1–3 months. In evaluating these data, it must be remembered that the difference would be even greater if a cross-sectional and a longitudinal study were compared; the latter shows the higher figures (DAHLBERG and MENEGAZ-BOCK, 1958). The differences found in the present material were slightly higher than the above figures (0·5 yr). As the standard deviations were also larger, it suggests that there was greater variation within this material than in other studies. This could be due to small groups, inaccurate records of age, or a true finding of the population.

The mean eruption times found by STEGGERDA and HILL (1942) are higher than the figures reported in other studies of Negro populations. This discrepancy might be accounted for by the fact that the study is longitudinal and thus would tend to give later eruption times than the cross-sectional studies with which it is compared. A further explanation might be that half the observation period (half a year) should have been subtracted from the figures presented to make the statistical evaluation valid (DAHLBERG and MENEGAZ-BOCK, 1958). With these exceptions in mind the eruption times are in good agreement within races, but Negroes erupt their permanent teeth 1–1·5 yr in advance of Caucasoids.

TABLE 5. COMPARATIVE DATA OF THE

Maxillary teeth	V. SUK (1919) Negroes, South Africa median				MACKAY and MARTIN (1952) Negroes Kenya average		HOUPT *et al.* (1967) Negroes, Ghana Median, graphically estimated				STEGGERDA and HILL (1942) Negroes, U.S.A. mean			
	Boys		Girls		Boys	Girls	Boys		Girls		Boys		Girls	
	Med.	S.D.	Med.	S.D.	A	A	Med.	S.D.	Med.	S.D.	Mean	S.D.	Mean	S.D.
1	5·97	1·10	6·15	0·90	6·9	6·5	6·3	1·3	6·0	2·1	7·77	0·16	7·20	0·81
2	6·99	1·44	7·17	1·23	8·1	7·7	7·5	1·3	7·3	1·5	8·50	0·18	8·22	0·15
3	10·21	1·62	9·65	1·47	10·7	10·2	10·4	1·8	9·5	1·8	11·81	0·14	10·44	0·12
4	10·15	1·34	9·80	1·25	10·0	9·6	9·5	2·1	9·0	1·9	10·82	0·20	10·11	0·11
5	10·67	1·21	10·02	1·14	10·9	10·3	10·5	2·0	10·0	2·0	11·92	0·15	11·02	0·12
6	5·26	0·68	5·74	0·59	5·4	5·3	5·0	1·5	5·0	1·6	6·57	0·30	7·13	0·14
7	11·33	1·21	10·93	1·32	11·3	10·8	10·9	1·9	10·9	2·0	12·49	0·15	11·82	0·10
Mandibular teeth														
1	5·39	0·75	5·82	0·67	5·8	5·8	5·3	1·1	5·1	1·6	7·00	0·17	6·31	0·21
2	5·97	1·10	6·18	0·97	6·9	6·4	6·1	1·4	6·4	1·7	8·00	0·18	7·18	0·15
3	9·57	1·28	9·10	0·80	10·3	9·5	10·0	2·0	8·9	1·6	11·03	0·15	9·70	0·13
4	10·07	1·42	9·71	1·06	10·2	9·6	9·8	2·2	9·2	1·7	10·92	0·15	10·33	0·14
5	10·78	1·33	10·12	1·19	11·0	10·7	10·6	2·2	10·3	2·0	11·53	0·15	10·74	0·13
6	5·19	0·64	5·49	0·74	5·4	5·1	4·9	1·2	4·5	1·2	6·85	0·21	6·33	0·15
7	11·04	1·09	10·61	1·52	11·2	10·3	10·8	1·9	10·5	1·8	12·30	0·14	11·50	0·14

Cited from HELLMAN (1943). BOAS (1933) has given average eruption times calculated from the same material. These figures are 0·1–0·3 yr smaller than those here recorded. Data are from the right side only.

The method of calculating the eruption times is not mentioned. Standard deviations are not given.

Longitudinal study. Data are for the right side only.

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Résumé—Au cours d'une étude concernant l'hygiene bucco-dentaire en Uganda, en 1966, l'âge d'éruption des dents permanentes a été déterminé pour 622 enfants. En utilisant la moyenne et le milieu comme tendance centrale, il s'est avéré que les dents des jeunes filles effectuent leur éruption plus précocement que celles des garçons, à l'exception de la première dent qui apparait à un plus jeune âge chez ces derniers. Ni le contenu en fluor de l'eau potable, ni la fréquence carieuse ni les extractions rituelles des dents temporaires dans les régions étudiées n'expliquent cette éruption accélérée des dents permanentes. Les études antérieures, qui montrent que l'éruption des dents permanentes est accélérée chez les Nègres par rapport aux populations blanches, sont ainsi confirmées.

Zusammenfassung—In einer in 1966 in Uganda durchführten Untersuchung über oralen Gesundheitsverhältnissen wurden auch die Eruptionszeiten der permanenten Zähne in 622 Kindern festgestellt. Sowohl die Mittelwerte als auch der Median wurde als Ausdruck zentraler Tendenz benutzt. Dabei wurde gefunden, dass bei den Mädchen die Zähne früher eruptierten als bei den Jungen, jedoch aber mit der Ausnahme, dass der permanente Zahn der zuerst eruptierte, in den Jungen zu finden war. Es wurde weiter gefunden, dass weder der Fluorhalt des Trinkwassers, noch der Kariesprevalenz noch vorkommende rituelle Extraktionen von Milchzähne in den geographischen Regionen der Untersuchung die akzelerierte Eruption der permanenten Zähne erklären konnten.

ERUPTION TIMES FOR PERMANENT TEETH

Hurme (1949) White Caucasians mean				Hurme (1948) White Caucasians median			Present study Negroes, Uganda mean				Median, graphically estimated	
Boys		Girls		Boys		Girls	Boys		Girls		Boys	Girls
Mean	S.D.	Mean	S.D.	Med.	S.D.	Med.	Mean	S.D.	Mean	S.D.	Med.	Med.
7·47	0·81	7·20	0·81	7·40	0·81	7·13	6·1	1·0	6·2	1·2	5·6	5·6
8·67	0·98	8·20	0·98	8·58	0·98	8·11	7·3	1·5	6·8	1·4	6·8	6·3
11·69	1·37	10·98	1·37				10·1	1·9	9·3	1·9	9·5	9·1
10·40	1·47	10·03	1·47				9·0	2·0	8·7	1·5	8·5	8·3
11·18	1·57	10·88	1·57				10·4	2·0	9·6	1·6	9·9	9·0
6·40	0·80	6·22	0·80	6·43	0·80	6·25	5·1	1·1	5·4	1·5	4·6	4·9
12·68	1·37	12·27	1·37				10·5	1·9	9·7	1·6	10·4	9·2
6·54	0·78	6·26	0·78	6·45	0·78	6·17	5·5	1·0	5·3	0·8	5·1	4·9
7·70	0·88	7·34	0·88	7·60	0·88	7·24	6·2	1·3	6·0	1·0	5·7	5·6
10·79	1·27	9·86	1·27				9·5	1·9	8·0	1·7	9·0	7·5
10·82	1·47	10·18	1·47				9·6	1·8	8·8	1·6	9·1	8·2
11·47	1·68	10·89	1·68				10·3	2·0	9·8	1·8	9·5	9·1
6·21	0·80	5·94	0·80	6·24	0·80	5·97	5·2	1·1	5·4	1·9	4·8	4·6
12·12	1·36	11·66	1·36				10·2	2·1	9·3	1·5	9·5	8·8

Data are compiled from 24 articles.

Standard deviations are for both sexes.

Data are for the right side only.

So wurden die Befunde anderer Authoren, dass die Eruption der permanenten Zähne in negroiden im Vergleich mit kaukasischen Populationen akzeleriert ist, in der vorliegenden Untersuchung bestätigt.

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