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A morphological and matrical study of the teeth, the jaws and the bony palate of several large groups of South African bantu-speaking negroids

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In the South African Bantu, Galloway (1937) and de Villiers (1964) noted a number of features, which have been described as typical of Bushmen or 'Boskop'. The Cape Nguni males have a higher average incidence of 'Boskop' features than the other tribal sub-groups. The Sotho, in contrast to the other three sub-groups, have the highest incidence of Bush features which is seemingly the result of direct hybridisation of the Sotho with Bushman tribes, in both early and recent times (de Villiers 1964). The relatively broader dental arch contours of the Sotho are possibly a result of this hybridisation with the Bushman whose dental arches are typically horse-shoe shape (de Villiers 1964).

Various studies on the early literature, skeletal remains and linguistic criteria, reviewed by de Villiers (1964), indicate that Bushman and Hottentot folk had been the earlier inhabitants of the region now occupied by the Nguni. The characteristically small maxillary and mandibular molars of the Natal Nguni males are possibly the effect of hybridisation with the earlier Khoisanoid inhabitants, as represented today by the Lake Chrissie Bushmen.

The Cape Nguni males, on the other hand, have mean cranial breadths and lengths, least frontal breadths, total sagittal arcs and horizontal perimeters which, according to de Villiers, are the highest recorded in her entire series. This and other craniometric evidence suggests hybridisation with a macrocranial people, such as the Gonaqua Hottentots, rather than a microcranial

people, such as the Bushmen. The larger maxillary and mandibular molar teeth found in the Cape Nguni are factors which appear to add further weight to the contention.

The large maxillary first premolars in Sotho males and the large maxillary first premolars, canines and first molars of the Miscellaneous group are likely the result of varied percentages of Bushman and Hottentot admixtures in these sub-groups.

It is evident from the morphological features and metrical dimensions of the jaws and teeth that the inter-group differences are generally minimal. This confirms and extends the craniological findings of de Villiers (1964) who, in her study of Southern Bantu skulls, concluded that on the basis of the very small size and shape distance among the four South African Negro tribal groups, it would be virtually impossible to separate the total series into its component groups.

On the basis of the foregoing morphological and metrical findings on the jaws and teeth, there seems little justification for maintaining the tribal subdivisions. For practical purposes, therefore, in studies of jaws and teeth, the four tribal series may be considered as samples of a single South African Negro population.

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CHAPTER 11

GENERAL SUMMARY

The Bantu generally possess large well-developed jaws with a minimum incidence of antero-posterior jaw dysplasia. Disto-occlusions were noted in only a little over 2.5 per cent of male and female skulls and only a single Class III jaw relationship was noted in an adult male skull.

Approximately three-quarters of the Bantu are readily able to accommodate all their teeth with no evidence of spacing or crowding. Crowding is evident in only about 10 per cent of maxillae and 25 per cent of mandibles. On the other hand, spacing is seen in approximately one out of every eight dentitions in both sexes. These factors suggest well developed jaws, which is confirmed by measurement.

The palates in the Bantu, although fairly deep, are not particularly long; rather they tend to be broad. Also the palates do not project unduly forward, as evidenced by the orthognathic profile angle which in the Bantu is similar to that of the Caucasoids. The dental arches in the Bantu, on the other hand, are longer and broader than those of most populations. The larger dental arches are associated with labially tipped incisor teeth. The heavy, flaccid, oro-labial musculature permits these generally large teeth to be severely proclinated, thereby

enabling teeth to be readily accommodated in the dental arches with no evidence of crowding in most instances.

The teeth exhibit a moderate degree of occlusal and interproximal attrition, less than the degree usually associated with primitive populations, but more than in Caucasoids. The degree of interproximal attrition is generally in keeping with the amount of occlusal attrition, both of which increase with age. The degree of attrition is usually greater in males, probably because of the heavier musculature and possibly because of their proneness towards chewing tobacco.

Although nearly half of the male Bantu skulls evince an edge-to-edge incisor relationship, there is no evidence to support the common assumption that there is a positive correlation between the amount of occlusal attrition in the molars and the degree of reduction of overbite. Only a third of the females possess the edge-to-edge incisor relationship commonly found in primitive populations. The modern refined diet very likely accounts for the only moderate degree of attrition in the Bantu.

The incidence of shovelling of maxillary incisor teeth is low, the incidence being about the lowest of all racial groups. The commonest type of maxillary incisor teeth are those which are smooth and free of ridges and tubercles. Ridges of varying degrees of prominence are, however, present in a fair proportion of maxillary incisor teeth.

The incidence of lingual tubercles of varying sizes in central and lateral incisor teeth is fairly high, the incidence in lateral incisor teeth being higher than in central incisors. However, marked tubercles are infrequently seen.

Approximately 38 per cent of the incisors of both sexes have an outline shape that is tapered. Square teeth are seen in about a third of the males and in about a quarter of the females. Ovoid teeth occur in a little over a quarter of males and in about one-third of females.

The maxillary molar cusp pattern in the Bantu is relatively stable. Four fully developed cusps are seen in all the maxillary first molars in males and in 98.7 per cent of females. Approximately 70 per cent of second molars in both sexes have four cusps and a little more than a quarter of the third maxillary molars are quadricuspid. Most human populations possess a high percentage of quadricuspid first molars, but the incidence of four-cusped second molars in different races is subject to far greater variation. The incidence of quadricuspid second molars in the Bantu is exceeded by those of Australian Aboriginals, Bushmen and Aleut males. The incidence of combined 4-and 3½-cusped maxillary third molars is higher only in the Australian Aboriginal.

The incidence of Carabelli's cusp or tubercle in maxillary first molars in both sexes is relatively high. The incidence of this cusp is less in second molars and

even less in third molars. The incidence in the Bantu is generally higher than in Mongoloids but less than in Caucasoids.

The basic lower molar pattern in man has 5 cusps and a Y-shaped groove system, the Dryopithecus pattern. This cusp and groove pattern is frequently altered and modified and is consequently useful in differentiating population groups. In the Bantu, the most frequent cusp pattern on lower first molars in both sexes is the Y5 pattern, which occurs in 90.7 per cent of males and 84.6 per cent of females. Approximately two-thirds of the second molars in both sexes are quadricuspid. The incidence of the Y5 pattern in third molars in males is only 6.6 per cent; in females the incidence is six times higher than in males (39.6 per cent). The overall incidence of the Y5 (cusp) (groove) molar pattern is generally highest in the Negroid races. Mongoloids possess a fairly high incidence of this pattern, whereas Caucasoids tend to have the smallest incidence of this Y5 molar pattern.

The incidence of the tuberculum sextum and of the accessory median lingual cusp on lower molars in Bantu are among the lowest and highest respectively of the populations studied.

Deep buccal grooves are not commonly seen on the buccal surfaces of the lower first and second molars, and are seen less frequently in third molars. Moderately deep buccal grooves are seen in approximately half of the lower first and second lower molars and in about one-third of the lower third molars. The greater percentage

of the latter teeth possess smooth buccal surfaces with only either a trace or complete absence of buccal grooves. Buccal pits were observed in approximately 6 per cent, 4.5 per cent and 3 per cent of lower first, second and third molars respectively in males. The percentage incidence in females is only very slightly higher.

The incidence of paramolar cusps on the buccal surfaces of molar teeth varies in different populations. In the Bantu, paramolar cusps appear to be relatively rare, though they are somewhat commoner in mandibular than in maxillary molars.

The calculated crown areas of all teeth in male Bantu, with the exception of the lower central incisors, are significantly larger than those of females. This is because all the mean B-L dimensions (with the exception of that of I_1), and all the M-D dimensions of the maxillary teeth (with the exception of that of P^2) and all the mandibular teeth (except I_1 and I_2) are significantly larger in males.

Although most of the absolute crown dimensions of teeth in Bantu males are larger than those of females, the only male teeth ~~in the upper jaw~~ which are significantly broader buccolingually (or shorter mesiodistally) are M^3, P^1, M^2 and M^3 in the upper jaw and $\underline{C}$ and P_1 in the lower jaw.

A determination of ratios revealed that the teeth with most sexual dimorphism of size and shape are $\underline{C}$ and M^3.

in the upper jaw, and $\bar{C}$ in hthe lower jaw. These teeth likewise exhibit the highest sex ratios in the M-D and B-L crown dimensions.

The teeth with the smallest sex difference in size are P^2 and I_1. This is in keeping with the similarly small sex differences recorded in their M-D and B-L crown diameters individually.

The crown areas of I^1 and P^1 in the upper jaw, and of I_2, P_1 and P_2 in the lower jaw, snow small sex differences. The M-D and B-L dimensions of these teeth do not necessarily evince the smallest sex differences.

The smallest sex differences in crown shape are the M^1 and M_1 of both sexes. The mean shape indices of P_2, M_1, M_2 are likewise only minimally sexually dimorphic.

The greatest degree of variation in tooth size is seen in I^2 and M^3 of both sexes in the upper jaw, and I_1 and M_3 of both sexes and I_2 in females, in the lower jaw. The M-D crown diameters of the same teeth are the most variable and probably account for most of the variance in crown area of these teeth.

Teeth which exhibit the greatest degree of variation in crown shape in the upper jaw are I^2 and M^3, whereas in the lower jaw I_1 and I_2 evince the greatest variability.

The least degree of variation in crown shape is noted in I^1 in the upper jaw and in M_1, M_2 and M_3 in the lower jaw.

In comparisons of the teeth of Bantu with those of other populations, it was seen that in the main Bantu teeth are close to the midpoint of the range of population means for living populations of man.

The mean M-D crown diameters of M^2 in the upper jaw and $\overline{C}$, P_1 and P_2 in the lower jaw tend to be larger than the interracial means for these teeth.

The mean B-L crown dimensions of maxillary and mandibular teeth in Bantu are all in the medium-sized category except for M^3 in both sexes, which teeth are relatively broad in Bantu.

The general tendency in maxillary teeth of both sexes in the Bantu is towards M-D shortness and B-L broadness. This tendency obtains in the lower jaw in which M_2 and M_3 are relatively the broadest teeth of all the available population series.

The dental arch dimensions and indices, and the palatal dimensions, of the various tribal groups, namely, Cape Nguni, Natal Nguni, Sotho and Miscellaneous, reveal no significant group differences.

The mean palatal indices, however, show Cape Nguni males to have significantly relatively broader palates than Natal Nguni and Miscellaneous male groups. The Sotho, too, have significantly broader palates than the Miscellaneous males. These metrical observations are partly borne out by morphological observations.

The Sotho and Miscellaneous tribal groups tend to have alveolar profile measurements which are slightly less than that of the two Nguni groups.

The maxillary molars of the Cape Nguni tend to have the least stable cusp numbers. This tendency in the Cape Nguni towards lesser stability of cusp pattern is reflected also in lower molars, particularly lower second molars in which the tendency for this group to retain the Y5 cusp groove pattern is less than in the other tribes.

The Sotho males and females and Natal Nguni females have a lower incidence of smooth lingual surfaces of their maxillary central and lateral incisors than that of the remaining tribes.

Characteristic of the Natal Nguni is the high incidence of the tuberculum sextum in lower molars of both sexes.

No differences in crown shapes were observed among the tribal sub-groups, but tooth size differences are, however, evident. The Natal males possess smaller maxillary and mandibular first molars and maxillary second molars.

The Cape Nguni males, on the other hand, have large maxillary and mandibular first and second molar teeth, and the mean M-D and B-L crown dimensions of these teeth being larger than those of the other tribes. The mandibular lateral incisor teeth of this group are generally small.

The Sotho and Miscellaneous males tend to have large maxillary first premolars, their mean M-D and B-L crown dimensions being larger than the combined group means.

The Miscellaneous males possess large maxillary canines and first molars owing to the large mean M-D crown diameter of the canine, and the large M-D and B-L crown dimensions of the molar.

The females of the various tribal sub-groups evince small, but not significant differences in crown size.

In sum, the sex differences in the morphology of the jaws and teeth in the South African Bantu-speaking Negroids are minimal. The greatest sex differences are in metrical features, in most of which male mean dimensions were significantly larger than those of females. A comparison of morphological features and metrical characters of the jaws and teeth of the four tribal subgroups revealed minimal differences. It was concluded that in jaw and teeth studies on South African Negroids, there is little justification for maintaining tribal subdivisions; rather, the tribal groups should be regarded as samples of a single South African Negro population.

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