The Craniofacial Morphology of Nubian Schoolchildren

CHARLES J. KOWALSKI, Ph.D.
JAMES E. HARRIS, D.D.S., M.S.
SUSAN J. WALKER, B.S.

In an earlier series of papers[1-7] we presented the descriptive statistics for a number of craniofacial measurements computed from a large sample of "normal" American Causasian school children. While the intent of these investigations was to provide the orthodontist with "normative" values for these measurements which might be of some utility in orthodontic diagnosis, case assessment and treatment planning, it was emphasized that "normality" is a multivariate phenomenon,[8,9] depending on proper *combinations* of dentofacial measurements, and that considerable care should be taken to account for other factors which could influence the applicability of such standards. This latter point was aptly put by Steiner[10] who, after giving the "normative" or "ideal" values for his battery of dentofacial measurements, cautioned the reader to, "Please bear in mind that these are rough estimates, to be used as a starting point from which to vary and must be modified by other factors . . . age, sex, race, growth potential and individual variations within these and other groupings." Following this lead, and concentrating on a potential racial difference in the light of other demonstrated variations in craniofacial morphology between different racial groups,[11,12] in this paper we present the descriptive statistics, by age and sex, of several craniofacial measurements computed from a sample of 254 Nubian school children collected as part of our study of ancient and modern Nubians.[13,14]

From the Department of Orthodontics and Dental Research Institute, University of Michigan, Ann Arbor, Michigan.

METHODS AND MATERIALS

The present study is based on direct measurements obtained from cephalometric tracings of lateral radiographs of 149 male and 105 female Nubian school children, ranging from 6 to 18 years of age. This sample is expected to be representative of "normal variation" in the modern Nubian population inasmuch as no special criteria, save the availability of the individual, were used in selecting the subjects. Roentgenographs were taken using a standard Wehmer headholder and a G.E. 90 Kv. x-ray source powered by a 3,000 watt portable generator[15] and were developed by a standard wet-process technique. Six craniofacial measurements are considered, these being directly comparable with the results already obtained for "normal" American Caucasian children. Two of these are incisal angular measurements[1-3] (the interincisal angle and the mandibular incisor-mandibular plane angle); two are measures of facial prognathism[4-6] (the SNA and SNB angles); and two are measures of mandibular size[4,16] which are studied to contrast the two groups' growth spurts as well as these aspects of mandibular morphology. All the statistical analyses were performed using MIDAS (Michigan Interactive Data Analysis System) developed by the Statistical Research Laboratory of the University of Michigan.

RESULTS

Table I contains the sample size, mean,

TABLE I

Statistics for the interincisal angle in 149 male and 105 female Nubian schoolchildren from 6 to 18 years of age.

	Male			*Female*		
Age	*N*	*Mean*	*S.D.*	*N*	*Mean*	*S.D.*
6-8	22	124.39	10.15	22	125.43	8.87
8-10	21	118.66	8.62	8	116.00	8.86
10-12	33	119.70	8.43	18	117.03	9.67
12-14	23	114.76	8.34	18	113.58	6.88
14-16	36	113.15	8.28	21	116.05	5.65
16-18	14	115.04	5.76	18	117.29	7.10

and standard deviation of the observed distribution of the interincisal angle, by age and sex, in the Nubian sample. There is no evidence of sexual dimorphism and (noting that in the 6-8 year old group the incisors are in, or have just completed, active eruption so that they have not as yet found their final position) no consistent developmental pattern, for either of the sexes, with respect to this measurement. Comparison with American Caucasian standards,[3] however, reveals an important racial difference. Whereas the American Caucasian mean value for this measurement in the 8-18 age range is of the order of 128°, the corresponding Nubian mean value is only, approximately, 115°. The incisors are, therefore, tipped much farther forward in the Nubian than they are in the American Caucasians. Otherwise stated, the Nubians exhibit a much higher degree of bimaxillary protrusion than that found among American Caucasians.

The descriptive statistics for the mandibular incisor-mandibular plane angle in the Nubian sample are given in Table II. These may be compared with our earlier results[1] and those offered by other investigators[17-20] for the distribution of this measurement in American Caucasians. It is seen that while these mean values agree relatively closely with our findings in "normal" American Caucasians, they differ considerably from the results of the other investigators who concentrated on the distribution of this measurement in children presenting "clinically excellent occlusions," agreeing on a mean value of near 90° and a range of "normal variation" (within this restricted population) from, roughly, 82° to 98°. Thus, in the context of this measurement, while the Nubian sample cannot on the average be considered to possess "clinically excellent occlusions," they do not drastically depart from the pattern observed among "normal" American Caucasians.

In Tables III and IV are the statistics for the SNA and SNB angles, respectively, in the Nubian population. No sexual dimorphism and no consist-

TABLE II

Statistics for the mandibular incisor/mandibular plane angle in 149 male and 105 female Nubian schoolchildren from 6 to 18 years of age.

	Male			*Female*		
Age	*N*	*Mean*	*S.D.*	*N*	*Mean*	*S.D.*
6-8	22	92.80	4.58	22	92.05	4.98
8-10	21	95.64	4.66	8	96.19	5.28
10-12	33	94.88	5.41	18	94.36	6.84
12-14	23	97.63	5.32	18	95.33	4.09
14-16	36	97.69	6.77	21	95.67	4.67
16-18	14	94.86	5.06	18	92.86	6.63

TABLE III

Statistics for the SNA angle in 149 male and 105 female Nubian schoolchildren from 6 to 18 years of age.

	Male			Female		
Age	*N*	*Mean*	*S.D.*	*N*	*Mean*	*S.D.*
6-8	22	81.68	2.90	22	81.36	4.15
8-10	21	80.48	2.91	8	83.50	4.42
10-12	33	81.53	2.77	18	81.11	3.97
12-14	23	79.48	4.27	18	81.67	2.30
14-16	36	81.27	3.31	21	81.81	3.59
16-18	14	82.18	4.10	18	82.06	2.20

TABLE IV

Statistics for the SNB angle in 149 male and 105 female Nubian schoolchildren from 6 to 18 years of age.

	Male			Female		
Age	*N*	*Mean*	*S.D.*	*N*	*Mean*	*S.D.*
6-8	22	77.02	3.03	22	76.91	4.13
8-10	21	77.29	2.35	8	78.75	2.34
10-12	33	77.29	3.02	18	77.67	3.62
12-14	23	76.24	3.72	18	78.03	2.53
14-16	36	78.11	2.42	21	78.71	3.35
16-18	14	79.54	4.78	18	78.42	2.90

ent developmental pattern is evident within the Nubian sample for the SNA angle and it is noted that they have somewhat smaller SNA angles than American Caucasians of the same age groups.[6] The SNB angle is, on the average, much the same as that found among American Caucasians[6] and, especially among the males of both the Nubian and Caucasian groups, tends to increase with increasing age. In the Caucasian sample the mean value of the ANB angle (the difference of the mean SNA and SNB angle values) becomes progressively more acute with age; this was related to the relatively longer growth period of the male mandibular complex.[4,16] A similar pattern, but with less apparent sexual dimorphism, is reflected in statistics measuring mandibular growth in the Nubian sample. In Table V we give the statistics for the length (mm) from *condylion* to *pogonion;* Table VI contains the corresponding information for mandibular length measured as the distance from *gonion* to *pogonion* projected along the mandibular plane (*gonion* to *menton*).

No matter which of these definitions of mandibular size is employed, it is clear that mandibular growth continues throughout the age range studied accounting for the observed increase with age of the SNB angle. Since the SNA angle remains relatively constant with respect to age, this causes the ANB angle to become more acute as mandibular growth progresses. While sexual dimorphism is not as pronounced as that previously observed among American Caucasians, this may be due to the fact that puberty occurs later in the Nubian population (16-18 for females; 17-19 for males), i.e., the divergence of the male and female growth curves has not as yet had time to assert itself. If the Nubian growth patterns follow those of American Caucasians, where female mandibular growth ceases shortly after puberty and male mandibular growth continues into the midtwenties,[16] this (potential) sexual dimorphism should become apparent as older age groups are added to the

TABLE V

Statistics for a measure of mandibular size (condylion to pogonion) in 149 male and 105 female Nubian schoolchildren from 6 to 18 years of age.

	Male			*Female*		
Age	*N*	*Mean*	*S.D.*	*N*	*Mean*	*S.D.*
6-8	22	103.24	5.87	22	98.57	6.28
8-10	21	106.67	4.53	8	104.85	3.71
10-12	33	109.21	4.95	18	107.34	4.62
12-14	23	112.15	4.26	18	114.26	4.93
14-16	36	117.02	6.23	21	117.89	5.84
16-18	14	123.76	4.58	14	122.52	4.57

TABLE VI

Statistics for a measure of mandibular length (gonion to pogonion) in 149 male and 105 female Nubian schoolchildren from 6 to 18 years of age.

	Male			*Female*		
Age	*N*	*Mean*	*S.D.*	*N*	*Mean*	*S.D.*
6-8	22	67.26	4.23	22	66.57	4.11
8-10	21	71.34	4.32	8	69.50	4.74
10-12	33	73.42	4.01	18	72.27	4.97
12-14	23	74.79	3.81	18	77.25	4.77
14-16	35	78.89	4.15	21	80.43	4.34
16-18	14	84.95	3.09	18	81.58	3.94

Nubian sample. It should also be noted that, for both sexes, the Nubians have consistently smaller ANB angles than do the American Caucasians of the same age range.

Summary and Conclusions

The descriptive statistics for the observed distributions of six craniofacial measurements in a sample of Nubian schoolchildren were presented and contrasted with the corresponding results for "normal" American Caucasian schoolchildren. The Nubian sample showed a much higher degree of bimaxillary protrusion, smaller SNA angles and smaller SNB angles than did the sample of American Caucasian children. The two groups did not differ to any appreciable extent with respect to the distribution of the mandibular incisor-mandibular plane angle, but both groups were considerably different from norms computed on samples of children presenting "clinically excellent occlusions." Since Nubians reach puberty later than American Caucasians, their mandibular growth patterns lag behind, but are otherwise similar to those for American Caucasian children.

School of Dentistry
Univ. of Michigan
Ann Arbor, Michigan

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