

CEPHALOMETRIC PATTERNS ON JAVANESE, BATAKS AND CHINESE STUDENTS IN JAKARTA

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Abstract

In 2000 a cephalometric survey has been done on both genders of Javanese, Bataks and Chinese students at the University of Indonesia (UI), the Indonesian Christian University (UKI) and the Christian University of Jakarta (UKRIDA) with the aim to detect their cephalometric characteristics patterns and the degree of their secular changes with their ancestors. Cephalometric parameters were measured as follows: the maximal head length (glabella-opisthocranion), the maximal head breadth (euryon-euryon), the minimal forehead breadth (frontotemporale-frontotemporale), the morphological facial height (suborbitale-gnathion), the bizygomatic breadth (zygion-zygion) and the bi-gonion breadth (gonion-gonion). In addition measurements were done on facial soft tissue factors such as the nasal height (suborbitale-subnasale) the nasal breadth (alare-alare), the ear length (superaurale-subaurale) and the ear breadth (preaurale-postaurale). The results were treated statistically using t test to obtain the degree of significance. It was determined that some cephalometric characteristics have undergone secular changes but both genders of Bataks, Javanese and Chinese students seemed to depict their retainment of their respective ancestors cephalometric characteristics, consequently their cephalometric characteristic differences were still detectable.

Keywords: measurements, students, protomalayid, deuteromalayid, modern mongoloid.

Introduction

For thousands of years Indonesian archipelago has been inhabited by about 18 secluded traditional populations which each of them was fractionated again into many clans at the beginning of the 20th century there a total of 214 clans, living secluded, caused by either natural or primordial traditional barriers¹. The Srivijaya and Majapahit great kingdoms and later on the European traders, the "Vereenigde Oost Indische Compagnie", which then were followed by the government of the "Nederlands Indische Kolonie" came to manage the archipelago. Since 1945 that Dutch Colony proclaimed its freedom to become the Republic of Indonesia.

Concerning the anthropological aspects, one may now observe the strong influence of mongoloid in the west and the north part of the Indonesian archipelago, while melanesoid influence is evident in the east and southeast of the archipelago and reaching its full manifestation in Irian Jaya (West Papua). Scattered mediterranean caucasoid influences are detected in the northwest and northeast of the archipelago. The newest layer of modern mongoloids or oversea Chinese has almost infiltrated the whole south west and north part of the archipelago.

Old Batavia, now called Jakarta, has been the capital city, during both the Dutch colonial period and the

Indonesian State period, has been considered for almost 200 years as a melting pot of interbreeding for many groups of people. However, the fact shows that ethnical seclusion still has been practiced by most ethnic groups who urbanized to Jakarta ever since.

Surveys on physical anthropology, with the idea of mapping the qualitative and quantitative characteristics of Indonesian ethnic physical groups, who inhabited Jakarta, has never been done since Dutch times². Therefore to obtain recent data on the issue, a survey has been done for the identification of the sub-ethnic physical groups that inhabited Jakarta, by cephalometric measurement of Javanese, Bataks and Chinese students at three different universities in Jakarta.

Methods

Three groups, consisting of Javanese, Bataks and Chinese students were selected based on the facts that the three groups are of mongoloid origin.

Cephalometric parameters measured were as follows: (1) maximal head length (glabella-opisthocranion or g-op); (2) maximal head breadth (euryon-euryon or eu-eu); (3) bizygomatic breadth (zygion-zygion or zy-zy); (4) minimal frontotemporale breadth or ft-ft. (5) bi-gonion breadth (gonion-gonion or go-go); (6) morphological facial height (sub-orbitale-gnathion or

so-gn); (7) nasal height (suborbitale-nasion or so-sn); (8) nasal breadth (alare-alare or al-al). (9) maximal mouth breadth (cheilion-cheilion or ch-ch); (10) intercanthic breadth (entocanthion-entocanthion or en-en); (11) outercanthic breadth (ektocanthion-ektocanthion or ex-ex); (12) Physiognomic ear length (superaurale-subaurale or sa-sba); (13) physiognomic ear breadth (postaurale-preaurale or pa-pra). Further on due to practical consideration in fixing the 'nasion' point, since 1982 it was preferred for all measurements to use the 'sub-orbitale' point, which is a point a few millimeters higher to the 'nasion' point.

The samples randomly collected were medical students UI, UKI and UKRIDA, in the age group of 19-26 years. All students were interviewed on his or her racial status of parents according to the objective of the study. The three groups consisted of Javanese students (52 males, 58 females), Bataks (32 males, 41 females) and Chinese (34 males, 43 females). All students were nutritional, neurological and musculoskeletal normal.

For measuring devices the sliding caliper straight and curve of Martin, and recording devices of Sony were used. The method of measurement was as follows: subject was measured in erect sitting position, head in Frankfurter Horizontale position. The measurement technique was as described by Martin & Saller³.

Result and Discussion

Table 1, contains mean and standard deviation values. Table 2, contains comparison between means value of the same parameters, using 't' test. Table 3 contains percentage of classification of head length (g-op), head breadth (eu-eu), face breadth (zy-zy) and morphological face height (so-gn). Table 4 contains percentage of classification of indices and Table 5 contains comparison on cephalometric data of mongoloid subraces in Java and Sumatra.

Bataks male characteristic as shown in Table 1: the longest head of all (g-op), medium head breadth (eu-eu), widest bi-zygomatic breadth (zy-zy), medium frontotemporale breadth (ft-ft), widest bi-gonion breadth (go-go), medium face height (so-gn), short nose (so-sn), broadest nose (al-al), medium mouth breadth (ch-ch), average innercanthic distance (en-en), average outercanthic distance (ex-ex), longest ear (sa-sba), average ear breadth (pa-pra). Table 2 confirms the presence of significant long head, wider bizygomatic breadth than Chinese, wider bigonion breadth than Javanese, wider nose breadth than Chinese, longer ear than Chinese. Table 3 confirms the dominance of male Bataks in their head length (47%), head breadth (47%), bizygomatic breadth (31%) and very high face height. We observe the Bataks male dominance in brachycephalic head index (53%), very narrow face/hyperleptoprosope (50%) and wide type face/yugomandibular index (4 1%).

Bataks female characteristics as shown in table 1 had similar position of means with the males, but this position will be corrected as shown in Table 2, which shows that the female Bataks head length are not absolute but merely longer than Javanese only by chance, the bigonial breadth of female Bataks are only wider than female Javanese, by chance too. Table 3 shows the percentage of long head type (71%), wide head type (50%), narrow type of bizygomatic breadth (56%) and very high facial height (70%). Table 4 which contains indices shows similar results of face index and yugomandibular index but head indices of brachycephalic (56%) and hyperbrachycephalic (29%) types. All in all, the specific cephalometric characteristics of Bataks groups are: dominance of head length types (g-op), dominance of bigonion breadth (go-go), brachycephalic head with the tendency toward mesocephalic in male Bataks and hyperbrachycephalic type in female.

Table 1. Means and Standard Deviations

Parameter	Male						Female					
	Java n.52		Batak n.32		Chinese n.34		Java n.58		Batak n.41		Chinese n.43	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
g-op	184.3	6.45	191.3	5.72	184.08	7.16	175.8	6	178.8	4.6	176.7	6.6
eu-eu	157.5	5.92	158.2	7.21	159.2	7.56	150.1	6	151.6	5.7	153.3	5.1
zy-zy	137.7	8.14	139.8	10	135.16	7.54	130	8	132.2	7.1	130.9	6
ft-ft	125.4	8.81	125.7	8.9	128.67	8.97	120.8	6.5	119.8	6.4	125	7.7
go-go	113.6	6.91	118.7	7.95	116.17	7.51	109.2	6.7	112.8	7	112.3	6.9
so-gn	127.4	6.72	128	6.17	129.05	6.29	119.8	6	121.3	5.1	121	6.9
so-sn	58.92	5.62	57.06	4.42	57.94	5.27	54.72	4.7	55.43	4.4	55.17	4.6
al-al	38.84	3.4	40.71	4.25	38.11	2.9	35.17	2.2	36.41	3.1	35.65	2.4
ch-ch	48.11	7.26	51.81	4.79	51.85	4.95	49.13	3.7	48.7	3.6	47.97	0.5
en-en	35.57	3.59	36.03	2.99	36.52	4.03	33.87	3.5	33.2	3.2	33.65	3.5
ex-ex	104.9	5.87	104.91	5.63	107.14	5.08	100.5	9.4	101.6	4.7	103.3	5.2
sa-sba	60.67	4.6	62.06	4.6	59.5	5.07	56.75	4.9	58.12	4.9	56.46	4.7
pa-pra	34.71	2.62	34.71	4.77	32.85	2.27	32.12	2.9	32.29	3	30.3	2.9

Tabel 2. Sigbificance "t" test

		<i>gop</i>	<i>eueu</i>	<i>zyzy</i>	<i>fiji</i>	<i>Gogo</i>	<i>sogn</i>	<i>sosn</i>	<i>alal</i>	<i>chch</i>	<i>enen</i>	<i>exex</i>	<i>sasba</i>	<i>papra</i>
Male	Javanese/Bataks	+	-	-	-	+	+	-	-	+	-	-	+	-
	Javanese/Chinese	-	+	-	+	-	-	-	-	+	-	+	-	+
	Bataks/Chinese	+	-	+	+	-	-	-	+	-	-	+	+	+
Female	Javanese/Bataks	+	-	-	-	+	-	-	-	-	-	-	+	+
	Javanese/Chinese	-	+	-	+	-	-	-	-	+	-	+	-	+
	Bataks/Chinese	-	-	-	+	-	-	-	-	+	-	+	+	+

(Significance level = 1%)

Javanese males characteristics are shown in Table 1: moderate head length (*g-op*), moderate head breadth (*eu-eu*), moderate bizygomatic breadth (*zyzy*), narrowest frontotemporale breadth (*ft-ft*), narrowest bigonion breadth (*go-go*), shortest face (*sogn*), longest nose (*so-sn*), medium nose breadth (*alal*), narrowest mouth breadth (*ch-ch*), shortest entocanthic breadth (*enen*), medium ectocanthic breadth (*ex-ex*), medium ear length (*sa-sba*) and ear breadth (*pa-pra*). Table 2 shows their head breath are narrower than that of Chinese and they had the narrowest mouth breadth. Table 3 shows that the medium type of head length (*g-op*) is 42 %, medium type of head breadth (*eu-eu*, 42%) and medium type of face breadth (*zy-zy*, 40%), very tall type of face height (*so-gn*, 44%), brachycephalic type (47%), hyperbrachycephalic type (35%), hyperleptoprosop type of face index (50%), very wide type of yugomandibular index (47%).

Javanese female characteristics are practically almost the same with the males except for (Table 1): shorter nose (*so-sn*), widest mouth breadth (*ch-ch*). Table 1 shows the shorter head length than Bataks, narrower head breadth than Chinese, narrower bigonion breadth than Bataks. Table 3 shows medium type of head length and wide type of head breadth. Table 4 shows hyperbrachycephalic type (40%), brachycephalic type (38%). In short, the specific characteristics of Javanese cephalometrics are: tendency toward moderate and small type of almost every measurement values. The only striking feature of Javanese is its tendency toward hyperbrachycephalic type.

Chinese male characteristics. Table 1 shows medium head length (*g-op*), and widest head breadth (*eu-eu*) narrowest bizygomatic breadth (*zy-zy*), widest frontotemporale breadth (*ft-ft*), medium bigonion breadth (*go-go*), highest face height (*so-gn*), medium nose length (*so-sn*), medium nose breadth (*al-al*), widest mouth breadth (*ch-ch*), medium innercantic distance (*enen*), widest ectocanthic distance (*ex-ex*), smallest ear (*sa-sba* and *pa-pra*). Table 2 confirms the wider of head breadth than Javanese, narrower bizygomatic breadth (*zy-zy*) than Bataks, widest frontotemporale (*ft-ft*) of all, narrower nose breadth than Bataks, widest ectocanthic breadth of all, smaller ear breadth. Table 3 shows the dominance of long head type, wide head type

narrow bizygomatic breadth, very tall face, 47% hyperbrachycephalic type, 30 % brachycephalic type, hyperleptoprosopic face type, wide type of yugomandibular index.

Chinese female also seems to follow the male characteristics, except for the smallest female mouth breadth of all. And medium face breadth type (*zy-zy*). In short, Chinese cephalometric characteristics are: widest frontotemporale breadth (*ft-ft*), wide head (*eu-eu*), widest ectocanthic breadth (*ex-ex*), small ear (*sa-sba* & *pa-pra*), and exceptionally due to meaningful percentages of ultrabrachycephalic type (18 % in male and 12 % in female) in Table 4, Chinese group has a very strong tendency toward the ultrabrachycephalic type.

Now that we have a clear vision on the specificity of each cephalometric characteristics of Bataks, Javanese and Chinese student populations in Jakarta.

Both genders of Bataks cephalometric characteristics are long head, wide bizygomatic breadth, wide bigonial breadth, brachycephalic head index with the remnants of meso cephalo in males and the progress toward hyperbrachycephaly in their females, wide nose and long ear.

Both genders of Javanese cephalometric characteristics are that almost all measurements fall into medium to small tendency. The smallest measurements are: frontotemporale distance (*ft-ft*), bigonion breadth (*go-go*), face height (*so-gn*), mouth breadth (*ch-ch*), entocanthic breadth (*enen*). Surprisingly the nose height (*so-sn*) is the longest of all. Cephalic indice is brachycephaly and hyperbrachycephaly dominance at both genders.

Both genders of Chinese cephalometric characteristics are wide frontotemporale breadth (*ft-ft*), wide ectocanthic breadth (*ex-ex*), small ear, hyperbrachycephaly and the tendency toward ultrabrachycephaly.

It is clear that three of them differ among each of them as their ancestors also differed among each other, as it is shown in Table 5. Speaking of ancestors, Bataks are protomalayid, Javanese are deuteromalayid and Indonesian Chinese are Hokianese, Cantonese or Moyenes descendants^{4,6}. The cephalometric

characteristics of protomalayid (Karo Bataks) were majority of mesocephaly and minority of dolichocephaly, head length of type, head breadth of wide type, wide bigonial breadth wide nose and long ear. This mode of change in cephalometric characteristics, happening after some generations, is considered as secular change in the head morphology.

Cephalometric characteristics of deuteromalayid (Javanese), were head length of medium type, head breadth also of medium type, wide bizygomatic breadth, brachycephaly. Meanwhile the cephalometric characteristics of deuteromalayid descendants in Jakarta were almost the same with their ancestors except for cephalic indices which undergoes secular change into brachy and hyperbrachecephaly.

Cephalometric characteristics of former Chinese of South China (Hokian, Canton and Moyen) as cited here were only cephalic indices-brachycephaly and mesocephaly. Their overseasdescendants in Indonesia, now Chinese students in Jakarta is brachycephaly and small number of ultrabrachycephaly, broad fore head (ft-ft), wide ectocanthic distance (ex-ex), small ear. This

progressive change in cephalic indice is noted as secular change too.

Long time ago anthropologists had a clear description of what differences were present between Bataks as protomalayid and Javanese as deuteromalayid and overseas Chinese (hoakiau) as ancestors of Chinese students in Jakarta as shown in Table 5. Results of this survey as presented in Tables 1-4, clearly depict the three populations, which still depict differences in certain important aspects of cephalometric characteristics such as head length (both genders of Bataks versus both genders of Chinese and Javanese, head breadth (Javanese vs. Chinese and Bataks), frontotemporale breadth (Chinese vs Bataks and Javanese), bi-gonion breadth (Bataks vs Javanese and Chinese), secular change in cephalic indice (brachycephalization process), those are: meso/brachycephaly for Bataks, brachy/hyperbrachypaly for Javanese and hyperbrachy/ultra-brachycephaly for Chinese. It is very interesting to state the very special characteristics of Bataks: the striking long of head length and wide bigonion breadth which was detected also by Uddin⁷ and Sofwanhadi^{8,9}.

Table 3. Classification of Craniofacial Measurements

	Head Length = (g-op)					
	Male			Female		
	Bataks	Javanese	Chinese	Bataks	Javanese	Chinese
Very short	0	4	0	0	0	2
Short	0	10	26	0	9	7
Moderate	19	42	30	22	48	27
Long	47	38	35	71	35	47
Very Long	34	6	9	7	9	7
	100	100	100	100	100	100
Head Breadth= (eu-eu)						
Very narrow	0	4	0	0	0	0
Narrow	0	10	26	0	7	0
Moderate	19	42	30	22	34	23
Wide	47	38	35	71	50	58
Very wide	34	6	9	7	9	19
	100	100	100	100	100	100
Face Breadth = (zy-zy)						
Very narrow	10	8	6	2	7	5
Narrow	22	31	56	17	33	23
Moderate	31	40	26	56	45	53
Wide	31	17	9	20	10	14
Very wide	6	4	3	5	5	5
	100	100	100	100	100	100
Face Height = (so-sn)						
Very short	0	2	0	0	0	0
Short	13	4	3	0	2	0
Moderate	9	18	15	10	12	16
Tall	34	32	37	290	36	26
Very tall	44	44	55	70	50	58
	100	100	100	100	100	100

Table 4. Classification of Craniofacial Index

Classification of Cephalic Index [(g-op)/(eu-eu) x 100]						
	Male			Female		
	Bataks	Javanese	Chinese	Bataks	Javanese	Chinese
Hiperdolikosefal	0	0	0	0	0	0
Dolikosefal	3	0	0	0	2	0
Mesosefal	28	12	5	15	17	2
Brakisefal	53	47	30	56	38	42
Hiperbrakisefal	10	35	47	29	40	44
Ultrabrakisefal	6	6	18	0	3	12
	100	100	100	100	100	100
Classification of Face Index [(so-gn)/(zy-zy) x 100]						
	Male			Female		
	Bataks	Javanese	Chinese	Bataks	Javanese	Chinese
Hipereriprosop	0%	6%	0%	3%	3%	2%
Enprosop	8%	13%	0%	0%	0%	0%
Mesoprosop	12%	9%	6%	11%	12%	9%
Leptoprosop	30%	25%	24%	19%	29%	28%
Hiperleptoprosop	50%	47%	70%	67%	56%	61%
Classification of Yugomandibular Index in Percentage						
	Male			Female		
	Bataks	Javanese	Chinese	Bataks	Javanese	Chinese
Very narrow	0%	0%	0%	0%	0%	0%
Narrow	14%	3%	0%	4%	0%	0%
Moderate	18%	16%	9%	12%	3%	8%
Wide	41%	34%	38%	29%	24%	21%
Very wide	27%	47%	63%	55%	73%	76%
Total	100%	100%	100%	100%	100%	100%

Efforts on studying the past history of human evolution is now strengthened by many disciplines such as social-cultural approach, geological approach and the most promising of all is biochemical or paleogenetics approach as already done by experts in that field^{10,11}. However, inasmuch advanced technology will be used in the fields of classical physical anthropology such as measurement methods, unless these will have no roots to grasp on.

Conclusions

A cephalometric survey on Bataks, Javanese and Indonesia Chinese student in Jakarta has been done. The results implied that cephalometric characteristics of those 3 groups differed from each other especially on their cephalic indices which still showed the stepwise difference along their route of progressive brachycephaliion process (secular change). Great head length of Bataks seemed to be the characteristic of protomalayid. Indeed, great head length and wide bigonion breadth were characteristics of Bataks, while small size measurements of almost all cephalometric parameters were found as Javanese cephalometric

characteristic. The difference between Javanese and Bataks is also due to secular change in the head morphology of protomalayid and deuteromalayid descendants. Chinese special features had a far advanced tendency of brachycephalization, strikingly large forehead, wide ectocanthic breadth and small ear.

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