

Head Morphology of Modern Dayak Kenyah Population in Borneo: A Tool for Forensic Identification

Maria Istiqomah Marini¹, Mieke Sylvia Margaretha²

¹Student, Department of Forensic Sciences, Airlangga University, Surabaya, Indonesia, ²Lecture, Department of Forensic Odontology, Faculty of Dentistry, Airlangga University, Surabaya, Indonesia

ABSTRACT

Background: Head morphology is important for determining race and sex for identification aid of unidentified remains. Head morphology is greatly affected by genetic factors and adaptation to the environment. Cephalic index is used to examine the head morphology.

Purpose: This study was done to see head morphology variation among modern Dayak Kenyah population in Borneo.

Materials and Methods: The present study is observational with cross-sectional study design and was done in Dayak Kenyah tribe community in Sungai Bawang cultural village which was performed on 70 Dayak Kenyah people who met the inclusive criteria. The measurement of head morphology is conducted with a spreading caliper.

Results: The cephalic index mean and standard deviation of males and females were 79.08 ± 5.37 and 79.55 ± 4.94 , respectively. The dominant type of the head shape for Dayak Kenyah males and females was mesocephalic with the second most common type was dolichocephalic.

Conclusions: There was no difference in the head shape in this present study and the previous study because of there was no changes in the environment factors. This study can be used to trace the origin of populations in Indonesia, especially Borneo and important for the database in forensic medicine and anthropology.

Key words: Cephalic index, Dayak Kenyah population of Borneo, Head morphology

INTRODUCTION

Indonesia comprises 360 ethnic groups inhabiting the islands and developing their own unique culture and custom.¹ There are three morphotypes defined by cephalic index, facial index, and nasal index. These three morphotypes are Protomalayid, Deuteromalayid, and Dayakid.² Cephalic index is the result of head width (measured from euryon to euryon (eu-eu)) divided by head length (measured from glabella to opisthion (g-op)).³

Dayak is a general (collective) terminology used to address indigenous people living in Kalimantan (Borneo). Dayak people spread across Kalimantan, including in Samarinda suburban area where they form and inhabit Sungai Bawang village (also called Sungai Bawang cultural village). Sungai Bawang cultural village is inhabited by Dayak Kenyah tribe. Dayak Kenyah tribe relies their living on Kalimantan tropical jungle. Kalimantan tropical jungle provides all their needs. Cultivating land, fishing,

foraging, hunting, gold mining, and cultivating rice fields are among the main activities carried out by Dayak Kenyah tribe.⁴

Human populations differ in relation to body size and shape, as do the males and females within each population.⁵ Human interaction with their environment causes physical changes on human morphology. Since modern study on Dayak Kenyah head morphological patterns has never conducted before, the writer attempts to conduct a study on this field. This study is very useful in serving basic data on head morphological patterns as forensic identification reference for Indonesian population.

MATERIALS AND METHODS

In this study, 70 samples of indigenous peoples of Dayak Kenyah tribe aged 18-45 years old were taken as participants. Indigenous people are those whose parents did not intermarriage with other racial group along two generation. This

CORRESPONDING AUTHOR:

Maria Istiqomah Marini,
Department of Forensic Sciences, Airlangga University, Surabaya, Indonesia.
E-mail: maria.istiqomah.marini-2015@pasca.unair.ac.id

Submission: 03-2017; Peer Review: 04-2017; Acceptance: 05-2017; Publication: 06-2017

information obtained from the head of family or if necessary from the local indigenous leader. This participant should physically and mentally healthy. Among 70 Dayak Kenyah populations, 38 were male and 32 were female. The study has been done in Sungai Bawang cultural village, Muara Badak districts, Kutai Kartanegara regency, East Kalimantan province. The study was carried out with protocol presentation and followed by Ethical Committee Clearance. Instrument used in the study was manual spreading caliper. Participants were informed about the study design, its benefits, and privacy of the data collected. Informed consent was given to each participant and consent was taken.

Participants were asked to sit in a relaxed state, straight, and looking forward. The measurement is conducted on the head with a spreading caliper to obtain the head breadth and the head length. All the measurements have been taken following the techniques of Martin and Saller. Cephalic index is the result of the head breadth (measured from euryon to euryon (eu-eu)) divided by the head length (measured from glabella to opisthion (g-op)).³ Cephalic index was classified according to Martin and Saller (Table 1).

RESULTS

In the present study of cephalic index, all measurements were expressed in millimeters. The data represent the mean and standard deviation of the actual values of head breadth, head length, and cephalic index of all participants. The results were shown in Tables 2 and 3. In Table 2, the result showed that the mean of males head breadth was 144.10 ± 8.29 with ranged from 125 to 160 mm. In females, head breadth was 138.21 ± 7.33 with ranged from 120 to 155 mm. The mean of males head length was 182.73 ± 13.64 with ranged from 140 to 197 mm, and in females, it was 174.21 ± 12.80 with ranged from 150 to 192 mm. The cephalic index mean and standard deviation of males and females were 79.08 ± 5.37 and 79.55 ± 4.94 , respectively.

Table 3 showed that the dominant type of head shape for Dayak Kenyah males was mesocephalic, which was 42.10%, followed by 26.32% of dolichocephalic, 18.42% of brachycephalic, and 7.9% of hyperbrachycephalic. Least common was 2.63% of hyperdolichocephalic and ultrabrachycephalic, whereas the dominant type of head shapes for Dayak Kenyah females were mesocephalic with 40.625%, followed by 25% of dolichocephalic, 15.625% of brachycephalic, and 12.5% of hyperbrachycephalic. With the least common was 6.25% of hyperdolichocephalic and with absence of ultrabrachycephalic.

DISCUSSION

The result of this study showed that the dominant shape of the head found in the Dayak Kenyah modern population is mesocephalic, with the order of the head shape (cephalic index) based on the percentage at most to least is as follow: Mesocephalic, dolichocephalic, brachycephalic, hyperbrachycephalic, hyperdolichocephalic, and ultrabrachycephalic. The previous research which had been done by Haddon in 1912 on the Dayak Kenyah population gained an average of mesocephalic cephalic index.⁶ In addition, Balner and Lebzelter also conducted a research in 1935 on Dayak Kenyah tribe and the result shown that the average of the cephalic index in the Dayak Kenyah population is mesocephalic.⁷ Similarities of

Table 1: Cephalic index (Martin-Saller Scale)³

Head shape	Male	Female
Hyperdolichocephalic	x-70.9	x-71.9
Dolichocephalic	71.0-75.9	72.0-76.9
Mesocephalic	76.0-80.9	77.0-81.9
Brachycephalic	81.0-85.4	82.0-86.4
Hyperbrachycephalic	85.5-90.9	86.5-91.9
Ultrabrachycephalic	91.0-x	92.0-x

Table 2: Results of cephalic index in Dayak Kenyah males and females

Parameters	Sex	N	Minimum-maximum (mm)	Mean±SD
Head breadth (eu-eu)	Male	38	125-160	144.10±8.29
	Female	32	120-155	138.21±7.33
Head length (g-op)	Male	38	140-197	182.73±13.64
	Female	32	150-192	174.21±12.80
Cephalic index (eu-eu/g-op)	Male	38	70-92.10	79.08±5.37
	Female	32	69.40-90	79.55±4.94

SD: Standard deviation

Table 3: Distribution of head type in Dayak Kenyah males and females

Male	Total (%)	Female	Total (%)
x-70.9 (hyperdolichocephalic)	1 (2.63)	x-71.9	2 (6.25)
71.0-75.9 (dolichocephalic)	10 (26.32)	72.0-76.9	8 (25)
76.0-80.9 (mesocephalic)	16 (42.10)	77.0-81.9	13 (40.625)
81.0-85.4 (brachycephalic)	7 (18.42)	82.0-86.4	5 (15.625)
85.5-90.9 (hyperbrachycephalic)	3 (7.9)	86.5-91.9	4 (12.5)
91.0-x (ultrabrachycephalic)	1 (2.63)	92.0-x	0 (0)

the findings indicate that there are no differences between the Dayak Kenyah population studied by Haddon in 1912, the study by Balner and Lebzelter in 1935 and this present study of Dayak Kenyah population that has lived near the urban environment and that has been modern.

The type of head depends on many factors, such as racial and ethnical affiliation, genetic influence, traditions, nutrition, environment, and climate.⁸ The kind of diet taken could also play a role in influencing the dominant head shape.⁹ The cephalic index in Dayak Kenyah modern populations has the same result with the previous research, it is presumably due to lack of change in environmental factors. In this research, the Dayak Kenyah populations have been living in modern area near cities but still do the tradition and culture of hunting and farming in the jungle of Kalimantan. The Dayak Kenyah tribe communities who are doing hunting survive by eating their catch, whereas the Dayak Kenyah communities who are farming survive by eating the vegetables or the yield from farming. The hunting and farming activity will affect the eating pattern. This eating pattern will affect the activity of mastication muscles which will affect the craniofacial growth. Because the mechanical loads on the skull have relation to masticatory forces.¹⁰ The activity of the Dayak Kenyah tribe communities in this research likely the same as the activity carried out by the Dayak Kenyah tribe communities that became the research subject of Haddon in 1912 as well

as research subjects of Balner and Lebzelter in 1935. Thus, the craniofacial morphology in the form of head and face can be seen from the result of head and facial index that share the same result with the previous research.

The most common head shape in the present study was mesocephalic, which was in agreement with the individuals from the North and South of Brazil (44% and 46%), individuals of the Mapuche ethnic group in the IX Region of Chile (66%), Gujaratis in India (41%), and Southern Odisha males and females (67.37% and 46.19%).¹¹⁻¹⁴ However, dolichocephalic head shape predominated among Indians (58.5%), Bulgarians (34%), and Serbs (39.2%).^{15,16} Brachycephalic predominated among of Turkmens (42.4%), Iranians (36.6%), and Sri Lankan population (66.15%).¹⁷⁻¹⁹

Cephalometric indices variations mostly reflect interactions between the width of the cranial base and the volume of the brain.²⁰ Variations in cephalic indices between and within populations have been attributed to a complex interaction of genetic and environmental factors.^{17,21,22} It was also show that changes occur in the head form and shape of subsequent generations of a specific population over a long period and dietary habits have been shown to influence the craniofacial form of a population.^{21,23,24}

CONCLUSION

There was no difference in head shape in this present study and the previous study because of there was no changes in the environment factors. This study can be used to trace the origin of populations in Indonesia, especially Borneo and important for the database in forensic medicine and anthropology.

REFERENCES

- Romdhon AR. . Reconstructive Forensic Identification Using Cephalometry Index. *Majority* 2015;4:23-8.
- Glinka J & Koesbardiati T. Morfotipe Wajah dan Kepala di Indonesia: Suatu Usaha Identifikasi Variasi Populasi (Facial and Head Morphotypes in Indonesia: An Attempt to Identify Population Variations). *Jurnal Anatomi Indonesia* 2007;2:41-6.
- Martin R, Saller K. *Lehrbuch der Anthropologie, Dritte Auflage*. Stuttgart: Gustav Fischer Verlag; 1957. p. 2.
- Masinambow SE, Konsep TG. *Tata Ruang Suku Bangsa Dayak Kenyah di Kalimantan Timur*. Jakarta: Departemen Pendidikan dan Kebudayaan RI; 1995. p. 146.
- Humphries AL, Ross AH. Craniofacial sexual dimorphism in two Portuguese skeletal samples. *Anthropologie* 2011;1:13-20.
- Haddon AC. *The Physical Characters of the Races and Peoples of Borneo*. London: Macmillan; 1912. p. 311-41.
- Balner L & Lebzelter V. Zur Biologie und Anthropologie der Kenja in Nordost-Borneo (Biology and Anthropology of Kenya in Northeast Borneo). *Anthropos* 1935;30:51-73, 495-508.
- Kpela T, Danborn B, Adebisi SS, Ojo SA. Anthropometric study of cephalic index of adult Tiv and Idoma ethnic groups of North Central Nigeria. *Glob Adv Res J* 2016;5:109-15.
- Yagain VK, Pai SR, Kalthur SG, Chethan P, Hemalatha I. Study of cephalic index in Indian students. *Int J Morphol* 2012;30:125-9.
- González-José R, Ramírez-Rozzi F, Sardi M, Martínez-Abadías N, Hernández M, Pucciarelli HM. Functional-cranial approach to the influence of economic strategy on skull morphology. *Am J Phys Anthropol* 2005;128:757-71.
- Alves HA, Santos MI, Melo FC, Wellington R. comparative study of the cephalic index of the population from the regions of the North and South of Brazil. *Int J Morphol* 2011;29:1370-4.
- Del Sol M. Cephalic index in a group of mapuche individuals in the IX Region of Chile. *Int J Morphol* 2005;23:241-6.
- Shah GV, Jadhav HR. The study of cephalic index in students of Gujarat. *J Anat Soc India* 2004;53:25-6.
- Patro S, Sahu R, Rath S. Study of cephalic index in southern Odisha population. *IOSR J Dent Med Sci* 2014;13:41-4.
- Bhatia M, Thin J, Debray H & Cabanes J. Etude anthropologique et genetique de la population du Nord de l'Inde (Anthropological and Genetic Study of the Population of Northern India). *Bull Et Mem. Soc. d'Anthrop. de Paris* 1955;10:199-213.
- Rexhepi A, Meka V. Cephalofacial morphological characteristics of Albanian Kosova population. *Int J Morphol* 2008;26:935-40.
- Golalipour MJ, Jahanshahi M, Haidari K. Morphological evaluation of head in Turkman males in Gorgan-North of Iran. *Int J Morphol* 2007;25:99-102.
- Abolhasanzadeh A, Farahani MR. Standarded international classification of head shapes of 22-24 years old in Tehran. *J Res Med* 2003;26:281-5.
- Ilayperuma I. Evaluation of cephalic indices: A clue for racial and sex diversity. *Int J Morphol* 2011;29:112-7.
- Lieberman DE, Pearson OM, Mowbray KM. Basic cranial influence on overall cranial shape. *J Hum Evol* 2002;38:291-315.
- Kasai K, Richards LC, Brown T. Comparative-study of craniofacial morphology in Japanese and Australian Aboriginal populations. *Hum Biol* 1993;65:821-34.
- Okupe RF, Coker OO, Gbajumo SA. Assessment of fetal biparietal diameter during normal pregnancy by ultrasound in Nigerian women. *Br J Obstet Gynaecol* 1984;91:629-32.
- Nakashima T. Brachycephalization in the head form of school girls in north Kyushu. *Sangyo. Ika Dainguku Zussshi* 1986;5:411-4.
- Vojdani Z, Bahmanpour S, Momeni S, Vasaghi A, Yazdizadeh A, Karamifar A, et al. Cephalometry in 14-18 year old girls and boys of Shiraz-Iran high school. *Int J Morphol* 2009;27:101-4.

HOW TO CITE THIS ARTICLE:

Marini MI, Margaretha MS. Head Morphology of Modern Dayak Kenyah Population in Borneo: A Tool for Forensic Identification. *Int J Prevent Public Health Sci* 2017;3(1):1-3.