THE DIFFERENCES OF HEAD SHAPE CHARACTERISTICS IN KALIMANTAN TRIBES USING FRONTOPARIETAL INDEX

(Morphological Identification Study of Head Shapes between Dayak Bukit Tribe, DayakNgaju Tribe and Banjar Hulu Tribes)

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ABSTRACT

Backgrounds: Kalimantan is the largest island in Indonesia that consists of 5 provinces, including South Kalimantan and Central Kalimantan. South Kalimantan and Central Kalimantan are inhabited by several tribes such as Dayak Bukit tribe, Banjar Hulu tribe and DayakNgaju tribe. The geographic condition of inter-ethnic residence affects the phenotype pattern that will characterize each population. Those characteristics can be measured using the frontoparietal index that are classified into 3 characteristic forms, which are <68.9% (Sthenomethopia/narrow forehead), 69.0-70.9% (Metriometopia/moderate forehead) and >71.0 (Eurymetopia/wide forehead). Objective: To know the difference in head shape characteristics using frontoparietal index between Dayak Bukit tribe, Banjar Hulu tribe and DayakNgaju tribe. Methods: This research was an analytic observational study with cross sectional design, using 180 people that consisted of 60 people from Dayak Bukit tribe, 60 people from DayakNgaju tribe, and 60 people from Banjar Hulu tribe which were measured by using digital caliper. Results: Measurements showed that the mean of frontoparietal index were 89.20% (Eurymetopia) in Dayak Bukit tribe, 88.77% (Eurymetopia) in BanjarHulu tribe, and 89.63% (Eurymetopia) in DayakNgaju tribe. The results of the research analyzed by Chi Square test with p=0.36 (p>0.05). It showed that there was no difference in head shape characteristics using frontoparietal index between Dayak Bukit tribe, Banjar Hulu tribe and DayakNgaju tribe. Conclusion: Frontoparietal index can not be used to differentiate the head shape characteristics of Dayak Bukit tribe, Banjar Hulu tribe and DayakNgaju tribe.

Keywords: Banjar Hulu’s Tribe, DayakBukit’s Tribe, DayakNgaju’s Tribes, Frontoparietal Index

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INTRODUCTION

Kalimantan is the largest island in Indonesia which consists of 5 provinces, include South Kalimantan and Central Kalimantan. The provinces of South Kalimantan and Central Kalimantan are inhabited by some tribes such as Dayak Bukit, Banjar Hulu and DayakNgaju tribes. Dayak Bukit tribe, DayakNgaju tribe, and Banjar Hulu tribe are located in different geographical conditions that force the tribe to adapt. Adaptation affects cultures and languages in people among other tribes. The geographical condition of inter-ethnic residence will also effect the typical pattern of individual phenotype of the tribe, so that the characteristics of each population may vary. This characteristic diversity occurs because of the interaction of genes and results in a physical appearance called phenotype. Phenotypes in individuals vary instructure, proportion, and size according to ethnic diversity.

Tribal diversity can be a genetic diversity, so different tribes will tend to have different body morphology and anatomical forms, including morphology of the head shape. The morphological diversity of each tribe can be helpful in forensic identification using anthropometry. A factor that complicates the identification using anthropometry is the inadequacy of population characterizations in Indonesian tribes. This difficulty is a problem in the identification of victims of unidentified corpses, deceased corpses, burnt bodies, bodies of mass
accidents, bodies of natural disasters, decaying bodies, body pieces or skeletons.\textsuperscript{4,5} This makes the measurement using anthropometry is important.

Anthropometry is a systematic measurement technique for expressing human body and bone dimensions quantitatively which is the basis of the science of physical anthropology.\textsuperscript{3} Cephalometry is part of anthropometry based on the morphological character of the head and human face.\textsuperscript{2} The cephalic index distinguishes individuals from a particular tribe into 3 types of foreheads, namely Sthenometopia (narrow forehead), Metriometopia (moderate forehead), and Eurymetopia (wide forehead).\textsuperscript{6}

A study conducted by Lubis (2017) on 32 respondents, 16 men and 16 women Balinese in Lampung, showed that there was a difference in mean frontoparietal index between men and women, where women had a larger frontoparietal index (67.35\%) compared to men (73.77\%). The Lubis research (2017) also obtained results of 32 respondents from male and female gender of Batak tribe in Lampung which showed difference in the mean of frontoparietal index toward both sex group. It is shown that the mean male frontoparietal index was bigger than female with 74.33\% and 74.10\% which classified as eurymetopia (forehead).\textsuperscript{7}

The purpose of this study is to determine the differences in head shape characteristics using frontoparietal index between Dayak Bukit tribe, Dayak Ngaju tribe and Banjar Hulu tribes.

MATERIALS AND METHODS

The implementation of the research began with asking the research permit and ethical clearance issued by the Ethics Committee of Faculty of Dentistry, University of Lambung Mangkurah No.064/KEPKG-FKGULM/EC/IX/2017. This research used analytic observational method with cross sectional design. The sample of the research was 180 people consist of 60 Dayak Bukit tribe, 60 people Dayak Ngaju tribe, and 60 people of Banjar Hulu tribe based on calculation using Slovin formula. Inclusion criteria in this research were those who willing to be a research respondent, Dayak Bukit tribe / Dayak Ngaju tribe / Banjar Hulu tribe and aged 19-50 years. Exclusion criteria in this study were the existence of skull bone deformities namely the frontal bone and zygomatic bone due to injury and surgical injury.

The research was conducted on August-November 2017 at Kiyu Village, Batang Alai Timur Sub-district, Bukit Bamba Village, Central Kahayan Sub-district, and Banua Kapayang Village, Sub-district of Labuan Amas Selatan. Research materials used in this research were informed consent sheets, questionnaire sheets, digital callipers and stationery. Research subjects sat quietly (relax) and their head were positioned in anatomical position.\textsuperscript{7} Subjects then were marked with easily removed stationery at their anatomical point for three times and we took the average value.

The measured points were the width of the face and minimum width of the frontal. The width of the face were measured from byzygomatic, the distance from the two zygion (zy-zy), were then measured using a digital calliper with mm units and numerical scale data, while the minimum frontal width was a measurement of distance from both frontotemporal points which measured by using a digital calliper with mm. The data was in numerical scale.\textsuperscript{8}

Before performing the measurement, the digital caliper equipment had been calibrated on each measurement to maintain the validity of the tools. The data was then entered into the questionnaire provided along with the subject's personal data and the questions which stating that the respondent was included in the inclusion criteria.

From the results of numerical data on both measurements, the width of the head and the width of the frontal minimum then calculated and classified using frontoparietal index that states the shape of the forehead using the following formula:\textsuperscript{2}

\[\text{Frontoparietal index} = \frac{\text{Frontal min width (ft-ft)}}{\text{Face Width (zy-zy)}} \times 100\%\]

Note:

- Ft-ft: Fronto temporal- fronto temporal
- Zy-zy: Zygomatic-zygomatic

The frontoparietal index will categorize the head shape into three categories based on numerical data, which are:\textsuperscript{6}

a. Frontoparietal index value $\leq 68.9\%$ is sthenoetopia (narrow forehead)

b. Frontoparietal index value of 69.0-70.9\% is metriometopia (moderate forehead)

c. Frontoparietal index value of $\geq 71.0\%$ is eurymetopia (wide forehead)
The result of categorical data using the frontoparietal index then analyzed with non-parametric analysis test using Chi Square Test. The test were chosen because the data was categorical data with 95% confidence level to compare head shape characteristics using frontoparietal index between Dayak Bukit tribe, Dayak Ngaju tribe and Banjar Hulu tribe. If the requirements of Chi Square test were not met then an alternative test would be done using Fisher Exact test.

**RESULTS**

The calculation of frontoparietal index was done on Dayak Bukit, Dayak Ngaju, and Banjar Hulu tribe. Based on the frontoparietal index, the description is presented in the table as follows.

Table 1 Mean of Frontoparietal Index on Dayak Bukit, Dayak Ngaju and Banjar Hulu tribe

<table>
<thead>
<tr>
<th>Tribe</th>
<th>Mean (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dayak Bukit</td>
<td>89.20</td>
</tr>
<tr>
<td>Dayak Ngaju</td>
<td>88.77</td>
</tr>
<tr>
<td>Banjar Hulu</td>
<td>89.63</td>
</tr>
</tbody>
</table>

Table 1 shows that the lowest mean of frontoparietal index measured is in Dayak Ngaju tribe and the highest is in Banjar Hulu tribe.

Characteristics of head shape based on frontoparietal index in Dayak Bukit, Dayak Ngaju tribe and Banjar Hulu tribe as a whole, can be seen in the following table:

Table 2 Characteristics of Head Shape Using Frontoparietal Index on Dayak Bukit, Dayak Ngaju and Banjar Hulu tribe

<table>
<thead>
<tr>
<th>Characteristic of IF</th>
<th>DBT</th>
<th>DNT</th>
<th>BHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>M</td>
<td>0</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td>E</td>
<td>60</td>
<td>59</td>
<td>98.3</td>
</tr>
</tbody>
</table>

Note:
- IF = Frontoparietal Index
- S = Sthenometopia (narrow forehead / ≤ 68.9%)
- M = Metriometopia (moderate forehead / 69.0-70.9%)
- E = Eurymetopia (forehead width / ≥71.0%)

Characteristics of head shape were measured by using frontoparietal index in each tribe with Eurymetopia (wide forehead) head shape characteristic.

Table 3 Mean of Frontoparietal Index by gender of Dayak Bukit tribe, Dayak Ngaju tribe and Banjar Hulu tribe

<table>
<thead>
<tr>
<th>Tribe</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dayak Bukit</td>
<td>88.52</td>
<td>89.89</td>
</tr>
<tr>
<td>Dayak Ngaju</td>
<td>89.06</td>
<td>87.35</td>
</tr>
<tr>
<td>Banjar Hulu</td>
<td>90.21</td>
<td>89.05</td>
</tr>
</tbody>
</table>

Note:
- DNT = Dayak Ngaju Tribe
- DBT = Dayak Bukit Tribe
- BHT = Banjar Hulu Tribe

The mean of frontoparietal index in Banjar Hulu tribe men is greater than the mean of frontoparietal index in Dayak Bukit tribe men and Dayak Ngaju tribe men. The mean of frontoparietal index in Dayak Bukit women is greater than the mean of frontoparietal index of Banjar Hulu women and Dayak Ngaju tribe women.

Data obtained from the results of this study were analyzed using Chi-Square statistical test to determine whether there are differences in head shape characteristics using index between the three tribes. Chi-Square test results showed that value p = 0.36 (p <0.05). It means that there was no difference in head shape characteristics using frontoparietal index.

Chi-Square test result on head shape characteristics using frontoparietal index between Dayak Ngaju tribe and Dayak Bukit tribe did not meet the requirement of the test, so that Fisher's Exact test was performed. Fisher's Exact test obtained value of p = 1.00 (p> 0.05). This result showed that there was no difference in head shape characteristics by frontoparietal index between Dayak Ngaju tribe and Dayak Bukit tribe.

**DISCUSSION**

The results of this study indicate that the characteristics of head shape using frontoparietal index shows the characteristics of Eurymetopia (forehead) in the three ethnic groups: Dayak Bukit, Dayak Ngaju and Banjar Hulu, but it can be found Metriometopia (middle forehead) on one...
respondent from DayakNgaju tribe. This study found no difference in head shape using frontoparietal index between Dayak Bukit tribe, DayakNgaju tribe and Banjar Hulu tribe so that the frontoparietal index in this study can not be used as the differentiation between the three tribes. This is in line with Jadav (2011) theory which states that genetic factors are factors that greatly affect the shape and size of the head. This can be due to the fact that Dayak Bukit tribe, Banjar Hulu and DayakNgaju tribe is stated in recent study as Mongoloid race.  

The theory according to TjilikRiwut (1979) from the point of view of migration assumes that the Dayak Bukit tribe belongs to the same tribe as the DayakNgaju tribe, while according to Radam (1987) from the socioeconomics point of view assume that the Banjar Hulu and Dayak Bukit tribes come from the same clump. From the results of this study through the physical and anthropometry approach performed by using frontoparietal index, it is found that the frontoparietal index can not distinguish the tribe (subras) and can only prove the kinship of the big race of Mongoloid race. According to Haldene (Daldjoeni, 1991), race is a group of humans who have a unity of physical character and geographical origin within a certain area, while the tribe (subras) according to Koentjaraningrat (2002) is a group of people bound by the awareness and identity of "cultural unity". This is in line with the melting pot theory 2 (Ethnic Synthesis) which states that the formation of a tribe occurs due to the melting of individual backgrounds incorporated into a new container both in the form of religious identity, ethnic, language and original culture of its members. It can be concluded based on the theory that the physicality approach of the three tribes makes no difference because of the same racial background.

Another theory that suspected to be related with the result of this research is the theory proposed by Daud (1997). He stated that Dayak tribe is a group of Proto Malay (Old Malay), while the Banjar tribe is the result of mix between two groups namely Proto Malay (Old Malay) and Deurro Malay (New Malay). Proto Malay race is a group consisted of Batak, Dayak, Nias, Kubu, Sasaak and Toraja people. Deurro Malay Race are people consisted in the tribes of Aceh, Minangkabau, Java, Madura, Bali, Bugis, Makasar, Manado, Sundanese, Malay, and Batavia.

This is in line with the research conducted by Lubis (2017) that there is no difference in head shape characteristics using frontoparietal index between Batak tribe from Proto Malay (Old Malay) group and Balinese Tribe from Deurro Malay (New Malay) with Eurymetopia characteristic (wide forehead). Romdhon (2015) study found that the characteristics of the head shape using the frontoparietal index of the Minang Tribe population belonging to the Deurro Malay and Nias racial groups including the Proto-Malay race group in West Sumatra. It showed no variation in head shape characteristics using the frontoparietal index and results in the fact that Eurymetopia (wide forehead) is the characteristics of the two tribes: Deurro Malay and Proto Malay races.

The similarity of head shape characteristics using frontoparietal index between Dayak Bukit tribe, DayakNgaju tribe and Banjar Hulu tribe is stated in recent study by Cray and James (2009). It is also stated that the diversity of craniofacial morphology is produced by complex interaction of environmental variables including muscles function factor, genetic factors, hormonal factors, and environmental factors. Environmental factor is like the geographic areas inhabited by a population. The result of the research is in line with the theory that DayakNgaju tribe, BanjarHulu tribe and Dayak Bukit tribe population are located in geographical area which is not much different. The Dayak Bukit tribe inhabits the Meratus Mountains region, the Banjar Hulu tribe inhabits the river valley in the Meratus Mountains and the DayakNgaju tribe inhabits the Kapuas and Kahayam rivers.

Based on the result, it can be concluded that head shape characteristics using frontoparietal index can not be used to distinguish Dayak Bukit tribe, Banjar Hulu and DayakNgaju tribes which have Eurymetopia characteristic (wide forehead).

REFERENCES