COMPARISON OF CRANIOFACIAL ANTHROPOMETRIC AMONG ETHNIC BAJAU AND ETHNIC RUNGUS IN SABAH

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DECLARATION

I hereby acknowledge that the material in this thesis is original except for quotations, equations, summaries, excerpts, and references, which have been duly acknowledged.

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ABSTRACT

Craniofacial anthropometry is a measurement of skull and face. It can be defined by size and shape, and both are analyzed. Quantitatively determining the extent of deviation of an individual's facial pattern from the normal state requires the collection of data on normal individuals in order to establish numerical descriptions of normal measurement ranges. Several studies showed anthropometric differences between racial groups. The objectives of this study is to compare craniofacial norms and proportions among Rungus ethnic and Bajau ethnic groups in Sabah, their relation to divine proportion, cephalic index (CI) and prosopic index (PI) of both ethnic groups. A total of four hundrend subjects of Rungus and Bajau have been recruited for this study. The measurements were obtained by using Martin breadth spreading caliper and measuring tape. Twenty four linear measurements were taken twice from twenty landmarks from six craniofacial regions and were marked on the skin using eyeliner. In Rungus ethnic, the obvious different measurement contributed to significantly different result (p value <0.05), except for width of the head (eu-eu), length of the head (g-op), forehead height I (tr-g), forehead height II (tr-n), and protrusion of nasal (sn-prn) for both respective gender and the higher measurement were found in Rungus males. Bajau males and females established significantly difference (p value <0.05) in the measurement of the distance from the top of the head to lower border of chin (v-gn), special forehead height (v-en), height of calva (v-tr), special face height (en-gn), special upper face height (g-sn), face height (n-gn), lower face height (sn-gn), facial width I (zy-zy), facial width II (tp-tp), eye fissure width (ex-en), biocular width (ex-ex), nose length (n-sn), nose width (al-al), protrusion of nasal (sn-prn), alar length (ac-prn), mouth width (ch-ch), upper lips height (sn-sto) and ear length (sa-sba) in both gender. In comparison of both ethnic groups, the width of head (eu-eu), the length of head (g-op), the distance from the top of head to lower border of chin (v-gn), special forehead height (v-en), height of calva (v-tr), special face height (en-gn), special upper face height (g-sn), lower face height (sn-gn), facial width I (zy-zy), facial width II (tp-tp), eye-fissure width (ex-en), biocular width (ex-ex), protrusion of nasal (sn-prn), alar length (ac-prn) and ear length (sa-sba) can be used to differentiate a Rungus face from a Bajau. Both ethnic groups had

proportion more than 1.618 which is not considered as ideal facial proportion. The mean cephalic index in Rungus males were 62.6±6.1 and Rungus females were 61.3±4.9 resepectively. While in Bajau ethnic group, their mean of cephalic index in males were 50.9±9.8 and 49.4±9.3 in females. Hence, it showed that both Rungus and Bajau had dominance of dolichocephalic phenotype in both sexes. In relation to prosopic index, the mean of prosopic index of Rungus males is 74.3±8.3 and Rungus females is 73.0±6.3 respectively while Bajau males had the mean of prosopic index of 74.2±9.4 and females with the mean of prosopic index of 70.6±7.7 respectively. Both ethnic groups belong to hypereuriprosopic facial shape. As conclusion, statistical analysis proved that there was significantly different in certain parameter of craniofacial norms for both gender in Rungus and Bajau ethnic groups. Both ethnic groups also do not follow the divine proportion whereas their proportion is more than 1.618. Most of Rungus and Bajau also were found to have dolicocephalic head shape and hypereuriprosopic facial shape. However, there was no significant different found in both of ethnic groups when comparing their cephalic index and prosopic index (p value >0.05).

ABSTRAK

PERBANDINGAN ANTROPOMETRI KRANIOFASIAL ANTARA ETNIK BAJAU DAN RUNGUS DI SABAH

Antropometri kraniofasial adalah ukuran tengkorak dan muka. Ia boleh ditakrifkan oleh saiz dan bentuk, dan kedua-duanya di analisis. Kuantitatif menentukan sejauh mana penyelewengan corak muka seseorang individu dari keadaan biasa yang memerlukan pengumpulan data pada individu biasa untuk untuk menghasilkan suatu julat pengukuran biasa. Beberapa kajian menunjukkan perbezaan antropometri antara kumpulan-kumpulan kaum. Objektif kajian ini adalah untuk membandingkan norma kraniofasial dan perkadaran di kalangan kumpulan etnik Rungus etnik dan Bajau Sabah, hubungannya dengan perkadaran ilahi, indeks cephalic (CI) dan indeks prosopic (PI) bagi kedua-dua kumpulan etnik. Seramai 400 subjek terdiri daripada kaum Rungus dan Bajau terlibat dalam kajian ini. Pengukuran telah diperolehi dengan menggunakan Martin caliper dan pita pengukur. Sebanyak dua puluh empat ukuran linear diambil dengan dua kali bacaan daripada dua puluh tanda dari enam kawasan kraniofasial dan ia ditandakan pada kulit dengan menggunakan celak. Untuk kaum Rungus, pengukuran yang jelas berbeza menyumbang kepada perbezaan signifikasi (nilai p <0.05), kecuali lebar kepala (eu-eu), panjang kepala (g-op), ketinggian dahi I (tr-g), ketinggian dahi II (tr-n), dan tonjolan keluar daripada hidung (sn-prn) bagi kedua-dua jantina kaum tersebut dan pengukuran yang lebih tinggi dimiliki oleh lelaki Rungus. Golongan lelaki dan perempuan untuk kaum Bajau pula menunjukkan perbezaan signifikasi (nilai p <0.05) pada parameter tersebut; jarak dari bahagian paling atas kepala ke bawah dagu (v-tr), ketinggian dahi khas (v-en), ketinggian calva (v-tr), ketinggian khas muka (en-gn), ketinggian muka atas khas (g-sn), ketinggian muka (n-gn), ketinggian muka yang lebih rendah (sn-gn), lebar muka I (zy-zy), lebar muka II (tp-tp), lebar fisur mata (ex-en), lebar biokular (ex-ex), panjang hidung (n-sn), lebar hidung (al-al), tonjolan keluar daripada hidung (sn-prn), panjang alar (ac-prn), lebar mulut (ch-ch), ketinggian bibir atas (sn-sto) dan panjang telinga (sa-sba) untuk kedua-dua jantina. Untuk perbandingan bagi kedua-dua kumpulan etnik , lebar kepala (eu-eu), panjang kepala (g-op), jarak dari bahagian atas kepala ke sempadan dagu (v-gn), ketinggian dahi khas (v-en),

ketinggian calva (v-tr), ketinggian khas muka (en-gn), ketinggian khas atas muka (g-sn), ketinggian muka yang lebih rendah (sn-gn), lebar muka I (zy-zy), lebar muka II (tp-tp), lebar mata fisur (ex-en), lebar biokular (ex-ex), tonjolan keluar daripada hidung (sn-prn), panjang alar (ac-prn) dan panjang telinga (sa-sba) boleh digunakan untuk membezakan wajah kaum Rungus dari kaum Bajau. Kedua-dua kumpulan etnik mempunyai nisbah perkadaran ilahi lebih daripada 1,618 yang tidak dianggap sebagai nisbah muka ideal. Purata indeks cephalic bagi lelaki Rungus masing-masing adalah 62.6±6.1 dan perempuan Rungus adalah 61.3±4.9. Bagi kumpulan etnik Bajau pula, purata indeks cephalic untuk kaum lelaki adalah 50.9±9.8 dan 49.4±9.3 bagi kaum wanita. Oleh itu, ia menunjukkan bahawa majoriti kaum Rungus dan Bajau memiliki bentuk kepala dolicocphalic untuk kedua-kedua jantina. Berhubung dengan indeks prosopik, nilai purata indeks prosopik bagi lelaki Rungus adalah 74.3±8.3 dan perempuan Rungus adalah 73.0±6.3, manakala lelaki Bajau masing-masing mempunyai nilai indeks prosopik kepala dengan purata 74.2±9.4 dan perempuan dengan purata indeks prosopik sebanyak 70.6±7.7. Kedua-dua kumpulan etnik memiliki bentuk wajah kategori hipereuriprosopik. Secara konklusinya, analisis statistik membuktikan bahawa terdapat perbezaan yang ketara dalam sesetengah parameter untuk norma kraniofasial tertentu bagi kedua-dua jantina pada kumpulan etnik Rungus dan Bajau. Kedua-dua kumpulan etnik juga tidak mengikut nisbah perkadaran ilahi kerana nisbah mereka adalah lebih daripada 1.618. Kebanyakan Rungus dan Bajau juga didapati mempunyai bentuk kepala dolicocephalic dan bentuk muka hipereuriprosopic. Walau bagaimanapun, tidak terdapat sebarang perbezaan yang signifikan didapati dalam kedua-dua kumpulan etnik apabila indeks cephalic dan indeks prosopic dibandingkan antara mereka (nilai p >0.05).

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Ac	alar curvature
Al	Alare
Ch	Cheilion
CI	Cephalic Index
En	Endocanthion
Eu	Euryon
Ex	Exocanthion
G	Glabella
Gn	Gnathion
Mf	Maxillofrontale
N	Nasion
Op	Occipital
PI	Prosopic Index
Prn	Pronasale
Sa	Superaurale
Sba	Subaurale
Sn	Subnasale
Sto	Stomion
SPSS	Statistical Package for the Social Sciences
Tp	Temperomandibular
Tr	Trichion
Tp	Temperomandibular
V	Vertex
Vs	Versus
Zy	Zygion

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Malaysia is a multi-ethnic and multi-religious country and regarded as one of the wealthiest and most developed countries in Southeast Asia. All Malaysian citizens are helping to enrich the cultural lifestyle of the country and living in harmony with each other. Each ethnic group has been able to keep its cultural identity by maintaining their individual language, religion, and traditions (Tong and Robertson, 2008). Malaysia can be divided into two mainland; peninsular and Borneo. Various indigenous ethnic groups are mostly lived in the states of Sabah and Sarawak in Borneo.

Sabah is the second largest state in Malaysia after Sarawak. It is also referred as 'Land below the Wind' because the location is strategically at the south of the typhoon-proon region around the Philippines. Sabah enrich with multicultural peoples, beautiful landscapes with extensive rainforests and highest mountain peak, Mount Kinabalu.

Sabah have more than thirty-one different indigenous ethnics groups including Muruts, Kadazans, Kedayans, Sulu, Bajau, Rungus. Their national language is *Bahasa Malaysia* (Dony, Ahmad, and Tiong, 2004). Ethnicity is an important aspect in the identification of one's religion, language, culture, national origin and others, and they would have same cultural practice and share similar historical background, value system, attitude, and behaviour (Muslim and Ibrahim, 2012).

Anthropometry is a systematic study of human measurement and important research tools in data collection on the living human individuals (Mane, Kale, Bhai, and Hallikerimath, 2010) where statistical data about the distribution of body dimension in the population are used to optimised products.

Craniofacial anthropometry is a measurement of skull and face. This study were used in the identification of craniofacial landmarks (Douglas, 2004) to determine the changes in the distribution of body dimension that might be caused by the development in lifestyles, nutrition, and ethnic composition of populations.

Anthropometric studies prove that there are differences in craniofacial features as well as in body characteristics among the different races (Farkas, Katic, and Forrest, 2005). Craniofacial development is highly conserved for the purposes of protecting the brain and providing a framework for sensory, respiratory and deglutition functions.

Therefore, scientists nowadays are looking towards any established measurement techniques as their main tools to find universal craniofacial focal points in other to provide a baseline quantitative data (Ngeow and Aljunid, 2009) of each ethnic. The Rungus ethnic are commonly found in the area of Kudat district, Sabah, Malaysia, and their dialect is related to Dusunic language family known as *Isoglot* (Appell and Appell, 2004). The Bajau, a second largest ethnic group in Sabah, are most commonly referred as 'Sama' (Miller, 2007), and most of them inhabited at Kota Belud district and Semporna district.

Hence, these studies were carried out to determine the difference of craniofacial norms and proportions and uniqueness in each Rungus and Bajau ethnics group of Sabah.

1.2 Problem Statement

People of Malaysia differ with those of other countries in term of genetic background, lifestyles, socio-demographic factor, and diet. Many studies had been reported to determine the ideal facial proportion (Wahl, 2006) such as: Afro-American, Angolan, Azerbaijan, Bulgarian, Czech, Croatian, Egyptian, German, Greek, Hungarian, Indian, Iranian, Italian, Japanese, Polish, Portuguese, Russian, Slovak, Slovenian, Singaporean Chinese, Thai, Tonga, Turkish, Vietnamese, Zulu (Farkas *et al.*, 2005), Malay (Ngeow and Aljunid, 2009), Gurung community of Nepal (Lobo, Chandrasekhar and Kumar, 2005), medical student of Gujarat (Shah and Jadhav, 2004), and Korean American Woman (Choe, Sclafani, Litner, Yu,and Romo III, 2004).

However, there are still lacks of information about craniofacial anthropometric norms in Malaysia, specifically in Sabah ethnic groups. Furthermore, it is becoming more difficult to study the differences in each ethnic group due to inter-ethnic marriage that has been occurring especially in the state of Sabah. Majority of them had been migrating to urban area and changes their lifestyle which was influenced by the development of the state and education.

Nevertheless, there are still many of Rungus ethnic and Bajau Ethnic who still maintain their culture and tradition by preventing inter-ethnic marriage that might cause change to their next generation. For instant, nowadays some of Kadazan who has married with Chinese are known as Sino-Kadazan. Hence, the purpose of this study is to provide a baseline anthropometric template for two of the major ethnic groups in Sabah, Rungus and Bajau.

1.3 Objectives

The main objective of this study is to compare craniofacial norms and proportions among ethnic Rungus and ethnic Bajau of Sabah.

Specific objectives for this study are:

1. To determine the mean of anthropometric measurement for Rungus ethnic and Bajaus ethnic in Sabah.
2. To assess the craniofacial proportion of two ethnic groups in relation to divine proportion.
3. To compare the cephalic index of Rungus ethnic and Bajau ethnic in Sabah
4. To compare the prosopic index among Rungus ethnic and Bajau ethnic of Sabah.

CHAPTER 2

LITERATURE REVIEW

2.1 Malaysia

Malaysia is known for its diversity of race and nation. Apart from the Malays, immigrants from China, India and Indonesia also contributed in racial diversity among the Malaysian population. Therefore, Asma and Lim (2001) consider Malaysia as a country rich in cultural refinement.

Nowadays, Malaysian population is mainly made up of three major ethnic groups: Malay, Chinese, and Indian (Budin and Wafa, 2013). They are living all over Peninsular Malaysia, and the island of Borneo: Sabah, and Sarawak. In Malaysia, religion and ethnicity are commonly associated (Hefner, 2007): Malays are usually Muslim, Chinese are generally Buddhist, and Indian is rottenly Hindu.

In the thirteenth century, the traders and Sufis bought Islam to Malaysia. Later, Malaysia becomes predominantly Muslim. Malaysia; which previously consists of Malaya and Singapore, were colonised by Britain and later Japanese taken Malaya in World War II. In 1957, Malaysia gets independence from Britain. In 1963, Singapore left Malaysia and replace with the entry of Sabah and Sarawak (Bouma, Ling, and Pratt, 2010).

As a multi-cultural and multi-religion country, Malaysia celebrates its variety with public holidays for all the major religions. Even though Islam is the religion of Nation, Malaysian citizen are allowed and give freedom to practise their beliefs in peace and harmony.

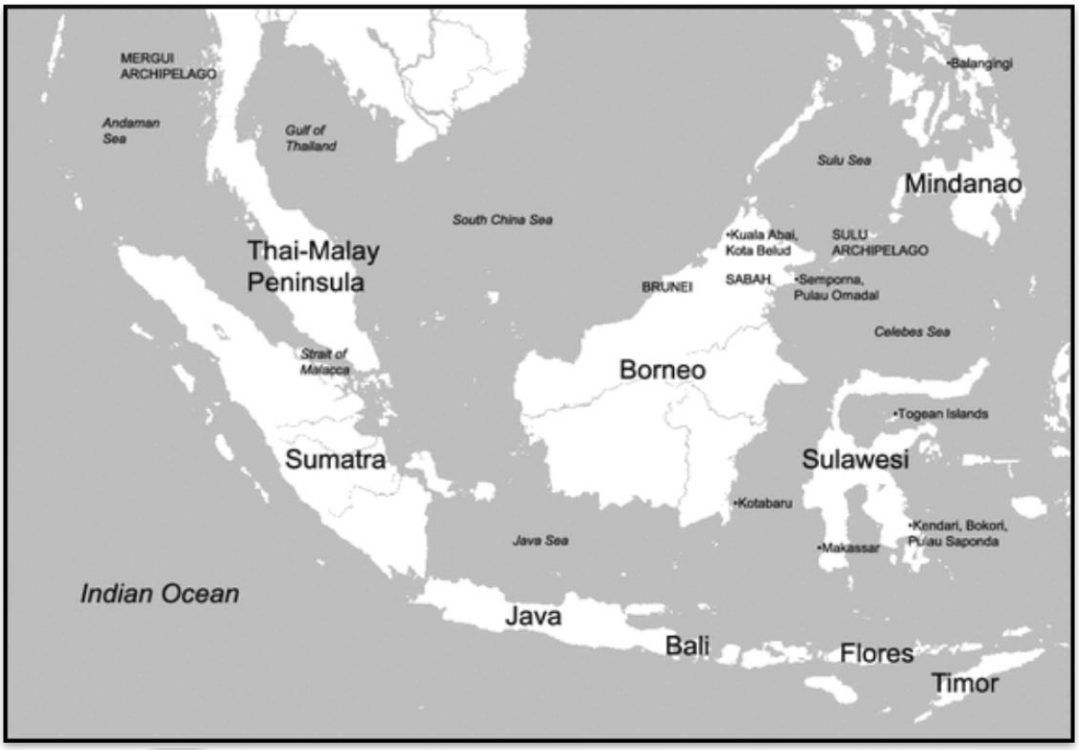

Figure 2.1 : Map of Malaysia, location of Malaysia in South East Asia.

Source : Hoogervorst, T. G. (2012)