

# Morphological Evaluation of Cephalic Index in Malay

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## ABSTRACT

*Cephalometry is an important tool in anthropometry. Cephalometric results are used in paediatric, craniofacial surgery, forensic medicine, research and clinical diagnosis. Cephalic index is an important parameter to find out the race and sex of unidentified remains. Cephalic index and head shape are affected by geographical, gender, age and racial factors. This study was conducted in UniKL RCMP, Ipoh, Perak, on 80 Malays, comprising of 40 males and 40 females. Due written consent was obtained from all subjects. Inclusion and exclusion criteria for the study were predefined. The measurements were taken by using fast display digital slide caliper. The aim of this study was to take the maximum head length, maximum head breadth, and also to find out the cephalic index among Malays in Malaysia. Statistical analysis was done with SPSS 17.0 version to obtain the Mean  $\pm$  SD. Difference between mean values in different gender were studied using t test and ANOVA. Level of significance was fixed at or below 0.05. The mean cephalic index for males was 79.55 and females was 79.97. Cranial phenotype was done based on cephalic index. The dolichocephalic, mesocephalic, brachycephalic and hyperbrachycephalic head shape was 30%, 22.5%, 35% 12.5%, and 13%, 33%, 30%, 25% in males and females respectively. This study will serve as basis of comparison for future cephalometric studies of Malay population in Malaysia.*

**Key Words:** Head length, head width, cephalic index.

## INTRODUCTION

Anthropometry is an important technique to obtain a characteristic of ethnic groups inhabiting a particular geographical region, not only assists in understanding the frequency in the distribution of human morphologies, but also provide the basis for comparison among different races (Golalipour 2007, 2006).<sup>1</sup> Cephalometry continues to be the most versatile technique in the investigation of the

craniofacial skeleton because of its validity and practicality (Rexhepi, A. and Meka, V 2008).<sup>2</sup> It is useful in the identification of racial difference (Shah and Jadhav)<sup>3</sup>, sexual difference (William et al, 1995)<sup>4</sup> and comparison of changes between parents, offspring and siblings that can give a clue to genetic transmission of inherited character (Shah and Jadhav 2004).<sup>5</sup> In respect to variation of head shape in various races and ethnicities it was believed that inherited factor primarily effect the shape of the head, however environment has secondary effect as well (Golalipour & Haidari, 2007).<sup>2</sup> Cephalic indices are similar in a race for those of the same age and sex (Golalipour, 2006)<sup>1</sup> and it is the parameter that is used for the categorization of the head shapes in craniotyping. It is also important in paediatric, forensic medicine and diagnostic comprehension between patient and normal population (Williams et al, 1995).<sup>5</sup> It has been reported that brachycephalic person have otitis media more frequent than dolichocephalic person (Vishal Manoharro Salve).<sup>6</sup> Individuals with Apert's Syndrome are hyperbrachycephalic and pathological cephalic index indicates chromosomal abnormality (Wilhem, P, 1995).<sup>7</sup> As there was few information regarding the cephalic indices among the Malaysian population this study is aimed at documentation of cephalometric values in Malay which can be helpful in anthropological studies, forensic medicine and in clinical practice.

## MATERIAL AND METHODS

This study group consisted of convenient sampling, with 80 Malays (40 male and 40 female) residing in Malaysia. Participants who volunteered were selected randomly with the age ranging from 19 to 30 years and in a healthy state without any obvious craniofacial abnormalities like congenital or

acquired and with no history of plastic or reconstructive surgery. All the measurements were taken with the subject sitting on a chair in a relaxed position with the head in anatomical position. Written consent form was taken from each subject and they were explained about the study and Anatomical land marks for measurements are :

G : Glabella

O : Opistocranium

Eu : Eurion

confidentiality. Measurements recorded are, head width and head length using Tresna digital slide calliper (Fast display calliper Series : ECO5-111-103-20g)(Beta Medik (M) Sdn Bhd ).

Maximum head length-**MHL(glabella –opistocranium,g-op)** (Fig1) was measured by sliding calliper with the anterior tip resting on the glabella and the posterior tip inferiorly along the mid line of occipital bone until maximum length was reached.

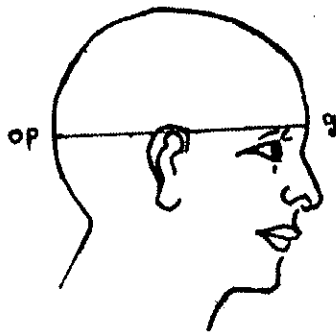


Fig:1 (glabella –opistocranium,g-op)

Maximum head Width- **MHW (eurion-aurion, eu– eu)** (Fig2) was measured by sliding both tips of calliper down along the lateral aspect of the parietal bones, forward and back until maximum width was reached

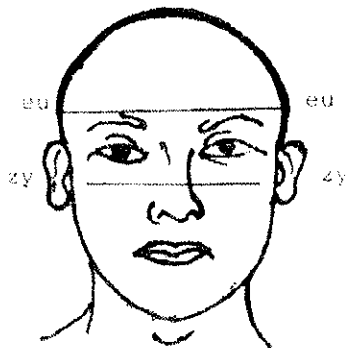


Fig: 2 (eurion-aurion, eu– eu)

The cephalic index (CI) was calculated as per Hrdlicka's method.

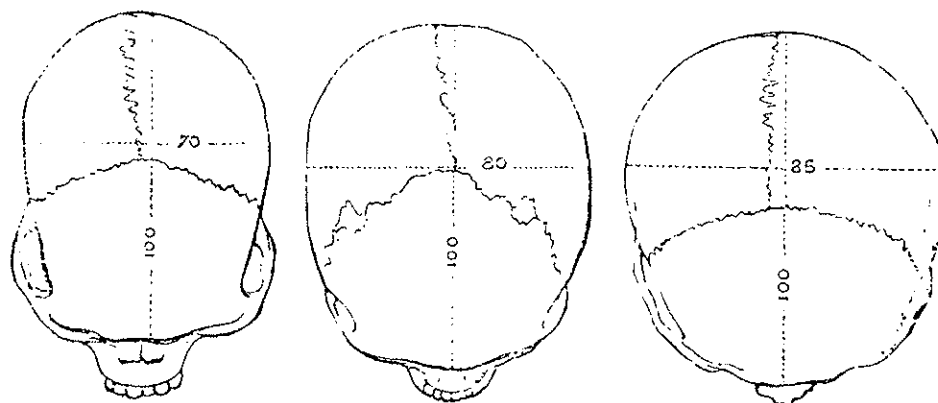
$$\text{Cephalic Index} = \frac{\text{Maximum head breadth ( Biparietal diameter)( eu-eu) x 100}{\text{Maximum head length ( g-op.)}}$$

Statistical analysis for cranial parameters and cephalic index were calculated with SPSS 17.0 version to obtain the Mean  $\pm$  SD. Difference between mean values in different gender were studied using *t* test and ANOVA. Level of significance was fixed at or below 0.05.

Categorization of cephalic phenotype was done based on CI as given by Williams et al 1995.

**Table 1: Cephalic phenotype based on the cephalic indices.**

Cephalic Phenotype	Range of Cephalic Index (CI)
Dolichocephalic ( Long head)	<70 -74.9
Mesocephalic	75 – 79.9
Brachycephalic ( Broad head)	80 – 84.9
Hyperbrachycephalic	85 – 89.9



*Dolichocephalic*

*Mesocephalic*

*Brachycephalic*

**Fig 3 : Diagram showing the various type of cephalic phenotye**

## RESULTS

The values of mean, Standard Deviation (SD) and p value were presented in Table 1-3.

**Table: 1 Mean, SD and p value of head length and breadth in male and female in Malay population**

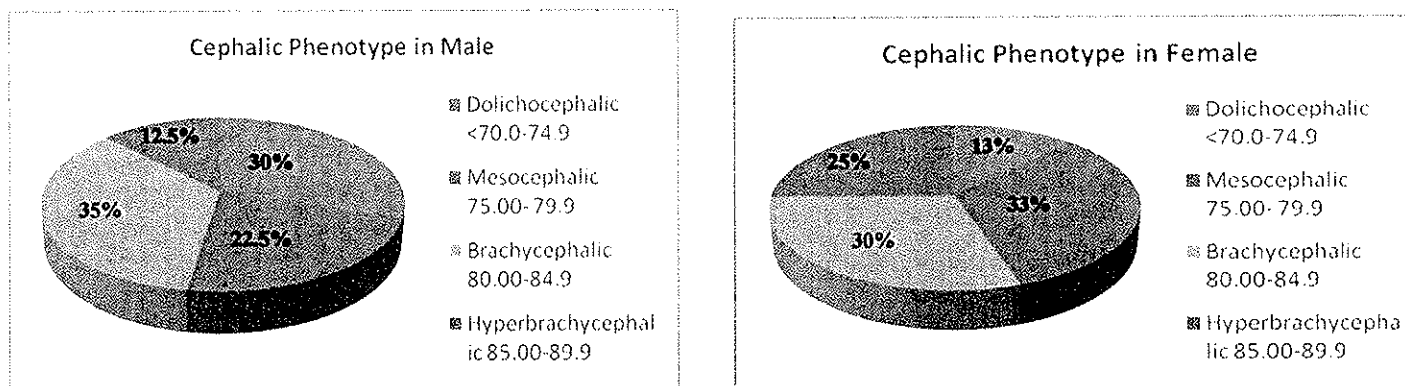
Sex	Head length( mm) Mean $\pm$ SD	Range of Head length	Head breadth (mm) Mean $\pm$ SD	Range of Head Breadth
Male	190.2 $\pm$ 9.3	117.08-213.11	151.1 $\pm$ 11.1	117.97-168.4
Female	180.8 $\pm$ 8.1	132.28-153.56	144.00 $\pm$ 9.8	153.99-195.57
Combined	185.5 $\pm$ 9.9		147.8 $\pm$ 11.0	

**Table: 2 Mean, SD and p value of cephalic index in male and female in Malay population**

Sex	Cranial Index Mean $\pm$ SD	p-value
Male	79.55 $\pm$ 6.34	0.166
Female	79.97 $\pm$ 4.97	
Combined	79.76 $\pm$ 4.76	

**Table:3 Frequency and % of cephalic phenotype in male and female in Malay Population .**

Sex	Cephalic Phenotype ( Head Shape)			
	Dolichocephalic	Mesocephalic	Brachycephalic	Hyperbrachycephalic
Male(n=40)	12	9	14	5
Female(n=40)	5	13	12	10
%Male	30	22.5	35	12.5
% Female	13	33	30	25



**Fig.4 Frequency of head type according to cephalic index among male and female in Malay Population.**

Figure 4 shows the frequency of cephalic phenotype in Malay. The predominant type in male is Brachycephalic (35%) and least common type is Hyperbrachycephalic (12.5%). In female the commonest type is Mesocephalic (33%) and Dolichocephalic is the least common type (13%).

## DISCUSSION

The data obtained in this study was shown in Table 1-3. The mean head length and width were 190.2 mm and 151.1 mm in male while those in female were 180.8 mm and 144.2 mm. Although all the value of the parameters in male are greater than that of female, there was no significant gender difference.

There was a slight difference in the mean value of cranial parameters in Ngeow, et al, 2009<sup>8</sup> study when compared to our present study in Malay population. The variation in cephalic indices between and within population had been attributed to a complex interaction between genetics and environmental factors (Bharati et al 2001).<sup>9</sup>

In our study cephalic index in male was 79.55 and 79.97 in female. It had been studied by many researchers as it is the value that categorized the head shapes.

As showed in Table 3 the dominant cephalic phenotype in male was brachycephalic (35%) followed by dolichocephalic (30%), mesocephalic (22.5%) and hyperbrachycephalic (12.5%).

In female the commonest type was mesocephalic (33%) followed by brachycephalic (30%), hyperbrachycephalic (25%) and dolichocephalic (13%).

The dominant type of head shape (brachycephalic type) in Malay population was found to be similar to the studies in Indian male population done by Vaishali (2012)<sup>6</sup>, Shah, G.V. & Jadhav (2004)<sup>4</sup>, Yangain (2012)<sup>10</sup>. Oladipo and Omotu (2009)<sup>11</sup> found that Nigerian male also belonged to this group. According to Thu K.M et al (2005)<sup>12</sup> in

Malay population the dominant type in both sexes was found to be brachycephalic. Yangain (2012)<sup>10</sup> noticed that comparing his findings with previous records of CI there was tendency of brachycephalisation in Indian population. Shah and Jadhav 2004<sup>4</sup> found that increased in growth of the brain in lateral direction leading to brachylisation. Head shape were longer (dolichocephalic) in tropical zone and more rounded (mesocephalic or brachycephalic) in temperate zone (Bharati et al 2001).<sup>9</sup> Kenneth Beals determined that there was a relationship between CI and climate. The shape of the upper part of the skull was related to heat loss. Narrow head lose heat more quickly and rounded head lose heat more slowly, having the advantages in hot and cold climate respectively. Yangain, (2012)<sup>10</sup> concluded that since India is partly in temperate and tropical zone, his study showed tendency to brachycephalization.

Hyperbrachycephalic was the rare type among male in our study and this was consistent with the finding of (Yangain, 2012)<sup>10</sup> in Indian population.

The commonest type of head was mesocephalic in Malay female and was same with the head shape of Sirilakan female (Ilayperuma, 2011)<sup>13</sup>, Gujarat female (Sapana Shah, 2012).<sup>14</sup> Punjabi female (Mahajan, 2009)<sup>15</sup>, Indian female (Yangain, 2012)<sup>10</sup>, West African female (Odokuma 2010)<sup>16</sup> and in Nigerian female Oladipo & Omotu (2009)<sup>11</sup>. The cephalic phenotype found to be ranging from mesocephalic to brachycephalic among different

Indian group (Golalipour 2004)<sup>17</sup> was similar to our present study. This showed that Asian population shared the similar cephalic phenotype.

## CONCLUSION

The cephalic index and craniotypes in Malay population were determined. The predominant type of cephalic phenotype identified is brachycephalic in male and mesocephalic in female. However the cephalic index in this study was not significantly different in both genders, further studies using larger sample of subjects in different ethnic groups may reveal the positive findings. The results of this study is aimed at documentation of parameters of head and cranial indices which will serve as a basis for future studies for anthropology, forensic medicine and plastic surgery in Malay populations. This will also be useful in designing various equipments for the head and face, like

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helmets, headphones and goggles by formulating suitable standard sizes<sup>15</sup>.

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