International Journal of Medical Science and Clinical Invention 6(1): 4272-4274, 2019
DOI:10.18535/ijmsci/v6i1.06 **ICV 2016: 77.2**
e-ISSN:2348-991X, p-ISSN: 2454-9576

Research Article

Cephalic Index among Children of 6 – 8 Year of Age with Low Body Mass Index in Bandung City, Indonesia

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Abstract: The cephalic index (CI) is calculated by measuring two fetal biometric parameters which are the occipitofrontal diameter (OFD) and the biparietal diameter (BPD). This index may gain through determination the ratio of BPD multiplied by 100 and divided by OFD. Cephalic index has tight correlation with growth and development which might be measurable by determining BMI. The aim of this study is to correlate the BMI and cephalix index among children of 6 – 8 year of age from several elementary school in Bandung City. This research was a cross sectional by using consecutive sample. The research's subjects were 42 students of elementary school in Bandung City who were measured their body weight and height for establishing their BMI, subsequently the diameter of occipitofrontal and biparietal were assessed with a view to determine their cephalic index. Correlation analysis were used to assess any significant association between BMI and CI. Result. Research's result shows that there is a negative correlation (r = -,334) with p-value=0,0153807 which significantly exhibits a correlation of 11,14 %. The research's result concludes that the BMI does not shows any significant influence positively on the cephalic index.

Keywords: Cephalic index, Body mass index

Introduction

Some theory has been establishing that nutritional status has a tight association with the process of growth and development. The growth of head is obtained before 5-6 years of age which will be slower afterward1. The growth of the head can be identified by the changes head dimension and proportions will be seen in increasing of head length and breadth which is indexed by cephalix index (CI). Craniofacial growth can be considered as an indicator of nutritional status reflected in head length, breadth and circumference whereby this circumference is a very important parameter that can be used to assess head growth and determine nutritional status among children2.

Cephalic index is craniofacial parameter which is frequently utilized as a tool to investigate the length and breadth of the head3. It is defined as a ratio between the breadth and the length of the head calculated as 100 times the maximum breadth of the head measured at the greatest diameter of the cranial vault above the supramastoid crest divided by the maximum length of the head measured from the most prominent point on the glabella to the opisthocranion. The greatest diameter of the cranial vault may also be able to be calculated by measuring two fetal biometric parameters which are the occipitofrontal diameter (OFD) meanwhile the maximum width of the head can be determined by establishing the biparietal diameter (BPD)4.

On the other hand, general health indexed by body mass index (BMI) might influence skeletal and dental development5. BMI is the important index that is utilized to determine quantitative factor related to nutritional status that may cause serious impairment of growth including growth and development of craniofacial[2]. As children grow, their amount of body fat changes and so will their BMI. Some diseases are suffered by children affecting their BMI such as infection, chronic and genetic disease may influencing their process of growth and development. The role of body weight among children marked by body mass index (BMI) in subsequent health development has been well documented to show that the discrepancy between the two is closely related to the child's physical condition[6,7]. Based on the statement above, it is reasonable to investigate the correlation between low BMI with CI among children who had actually experience a decline in growth and development of the head in children with age of 6-8 years old.

Method

The study was a cross-sectional involving 42 children from 6 to 8 years of age as a consecutive sample from elementary school in Bandung City. The study excluded the students with craniofacial trauma. The subjects were asked to sit relax on the chair with head in anatomical position. The measurement of CI was carried out by using caliper with placing one end of it at the glabella and the other end at the opisthocranion for determining the head length. The head breadth was measured by placing the end of caliper on two fixed point over parietal bone transversely. CI was calculated through determination

biparietal diameter multiplied by 100 divided by length of cranium3.

The BMI was determined through anthropometric measurements. The subjects' weights (kg) were assessed by using digital scale and their height (cm) were established by using a wall mounted measuring device. Body mass index (BMI) is the usual tool in expressing body fat percentile and is calculated by dividing weight by squared height: BMI=mass(kg)/(height[m])28. The data obtained was analyzed using chi-square and the degree of weak association was determined by using contingency coefficient.

Ethical and legal considerations of the study

The project was approved by Scientific Ethic Committee (No: 979/UN6.C.10/PN/2017), Faculty of Medicine, Universitas Padjadjaran in Bandung, Indonesia. All of research's subjects were asked to sign an informed consent through their parents to comply with the ethical and legal aspects of the research.

Result

This study involved 42 subjects with age of 6 – 8 who have low BMI from elementary school students. From the overall population, 20 students are male and 12 students are female. The tables below show CI among students participating in this study who have low BMI.

Table-1 CI and BMI Among Female Students

No	*Age*	*Code*	*CI*	*BMI*
1	7	A.11	88.89	11.2
2	6	S.18	92.86	12.0
3	8	A.40	93.10	12.2
4	7	S84	87.50	12.6
5	8	N95	96.77	11.2
6	7	S. 1132	77.14	13.2
7	6	K158	89.66	12.2
8	7		80.65	12.7
9	7	K,238	90.00	11.8
10	7	T284	83.87	12.4
11	6	A288	84.38	12.6
12	7		75.76	12.4
Mean			86.72	12.2

Table-2 CI and BMI Among Male Students

No	*Age*	*Code*	*CI*	*BMI*
1	6	R.6	97.97	12.64
2	6	A.12	89.66	12.85
3	6	Z.15	96.55	12.49
4	6	R.16	96.50	12.99
5	7	D.25	93.33	13.04
6	9	R.31	93.33	12.56
7	8	A.41	93.55	8.43
8	6	M53	88.24	12.76
9	6	R60	83.87	12.76
10	7	M76	87.10	12.99
11	7		90.63	12.93
12	8	M110	84.38	13.26
13	7	I111	87.50	12.63
14	7	J220	86.67	12.11
15	7	R,252	83.33	11.75
16	7	M,246	87.50	13.04
17	7	D,233	87.10	12.10
18	7	D237	78.79	12.87
19	7	M289	93.33	13.66
20	7		96.77	13.28
Mean			89.81	12.56

The correlation between low CI and BMI are presented in table below.

Tables-3 Correlation between CI and BMI

Variable	r	t-value	p-value	sig	correlation
Index & BMI	-334	-2.24	0.0153807	sign	11.4

The research exhibits that the BMI does not shows any significant influence positively on the CI.

Discussion

In the present study, the average CI of male students is 89.81 with mean of BMI of 12.56 which is higher than that of the female average CI is that 86.72 with BMI of 12.2. This CI of the subjects shows that the head type of elementary students in Bandung is mostly hyperbrachycephalic although they are physically and mentally normal. However, 16.67% of the female students have mesocephalic followed by brachycephalic of 25%. On the other hand, among the male students there is 15% of students with brachycephalic and 5% with mesocephalic. This condition conforms to the study result of Kaur et al that showed statistically significant differences of CI between males and females as well as stated by Esomonu and Badamasi[9,10].

Many study had been conducted to investigate the correlation between BMI and CI considering that growth and development of craniofacial might be represented by measurement of head that exactly indexed by CI can be influenced by nutritional status which is parametrically signed by BMI. Among those study done, they demonstrated significantly correlates between both of these indeces. One of the study is belong to Danborno (2007) that provide the result showing all the head dimension correlated significantly with height and weight of boys and girls ($P < 0.05$, $P < 0.001$)[11]. According to Thakur and Gautam there is a significantly correlation between cephalic index and BMI were calculated to know the impact of delayed growth and nutritional deficiency among female subjects[2].

In comparison, this study gives the contrary result to previous study exhibiting was negatively significantly correlation between CI and BMI with p-value=0,0153807 among all of the subjects. This differences emerge might be due to the variation of head shapes that is actually influenced by many

factors such as hereditary factor, environmental, climatic, genetic, ecological, biological, geographical, racial, gender and age[12,13].

Conclusion

The study concludes that the students of elementary school in Bandung who was participated in this study with low BMI have a different CI between male and female whereby the male subjects have a higher CI compare to that of females. Nevertheless, it is not seen statistically significant correlation between CI and BMI among the students of elementary school in Bandung City.

Acknowledgement

This study was funded by Ministry of Research, Technology and Higher Education, Republic of Indonesia via Universitas Padjadjaran. So, we should say thank you as much as possible to the government as well as to all researcher who had given contribution to this investigation.

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