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Một số chỉ tiêu nhân trắc và tình trạng dinh dưỡng của học sinh từ 6 - 10 tuổi thuộc khu vực miền núi tỉnh Bình Định

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TÓM TẮT

Mục tiêu của bài báo là đánh giá một số chỉ tiêu nhân trắc, từ đó thấy được tình trạng dinh dưỡng của học sinh từ 6 - 10 tuổi thuộc khu vực miền núi. Nghiên cứu được tiến hành trên 2.040 học sinh (gồm 1.024 nam và 1.016 nữ) thuộc một số huyện miền núi tỉnh Bình Định theo *phương pháp* mô tả cắt ngang có so sánh. *Kết quả* nghiên cứu cho thấy, các chỉ tiêu nhân trắc cơ bản: chiều cao, cân nặng, vòng ngực, vòng đầu của học sinh khu vực miền núi tỉnh Bình Định tăng dần theo tuổi và hầu hết các chỉ số đều thấp hơn so với học sinh cùng độ tuổi ở các khu vực khác trong nước và trên thế giới. Học sinh miền núi tỉnh Bình Định có tỷ lệ suy dinh dưỡng là 21,67%, tỷ lệ này là khá cao so với cả nước và trong khu vực, vì vậy cần có những kế hoạch đầu tư hơn nữa về mọi mặt cho các khu vực miền núi, nhằm giúp sự tăng trưởng của học sinh tốt hơn, góp phần nâng cao tầm vóc người Việt Nam trên cả nước.

Từ khóa: *Học sinh tiểu học, học sinh miền núi, học sinh Bình Định, chỉ số nhân trắc, dinh dưỡng học sinh.*

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TẠP CHÍ KHOA HỌC
TRƯỜNG ĐẠI HỌC QUY NHƠN

Some anthropometric indicators and the nutritional status of the pupils from 6 to 10 years old in the mountainous area of Binh Dinh province

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ABSTRACT

The objective of the paper is to assess some anthropometric indicators, showing the nutritional status of pupils from 6 to 10 years old in mountainous areas. The research was conducted on 2,040 pupils (including 1,024 males and 1,016 females) in some mountainous districts of Binh Dinh province using *the method* of cross-sectional comparison. *The research results* show that the basic anthropometric indicators: height, weight, chest, head circumference of pupils in mountainous areas in Binh Dinh province increase gradually with age and most of the indicators are lower than those of pupils of the same age in other parts of the country and around the world. Mountainous pupils in Binh Dinh province have a malnutrition rate of 21.67%, which is quite high compared to that of the whole country and in the region, so it is necessary to have more investment plans in all aspects for the mountainous areas to help pupils have the better growth, contributing to raising the stature of Vietnamese people nationwide.

Keywords: *Primary pupils, mountainous pupils, Binh Dinh pupils, anthropometric indicators, pupils' nutrition.*

1. INTRODUCTION

Anthropometry is one of the biological indicators showing growth and development in humans. For children, the anthropometric indicators also show the growth rate and nutritional status of children, contributing to the orientation for the development and stature of the Vietnamese people. However, the current situation of the growth, development and nutritional status of primary children in mountainous areas is still limited, which has affected quite a lot on the stature of Vietnamese people and the human strategy in general. In order to contribute to the implementation of the *"General project on physical development and stature of Vietnamese people in the period of 2011 - 2030*" of the Prime Minister, issued on April 28, 2011,[7] we conducted a research on basic anthropometric indicators: height, weight, chest, head circumference of primary pupils, from that assessing the nutritional status of children through the topic ***"Some anthropometric indicators and the nutritional status of pupils from 6 to 10 years old in the mountainous area of Binh Dinh province "*** to assess some anthropometric indicators, from that showing the nutritional status of pupils from 6 to 10 years old in mountainous areas of Binh Dinh province.

2. SUBJECTS AND RESEARCH METHODS

2.1. Subjects and research duration

- Our research subjects are pupils from 6 to 10 years old in primary schools in some mountainous districts in Binh Dinh province.

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Pupils in the research area were free of chronic disease and were not morphologically malformed, showed no abnormal physiological signs, were not absent in surveys and were of appropriate age.

- Research duration: from October 2017 to May 2018.

2.2. Sampling method and sample size

- The sample size was selected randomly by the method of cross-sectional study design and large samples were selected based on basic investigations in biomedicine. Samples were selected with the following steps:[2,4]

+ Step 1: Calculate sample size by the formula:

$$n_1 = Z^2_{1-\alpha/2}\frac{p(1-p)}{d^2}$$

In which: n_1 is the smallest research sample size to be achieved for each grade; p is the normal pupil rate, choose p = 0.5; d is the absolute error, choose d = 0.05; is the reliability coefficient corresponding to 95% reliability = 1.96; replacing in the formula we have: n_1 = 384.

+ Step 2: There are 5 grades so the sample size for the study is $n_2 = n_1$ x 5 = 1,920.

+ Step 3: Expected to give up 5%, so the sample size to be collected is n = 1,920 + (1,920 x 5) / 100 = 2,016 pupils. The investigated sample size that is satisfactory is 2,040 (> 2,016), so the reliability is guaranteed.

- Sampling method: Binh Dinh province has 5 mountainous and midland districts (collectively referred to as mountainous areas): An Lao, Hoai An, Tay Son, Van Canh and Vinh Thanh. Two districts randomly selected were Van Canh and An Lao; 8 out of 20 primary schools selected were Canh Vinh 1 Primary School, Canh Vinh 2 Primary School, Canh Hiep Primary School, Van Canh 1 Primary School, An Lao Primary School, An Dung Primary School, An Tan Primary School and An Vinh Primary School. Pupils who meet the research criteria of these schools were included in the study. The sample is distributed as table 1.

Table 1. Distribution of research samples by gender, age and location

Gender	Age					Total
	6	7	8	9	10	
Male	205	200	209	200	210	1.024
Female	201	203	202	208	202	1.016
Total	**406**	**403**	**411**	**408**	**412**	**2.040**

2.3. The method of data collection

Height: Using a wooden ruler to measure the height of UNICEF with an accuracy of 0.1 cm. When measuring, pupils stand on a flat ground, their heels close together, their eyes look straight, making sure that 4 points: occipital, back, buttocks and heels touch the ruler. The upright posture is determined when the canthus and the upper edge of the ear rim are in the same horizontal line. The child stands upright, the shoulders and arms are free on either side of the person, knees do not sag, move the bar of the scale silently until it touches the top of the head of the child. When reading, the eye of the measuring person must be equal to the bar of the scale.[1,2,3,10]

Weight: Using a Japanese TANITA scale with an accuracy of 0.1kg. The scale should be placed on the horizontal plane. Before each weighing, check the accuracy of the scale. The child is upright on the scale so that the body focus falls on the center of the scale. When weighing, the child wears thin clothes, no hats, shoes, sandals, away from meals and stands still in the middle of the scales.[1,2,3,10]

Chest size: Using a Chinese inelastic measuring tape with an accuracy of 0.1 cm. Each measuring tape is not used over 100 times. When

measuring, the child is in an upright position, circle the measuring tape perpendicularly to the spine, passing through the shoulder blade (at the back) and the breastbone (in front of the chest) so that the plane of the tape is parallel to the ground. The measurement is determined by the average of the chest measurements when the child inhales and exhales as hard as he can. The person measured is in an upright position, not raising his hands up high, his arms stretched out along his thighs, his posture stands naturally.[1,2,3]

Head circumference: Using a Chinese inelastic measuring tape with an accuracy of 0.1 cm. Each measuring tape is not used over 100 times. When measuring, the child is in an upright position, circle the tape around the head, the front of the lower edge of measuring tape is near the eyebrow, and the back of measuring tape through the occipital. The tester is standing on the side of the person being measured, paying attention that the measuring tape is not crooked, skewed or twisted.[5,10]

Nutritional status by BMI: Evaluation of nutritional status based on Z - Score, by age and gender compared to the reference population of WHO (2007).[6,8,10]

- Severe malnutrition: BMI <-3SD;
- Moderate malnutrition: - 3SD ≤ BMI <-2SD;
- Normality: - 2SD ≤ BMI ≤ + 1SD
- Overweight: + 1SD <BMI ≤ + 2SD;
- Obesity: BMI> + 2SD.

2.4. Data processing method: The data is processed in 2 steps is to filter the reasonable data, then process by Epi Data 3.1 software and transfer to Stata 10.0 software for analysis.

3. RESEARCH RESULTS AND DISCUSSION

3.1. Height of mountainous primary pupils by age and gender

Height is one of the basic morphological indicators, used frequently in human anthropological surveys. The result of the study of height of 2,040 pupils in the mountainous districts of Binh Dinh province is shown in Table 2.

Table 2. Height of mountainous primary pupils in Binh Dinh province

Age	Height (cm)						$\overline{X}_1 - \overline{X}_1$	p
	Total (n= 2.040)		Male (n_1= 1.024)		Female (n_2= 1.016)			
	$X \pm$ SD	Increase	$X_1 \pm$ SD	Increase	$X_2 \pm$ SD	Increase		
6	114,24 ± 6,07	-	113,96 ± 6,21	-	114,53 ± 5,92	-	- 0,57	> 0,05
7	120,20 ± 5,70	5,96	120,15 ± 5,72	6,19	120,26 ± 5,68	5,73	- 0,11	> 0,05
8	125,44 ± 6,06	5,24	125,14 ± 5,91	4,99	125,76 ± 6,22	5,50	- 0,62	> 0,05
9	130,08 ± 6,06	4,64	130,90 ± 5,90	5,76	129,28 ± 6,12	3,52	1,62	> 0,05
10	134,47 ± 6,13	4,39	134,68 ± 5,79	3,78	134,26 ± 6,48	4,98	0,42	> 0,05
Average increase / year		5,06		5,18		4,93		

Table 2 shows that the height of pupils increases from 6 to 10 years old. 6-year-old children have an average height of 114.24 ± 6.07 cm and 10-year-old children are 134.47 ± 6.13 cm. Females have a lower annual growth rate than men (females increase 4.93 cm/year, male increase 5.18 cm/year), girls are higher than boys (p> 0.05) at the age of 6 to 8 but at 9 and 10 years of age, boys are taller than girls (p> 0.05). This may be because girls have puberty earlier than boys so the age of prepuberty also comes earlier. Comparing with a number of domestic and foreign research results, we notice that the group of pupils in our study has lower height than

pupils in Thu Dau Mot City (2015) and pupils of many studies in our country….[2,3] Compared to the research results of NCHS (1981), WHO (2007) and CDC (2007-2010),[10] the pupils in our study were also lower in all age groups, although these studies were conducted many years ago ($p < 0.05$).

3.2. Weight of mountainous primary pupils by age and gender

Besides height, weight is also a basic anthropometric indicator that clearly shows the growth of children. The results of the weight survey of mountainous pupils in Binh Dinh province are shown in Table 3.

Table 3. Weight of mountainous primary pupils in Binh Dinh province

Age	Weight (kg)						$\overline{X}_1$-$\overline{X}_2$	p
	Total (n= 2.040)		Male (n1 = 1.024)		Female (n2 = 1.016)			
	$X \pm$ SD	Increase	$\overline{X}_1 \pm$ SD	Increase	$\overline{X}_2 \pm$ SD	Increase		
6	19,13 ± 4,00	-	19,13 ± 4,33	-	19,13 ± 3,66	-	0,00	> 0,05
7	21,24 ± 4,63	2,11	21,46 ± 4,89	2,33	21,03 ± 4,36	1,90	0,43	> 0,05
8	23,72 ± 5,19	2,48	23,21 ± 5,03	1,75	24,26 ± 5,31	3,23	-1,05	> 0,05
9	26,43 ± 5,66	2,71	27,03 ± 5,41	3,82	25,85 ± 5,85	1,59	1,18	> 0,05
10	28,24 ± 6,02	1,81	29,61 ± 6,74	2,58	26,81 ± 4,77	0,96	-0,20	> 0,05
Average increase / year		2,28		2,62		1,92		

Table 3 shows that the weight of the child increases over the years. At the age of 6, the mountainous pupil in Binh Dinh province had an average weight of 19.13 ± 4.00 kg but by the age of 10 was 28.24 ± 6.02 kg. The average annual increase is 2.28 kg, of which the male has an average growth rate higher than that of female (male increases 2.62 kg/year and female is 1.92 kg/year). The weight of male and female children at different ages is not much different ($p > 0.05$).

Pupils in mountainous areas in Binh Dinh province have an increasing weight of 6-10 years old, consistent with previous studies....[1,2,3,6,10] The highest increase is for females at the age of 7 and for males at the age of 9. At all ages, pupils in mountainous Binh Dinh province have a higher weight than that in the research results in 2002 and 2003 ($p < 0.05$) and lower than that in the results of recent years (2009, 2013, 2015) with $p < 0.05$. The average increase of pupils in 2002 was 2.63 kg/year; 2003 was 1.67 kg/year; 2007 was 2.7 kg/year; 2009 was 2.37 kg/year; 2013 was 2.22 kg/year; 2015 was 2.99 kg/year and in our study was 2.28 kg/year. Comparing the weight of primary pupils in Binh Dinh province in 2009[8] with current mountainous pupils shows that after nearly 9 years their weight did not increase ($p < 0.05$). Thus, in the same study area, the weight of the mountainous group of pupils is lower than the average weight of pupils of the same age in the province, this is explained by the limitations of socio-economic conditions of mountainous districts. The weight of pupils of the same age in our study is also lower than that of foreign organizations such as NCHS, WHO and CDC (with $p < 0.05$).[10]

The third important anthropometric indicator of physical strength of each person is chest size. The average chest size of 2,040 pupils in the mountainous area of Binh Dinh province is shown in Table 4.

3.3. Chest size of mountainous primary pupils by age and gender

Table 4. Average chest size of mountainous pupils in Binh Dinh province

Age	Chest size (cm)						$\overline{X_1}$ - $\overline{X_2}$	p
	Total (n= 2.040)		Male (n1 = 1.024)		Female (n2 = 1.016)			
	X ± SD	Increase	$\overline{X_1}$ ± SD	Increase	$\overline{X_2}$ ± SD	Increase		
6	59,19 ± 5,11	-	59,14 ± 5,57	-	59,25 ± 4,62	-	-0,11	> 0,05
7	59,79 ± 5,06	0,60	59,85 ± 5,06	0,71	59,73 ± 5,06	0,48	0,12	> 0,05
8	61,05 ± 6,01	1,26	60,57 ± 5,94	0,72	61,54 ± 6,05	1,81	-0,97	> 0,05
9	63,16 ± 6,08	2,11	64,73 ± 5,88	4,16	61,65 ± 5,91	0,11	3,08	> 0,05
10	64,56 ± 6,38	1,40	65,18 ± 7,08	0,45	63,91 ± 5,50	2,26	1,27	> 0,05
Average increase / year		1,34		1,51		1,17		

The chest size indicator of mountainous pupils in Binh Dinh province at the age of 6 is 59.19 ± 5.11 cm, at 7 years old - 59.79 ± 5.06 cm; at 8 years old - 61.05 ± 6.01 cm; at 9 years old - 63.16 ± 6.08 cm and at 10 years of age is 64.55 ± 6.38 cm. The difference in chest size in male and female is not statistically significant (p> 0.05). Males have the fastest chest size growth at 9 years old and females at 10 years old.

The increase in chest size of male pupils is higher than that of female pupils (male increases an average of 1.51 cm/year; female is 1.17 cm/year).

Comparing the growth of chest size of primary pupils in mountainous areas of Binh Dinh province with other studies shows that pupils in our study have lower average chest size than that in the research results in pupils of the same age in the province and city of Thu Dau Mot in 2015 (p < 0.05).[3]

3.4. Head circumference of mountainous primary pupils by age and gender

Table 5 shows that the head circumference of pupils increases gradually with age with not much increase. 6-year-old children have a circumference of 51.16 ± 1.45 cm for boys and 51.11 ± 1.68 cm for girls; up to 10 years of age, the male has a head circumference of 53.38 ± 1.70 cm and the female is 52.55 ± 1.45 cm; the average growth rate of 0.46 cm/year. In general, the average circumference of pupils from 6 to 10 years old in Binh Dinh province is 51-54 cm, which is higher than that of pupils at the same age of Vietnamese standard in GTSH (p < 0.05).[1]

According to the research in 2012 by Dinh Ngoc De, the average size of the head circumference of children from 6 to 12 years old is 50 - 52 cm. Other researches suggest that the average head circumference for 6 to 10 years old pupils is 50 - 54 cm. The results of the head size survey by WHO are as follows: at 6 years of age is 48 - 52.5 cm, at 7 years olds: 48.2 - 54 cm, at 8 years old: 48.6 - 54.2 cm, at 9 years old: 48.8 - 54.6 cm and at 10 years of age is 48.9 - 54.8 cm. Turkish primary pupils in 2015 have a head size of 48 - 56.5 cm...[5,9,10] Head circumference, body size and memory have a positive correlation, so it is important to pay attention to diet and safety to help the child's brain develop well. On the other hand, it is necessary to enhance memory training for children through intellectual activities such as learning, games ... Thus, the head circumference of pupils from 6 to 10 years old in mountainous areas in Binh Dinh province is within normal limits. Based on height and weight criteria, we determine BMI, from that assessing nutritional status of pupils.

Table 5. Average head circumference of mountainous pupils in Binh Dinh province

Age	Head circumference (cm)						$\overline{X_1}$ - $\overline{X_2}$	p
	Total (n= 2.040)		Male (n_1= 1.024)		Female (n_2= 1.016)			
	X ± SD	Increase	$\overline{X_1}$ ± SD	Increase	$\overline{X_2}$ ± SD	Increase		
6	51,14 ±1,57	-	51,16 ± 1,45	-	51,11 ± 1,68	-	0,05	> 0,05
7	51,60 ±1,61	0,46	51,52 ± 1,46	0,36	51,68 ± 1,74	0,57	-0,16	> 0,05
8	51,74 ±1,69	0,14	51,74 ± 1,57	0,22	51,74 ± 1,62	0,06	0,00	> 0,05
9	52,62 ±1,93	0,88	53,29 ± 1,85	1,55	51,98 ± 1,79	0,24	1,31	> 0,05
10	52,97 ±1,63	0,35	53,38 ± 1,70	0,09	52,55 ± 1,45	0,57	0,83	> 0,05
Average increase / year		0,46		0,56		0,36		

3.5. Nutritional status of mountainous pupils in Binh Dinh province

Table 6 shows that mountainous pupils have a high proportion of severe malnutrition and moderate malnutrition, accounting for 5.49% and 16.18% respectively. Of which, male children account for a higher proportion than female children.

Table 6. Nutritional status of mountainous pupils in Binh Dinh province

Nutritional status	Total (n= 2.040)		Male (n_1=1.024)		Female (n_2= 1.016)	
	n	%	n	%	n	%
Severe malnutrition	112	5,49	68	6,64	44	4,33
Moderate malnutrition	330	16,18	167	16,31	163	16,04
Normality	1364	66,86	661	64,55	703	69,19
Overweight	162	7,94	77	7,52	85	8,37
Obesity	72	3,53	51	4,98	21	2,07

Primary pupils in Binh Dinh province in 2009 had an average malnutrition rate of 22.23% but by 2016 it was only 11.18%;[8] This shows that the malnutrition rate among pupils of this age has decreased significantly. However, mountainous pupils in our study account for a malnutrition rate of 21.67% (p > 0.05). This shows that the malnutrition rate of pupils in the province has decreased but it has only decreased in urban and rural areas; mountainous areas have hardly decreased.

From 2010 to 2012, a study of 3,600 children aged between 0.5 and 11 in urban and rural areas showed that the proportion of malnourished children in 2000, 2010 and 2011 gradually decreased, respectively 30.8%; 21.5% and 18.1%. The highest rate of malnutrition is in mountainous areas, then to rural areas and the lowest is urban areas. Meanwhile, the ratio of overweight - obesity is highest in urban areas and lowest in mountainous areas.[6]

The situation of malnutrition, overweight and obesity of children varies by ecological region and time of study. In 2011, the survey result of stunting children in 6 provinces (Hanoi, Ha Nam, Quang Binh, Hue, Ho Chi Minh City and Ben Tre) in Vietnam was 13.7% at the age of 6 - 9 and 18.2% at the ages of 9 - 11. In 2012, among primary pupils in district 5 Ho Chi Minh City 2.3% were malnourished, and 21.2% were overweighed. In 2014, research results at some primary schools in Nghia Dan,

Nghe An showed that 21.5% of the pupils had low weight and stunting pupils accounted for 17.8%.[6] In 2015, the number of malnourished primary pupils in Hai Phong was 2.15%, in Thu Dau Mot was 5.7% in boys and 8.91% in girls....[3] In general, primary pupils in the mountainous areas of Binh Dinh province nowadays have a quite high rate of malnutrition (21.67%) compared to the whole province, other provinces in the country and in the region.[10]

The basic anthropometric indicators of pupils from 6 to 10 years old in mountainous areas of Binh Dinh province are higher than that of the Vietnamese biological values (2003) but lower than that of pupils of the same age according to recent domestic studies[2,3] and foreign organizations.[10] The situation of severe and moderate malnutrition of children is quite high. Therefore, organizations and authorities need to have more policies on economy, culture and society to support the lives of people in mountainous areas, and need to plan key strategies such as health, nutrition and education… to help children and people in these areas have a better life, higher incomes, stable jobs, contribute to raising awareness and improving life for themselves and the community in order to implement the project on physical development and stature of the Vietnamese successfully.

4. CONCLUSION

- Anthropological indicators of pupils from 6 to 10 years old in the mountainous districts of Binh Dinh province gradually increase with age. The average height of children from 6 to 10 years old is 114.24 cm; 120.20 cm; 124.44 cm, 130.08 cm and 134.47 cm respectively. Average weight is 19,13 kg; 21.24 kgs; 23.72 kg; 26.43 kg and 28.24 kg respectively. The average chest size is 59.19 cm; 59.79 cm; 61.05 cm; 63.16 cm and 64.56 cm respectively. The head circumference increases gradually: at 6 years of age is 51.14 cm; at 7 years old - 51.60 cm; at 8 years old - 51.74 cm; at 8 years old is 52.62 cm and at 10 years of age is 52.97 cm.

- Malnutrition status accounts for 21.67%. This is a relatively high rate compared to the current rate of the whole province and the whole country.

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