

## **Sự tăng trưởng và tình trạng dinh dưỡng của trẻ mầm non 4 - 5 tuổi trên địa bàn huyện Phù Mỹ, tỉnh Bình Định**

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### **TÓM TẮT**

Bài báo nhằm cung cấp số liệu khoa học chính xác về sự tăng trưởng và tình trạng dinh dưỡng của trẻ em lứa tuổi mầm non (4 - 5 tuổi) trên địa bàn huyện Phù Mỹ, tỉnh Bình Định. Nghiên cứu được tiến hành trên 1.409 trẻ em từ 4 - 5 tuổi (trong đó có 711 trẻ nam và 698 trẻ nữ) thuộc một số trường mầm non trên địa bàn huyện Phù Mỹ, tỉnh Bình Định. Kết quả nghiên cứu cho thấy, chiều cao trung bình của trẻ nam 4 - 5 tuổi lần lượt là: 104,65 cm và 109,37 cm; trẻ nữ lần lượt là 95,63 cm và 108,25 cm. Cân nặng trung bình của trẻ nam 4 - 5 tuổi lần lượt là: 17,65 kg, 19,14 kg và ở nữ là 16,86 kg; 18,01 kg. Ở trẻ nam 4 - 5 tuổi không có trẻ SDD thể gầy còm mức độ nặng nhưng BP ở mức cao (5,57% và 8,5%). Trẻ nữ có chỉ số thừa cân cao (trẻ 4 tuổi chiếm 10,83% và trẻ 5 tuổi là 10,25%). Ở vùng ngoại thị, tỷ lệ trẻ SDD thể gầy còm mức độ vừa chiếm tỷ lệ cao nhất trong ba khu vực. TC và BP chiếm tỷ lệ cao nhất ở vùng trung tâm huyện (lần lượt là 21,73% và 6,37%).

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# The growth and nutritional status of preschool children aged 4 - 5 years in Phu My district, Binh Dinh province

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## ABSTRACT

The article aims to provide accurate scientific data on the growth and nutritional status of preschool children aged four to five years of age in Phu My District, Binh Dinh Province. The study was conducted on 1409 children aged 4-5 (including 711 boys and 698 girls) from preschools in Phu My District, Binh Dinh Province. The average heights of boys aged four and five are 104.65 cm and 109.37 cm, respectively; and 95.63 cm and 108.25 cm with girls, respectively. The average weights of boys aged four and five are 17.65 kg, 19.14 kg, and 16.86 kg and 18.01 kg in girls, respectively. In boys aged 4-5, there are no severely malnourished children, but the obesity rate is high (5.57% and 8.5%). Female children have a high overweight index (4-year-old children account for 10.83% and 5-year-old children 10.25%). The proportion of children with moderate malnutrition in suburban areas is the highest among the three regions. Overweight and obesity account for the highest proportion in the district center (21.73% and 6.37% respectively).

## 1. INTRODUCTION

*“The overall project on the development of physical strength and stature of Vietnamese people for the period 2011 - 2030”* promulgated by the Prime Minister on April 28, 2011 has defined the overall goal of developing physical strength and stature of the Vietnamese in the next 20 years to improve the quality of human resources, serving the cause of industrialization and modernization of the country; step by step improve the quality of the race and increase the health and longevity of Vietnamese people.<sup>1</sup> To accomplish this goal, the first concern is the preschool generation because today's children,

the people who will succeed in their careers, are human resources and are the future owners of the country. Therefore, in addition to caring for and educating children from the first years of life, it is necessary to understand and evaluate children's growth, to help policymakers propose appropriate and effective measures to help children develop comprehensively.

A number of studies in recent years have shown that the physical and nutritional status of children in our country, especially between the ages of 4 and 5, have changed a lot compared to previous years: the height is increasing, the age at reaching the corresponding heights is

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also earlier and the growth standards have been met,<sup>2</sup> malnutrition remains but the prevalence of obesity is increasing and with younger people. However, these studies mainly focus on provinces and cities, while rural and mountainous areas have not received much attention. Therefore, the study entitled "*The growth and nutritional status of preschool children 4-5 in Phu My District, Binh Dinh Province*" is necessary to contribute to supplementing biological indicators about preschool children.

## 2. SUBJECTS AND RESEARCH METHODS

### 2.1. Subjects and research duration

Our research subjects include 1,409 preschool children between 4 and 5 years old with normal health in ecological regions of the district center, coastal areas and suburban areas of Phu My District, Binh Dinh Province.

Research duration is from September 2021 to November 2021.

### 2.2. Sampling method and sample size

**Sampling method:** Phu My District has 19 administrative units. We conducted simple random sampling and selected Binh Duong and My Phong towns to represent the district center, My Duc and My Chau communes the suburban area, My An and My Thanh communes the coastal area of the district.

The sample size was selected according to the large sample size applied in basic surveys of human biological indexes such as height, weight, chest size, etc. The study sample size was calculated according to the formula of large sample size and the overall is unknown.<sup>3,4</sup>

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

In which:

+  $n_1$  is the minimum study sample size to be achieved for each age;

+  $p$  is the percentage of students with abnormal nutritional status, choose  $p = 11.3\%$ ;<sup>5</sup>

+  $d$  is the absolute error, choose  $d = 0.05$ ;

+  $Z_{1-\alpha/2}$  is the confidence coefficient corresponding to 95% confidence level = 1.96;

+ DE is sample design influence coefficient DE = 1; Substituting into the formula we have:  $n_1 = 154$ .

There are two age classes and three study areas (central, suburban and coastal) so the sample size for the study is  $n_2 = n_1 \times 2 \times 3 = 154 \times 2 \times 3 = 924$ . Expected to give up 10% so the final sample size is:

$$n = 924 + (924 \times 10)/100 = 1,016 \text{ children.}$$

But in our study, the total number of samples taken after the screening was 1,409 and at each age, each sex, the number of samples was larger than 154 children, so the reliability should be ensured.

**Methods of data processing:** The collected data is processed in 2 steps, which is to screen the reasonable data and then process them on the computer using Microsoft Excel and SPSS software.

**The method of data collection:**

**- Height:** We use UNICEF standard standing height measurement, accurate to 0.1 cm. When measuring, we have the child stand on a flat platform, heels close together, eyes looking straight, making sure 4 points: occipital, back, buttocks and heel touch the measuring tape. The upright posture is determined when the outer corner of the eye and the upper edge of the helix are in the same horizontal line. The child stands upright, his shoulders and arms hang freely on his sides, his knees are not slack, and the bar is gently moved until it touches the top of his head. When reading, the measurer's eye level must be level with the bar of the ruler.<sup>3,6-8</sup>

**- Weight:** We use standard scale with accuracy to 0.1 kg. The scale is placed on a horizontal plane. Before each weighing, the scale should be checked. We have the child stand upright on the scale so that the center of gravity falls on the center of the scale. When weighing,

children wear thin clothes, do not wear hats, shoes; away from meals; children must stand still in the middle of the scale.<sup>3,6-8</sup>

- *Body mass index* (Body Mass Index) is calculated according to the following formula.<sup>9-11</sup>

$$\text{BMI} = \text{Weight (kg)} / [\text{height (meters)}]^2$$

- *Assessment of nutritional status according to BMI*: Based on BMI, by age and sex, we make reference according to WHO standards (2007)<sup>11-14</sup>:

- + Severe malnutrition:  $\text{BMI} < -3\text{SD}$ ;
- + Moderate malnutrition:  $-3\text{SD} \leq \text{BMI} < -2\text{SD}$ ;
- + Normality:  $-2\text{SD} \leq \text{BMI} \leq +1\text{SD}$ ;

- + Overweight:  $+1\text{SD} < \text{BMI} \leq +2\text{SD}$ ;
- + Obesity:  $\text{BMI} > +2\text{SD}$ .

### 3. RESEARCH RESULTS AND DISCUSSION

#### 3.1. The development of standing height of preschool children aged 4-5

Height is one of the important parameters in most basic surveys of human fitness, anthropometry and medicine. Height represents a person's physical development. Medical professionals often rely on height to assess the development of children and the stature of a person.<sup>15</sup> The results of the study on the standing height of 4 to 5 year-old children in different ecological areas of Phu My District by age and sex are presented in Table 1.

**Table 1.** Standing height of 4-5 year-old children in Phu My District

Sex	Age	Standing height (cm)								P		
		Common n = 1409		District center (1) n = 345		Suburban area (2) n = 429		Coastal area (3) n = 635		1-2	1-3	2-3
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD			
Male	4	104.65	4.80	102.62	4.88	106.57	5.57	104.83	4.59	> 0.05	> 0.05	> 0.05
	5	109.37	4.98	108.43	4.31	110.28	5.35	109.73	5.19	> 0.05	> 0.05	> 0.05
Female	4	95.63	4.48	100.93	4.31	105.91	4.89	104.28	5.00	> 0.05	> 0.05	> 0.05
	5	108.25	4.50	107.38	4.17	109.2	5.38	107.38	5.24	> 0.05	> 0.05	> 0.05

Table 1 shows that children's standing height increases with age: In boys aged 4-5, the average height is  $104.65 \pm 4.80$  cm and  $109.37 \pm 4.98$  cm, respectively; in girls aged 4-5, the average height is  $95.63 \pm 4.48$  cm and  $108.25 \pm 4.50$  cm, respectively.

Comparing the height of 4 to 5 year-old boys from three different ecological regions, it is shown that in the district center, the height of 4-year-old boys is  $102.62 \pm 4.88$  cm, which is 3.95 cm and 2.21 cm lower than that of 4-year-old boys in the suburban and coastal areas, respectively. The height of 5-year-old boys is  $108.43 \pm 4.31$ , which is 1.85 cm and 1.3 cm lower than that of 5-year-old boys in suburban and coastal areas, respectively. In addition, the height of 4-year-old girls in the district center is

$100.93 \pm 4.31$  cm, which is 4.98 cm and 3.35 cm lower than that of 4-year-old girls in suburban and coastal areas, respectively. The 5-year-old girls in the central area have a height of  $107.38 \pm 5.24$  cm, which is 1.82 cm lower than that of the suburban area and equal to that of the coastal area, but this difference is not significant in statistics ( $p > 0.05$ ).

A comparison of research data on the height of children of the same age according to "Biological values of normal people in the 90s - 20<sup>th</sup> century"<sup>16</sup>, growth standards of the World Health Organization (WHO)<sup>17</sup> and researches by Nguyen Thi Hai Vinh<sup>18</sup> and Nguyen Thi Tuong Loan<sup>19</sup> and our research group is presented in Table 2.

**Table 2.** Standing height (cm) of children aged 4-5 years according to the authors' researches

Sex	Age	Biological values of normal Vietnamese people in the 90s - 20 <sup>th</sup> century <sup>6</sup>	WHO <sup>14,17</sup>	Nguyen Thi Hai Vinh <sup>18</sup>	Nguyen Thi Tuong Loan <sup>19</sup>	Our research group
Male	4	95.81	103.30	98.21	101.28	104.65
	5	101.87	110.00	106.95	107.52	109.37
Female	4	95.05	102.70	96.87	99.21	95.63
	5	101.61	109.40	106.14	106.00	108.25

The comparison results showed that the average height of boys and girls in our study was quite different. Our research and the study of other authors are similar in that later on when the height increases, there is a difference in the height between male and female children: the height of male children is usually higher than that of female children of the same age. It can be seen that the height of children in the previous period was lower than today due to the low economic conditions in previous years. In general, studies on children's growth indicators in the world and in Vietnam are quite abundant. Although there are differences in the research results of these indicators have more or fewer differences, the changes of these indicators are determined by age, sex as well as different study areas, and different climate zones. When comparing our study with that of Nguyen Thi Tuong Loan,<sup>19</sup> it shows that the height index of male and female children in our study is larger. Specifically, the

average height of 4-year-old boys increased by 3.37 cm, 5-year-old boys increased by 1.85 cm, 5-year-old girls increased by 2.25 cm. From that, it can be said that "*The overall project on the development of physical strength and stature of Vietnamese people for the period 2011 - 2030*" issued by the Prime Minister<sup>1</sup> on April 28, 2011 has been highly effective in achieving the set goals.

### 3.2. The weight development of preschool children aged 4-5

Weight is one of the basic morphological indicators after height. The weight of the body reflects the nutritional status, indicating the level and ratio between the absorption and consumption of materials and energy.<sup>20</sup> The results of weight studies of 4-5 year-old children belonging to different ecological areas of Phu My District by age and sex are presented in Table 3.

**Table 3.** Weight (kg) of 4 to 5 year-old children in Phu My District

Sex	Age	Weight (kg)								P		
		Common = 1409		District center (1) n = 345		Suburban area (2) n = 429		Coastal area (3) n = 635		1-2	1-3	2-3
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD			
Male	4	17.65	3.15	17.44	2.48	18.30	4.25	17.27	2.77	> 0.05	> 0.05	> 0.05
	5	19.14	3.45	19.13	3.09	19.03	3.80	19.12	3.30	> 0.05	> 0.05	> 0.05
Female	4	16.86	2.96	16.50	2.48	16.93	3.12	16.94	3.22	> 0.05	> 0.05	> 0.05
	5	18.01	3.20	18.35	3.57	18.14	3.39	17.60	3.15	> 0.05	> 0.05	> 0.05

Through the data presented in Table 3, it was found that the weight of children increased gradually with age: In boys aged 4-5, the average weight was  $17.65 \pm 3.15$  kg and  $19.14 \pm 3.45$  kg, respectively; in girls aged 4-5, the average weight was  $16.86 \pm 2.96$  kg and  $18.01 \pm 3.20$  kg, respectively. Comparison of the weight of 4-5 year-old boys from three different ecological regions shows that in the district center, the weight of 4-year-old boys is  $17.44 \pm 2.48$  kg, which is 0.86 kg lower than that of 4-year-old boys in the suburban area and 0.17 kg higher than that in the coastal area. The weight of 5-year-old boys is  $19.13 \pm 3.09$  kg, which is 0.1 kg and 0.01 kg higher than that of 5-year-old boys in the suburban area and coastal areas, respectively. In addition, the weight of 4-year-old girls in the

district center is  $16.50 \pm 2.48$  kg, which is 0.43 kg and 0.44 kg lower than that in the suburban and coastal areas, respectively. 5 year-old girls in the central area have a weight of  $18.35 \pm 3.57$  kg, which is 0.21 kg and 0.75 kg higher than that in the suburban and coastal areas, respectively, but this difference is not significant in statistics ( $p > 0.05$ ).

A comparison of the research results on the weight of children aged 4 - 5 years according to "Biological values of normal people in the 1990s - 20<sup>th</sup> century"<sup>16</sup> (BV - 2004), growth standards of the World Health Organization (WHO),<sup>17</sup> and researches by the authors Nguyen Thi Hai Vinh,<sup>18</sup> Nguyen Thi Tuong Loan<sup>19</sup> and our research group is presented in Table 4.

**Table 4.** Standing weight (kg) of children 4-5 years old according to the authors' researches

Sex	Age	Biological values of normal Vietnamese people in the 90s - 20 <sup>th</sup> century <sup>6</sup>	WHO <sup>14,17</sup>	Nguyen Thi Hai Vinh <sup>18</sup>	Nguyen Thi Tuong Loan <sup>19</sup>	Our research group
Male	4	13.73	16.30	15.88	17.24	17.65
	5	15.22	18.30	19.59	19.97	19.14
Female	4	13.32	16.10	15.38	16.48	16.86
	5	15.01	18.20	18.76	19.00	18.01

The comparison results in Table 4 show that the weight of 4-year-old children in our study is higher than that in the studies of domestic authors, but the weight of 5-year-old children in our study is only higher than that of children of the same age in biological value, lower than that of children of the same age in the studies of other authors ( $p > 0.05$ ). This proves that in recent years, along with socio-economic development, people's living standards have been improved and children are increasingly

cared for, but perhaps different study areas have affected the development of children. Compared with the WHO world standards, the 4-5-year-old children in our study all had a lower weight and did not meet the international standards.

### 3.3. Nutritional status according to BMI of preschool children aged 4-5

Nutritional status according to BMI of 1,409 preschool children aged 4 - 5 in Phu My District, Binh Dinh Province is presented in Tables 5 and 6.

**Table 5.** Nutritional status according to BMI of preschool children aged 4-5 years by age and sex

Sex	Nutritional status according to BMI	Age			
		4		5	
		n	%	n	%
Male	Severe malnutrition	0	0	0	0
	Moderate malnutrition	10	3.09	16	4.12
	Normality	270	83.60	302	77.84
	Overweight	25	7.74	37	9.54
	Obesity	18	5.57	33	8.50
Female	Severe malnutrition	1	0.33	2	0.50
	Moderate malnutrition	10	3.30	24	6.10
	Normality	238	78.10	310	78.90
	Overweight	43	14.01	43	10.94
	Obesity	13	4.26	14	3.56
Common	Severe malnutrition	1	0.16	2	0.26
	Moderate malnutrition	20	3.18	40	5.12
	Normality	508	80.90	612	78.35
	Overweight	68	10.83	80	10.25
	Obesity	31	4.93	47	6.02

The data in Table 5 shows that the nutritional status according to BMI of children between 4 and 5 is mostly normal, accounting for 80.9% and 78.35% respectively (with 508 and 612 children, respectively). The percentage of girls aged 4-5 with severe malnutrition and moderate malnutrition was 0.33%, 3.3% and 0.5%, 6.1% higher than those of boys, respectively.

There is a difference in nutritional status between male and female children. Specifically,

in 4-year-old boys, the rate of normality and obesity is higher than that of girls at 5.5% and 1.31%, respectively. Other indexes of girls were higher than those of boys: severe malnutrition in girls is 0.33% higher than that of boys, and moderate malnutrition is 0.21% higher than that of boys. In 5-year-old children: The obesity index of boys was higher than that of girls at 4.94%. Other indexes of girls are higher than those of boys. In general, in both age groups, boys do not have severe malnutrition and high obesity index, while girls have a high overweight index.

**Table 6.** Nutritional status according to BMI of preschool children aged 4-5 years by study area

Sex	Nutritional status	Common (n = 1.409)		District center (n = 345)		Suburban area (n = 429)		Coastal area (n= 635)		p
		n	%	n	%	n	%	n	%	
Male (n = 711)	Severe malnutrition	0	0	0	0	0	0	0	0	< 0.05
	Moderate malnutrition	26	3.65	2	1.14	12	5.43	12	3.82	
	Normality	572	80.46	134	76.18	172	77.83	266	84.73	
	Overweight	62	8.72	27	15.3	14	6.33	21	6.68	
	Obesity	51	7.17	13	7.38	23	10.41	15	4.77	

<b>Female (n = 698)</b>	Severe malnutrition	3	0.43	2	1.18	1	0.48	0	0	< 0.05
	Moderate malnutrition	34	4.93	7	4.14	14	6.73	1	4.05	
	Normality	548	78.22	103	60.95	169	81.25	276	85.67	
	Overweight	86	12.5	48	28.40	17	8.17	13	4.05	
	Obesity	27	3.92	9	5.33	7	3.37	11		
<b>Common (n = 1,409)</b>	Severe malnutrition	3	0.21	2	0.58	1	0.23	0	0	< 0.05
	Moderate malnutrition	60	4.25	9	2.60	26	6.06	25	3.93	
	Normality	1.120	79.51	237	68.72	341	79.49	542	85.37	
	Overweight	148	10.50	75	21.73	31	7.23	42	6.61	
	Obesity	78	5.53	22	6.37	30	6.99	26	4.09	

Table 6 shows that there is a difference in nutritional status according to BMI in the study areas ( $p < 0.05$ ). In suburban areas, the proportion of children with moderate malnutrition accounted for the highest rate in the three areas (6.06%). Overweight and obesity accounted for the highest proportion in the district center (21.73% and 6.37% respectively).

In general, the growth in height, weight and nutritional status of 4- to 5-year-old children in Phu My District, Binh Dinh Province is different in ecological regions and depends on many factors such as children's movement ability, child care time, socio-economic circumstances, climate, seasons, physical activity, urbanization, nutrition, psychological stress.<sup>21</sup> The majority of children in the district center have used mobile phones to watch cartoons, play games, watch TV, read stories, etc., so they expend less energy than the input, leading to an excess of stored energy and causing a higher obesity rate compared with children in the other two regions. The economy of the suburbs has not developed yet, and the facilities are still limited. However, children in suburban and coastal areas have quite spacious living spaces and are more exposed to nature, they can run, play folk games, and have less access to information technology; children in coastal areas can have seafood in their daily meals; currently, the coastal tourism industry is also developing,

the household economy is improved, so people's lives are gradually improved.

Female children are overweight and obese more than male children because their lifestyles are more sedentary while boys are curious and more active, so they expend more energy. In addition, some parents still hold the wrong view that they want their children to be fat and chubby, because they look beautiful and cute, so they do not have a reasonable nutrition plan for their children, or pamper their children's eating preferences such as: always having the same food, only letting children eat what they like such as canned foods. Moreover, after the age of three, the difference between boys and girls has started to show up relatively clearly. Boys begin to enjoy playing more physically demanding games than girls. Girls, on the other hand, are more inclined to play care-giving games.<sup>16</sup>

#### 4. CONCLUSION

From the above research results, we draw the following conclusions:

- The average height of boys and girls aged 4-5 is 104.65 cm, 109.37 cm, and 95.63 cm, 108.25 cm, respectively.

- The average weight of boys and girls aged 4-5 is 17.65 kg, 19.14 kg and 16.86 kg, 18.01 kg, respectively.

- 4- to 5-year-old boys do not have severe malnutrition and a high obesity index (5.57% and 8.5%), while 4-5 year-old girls have a high overweight index (10.83% and 10.25%). Overweight and obesity account for the highest proportion in the district center (21.73% and 6.37% respectively).

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