RESEARCH ON SOME ANTHROPOMETRICAL MEASURES AND INDEXES OF FIRST-GRADE PUPILS
OF KINH, KHMER, AND CHAMPA ETHNICS IN THE MEKONG DELTA

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ABSTRACT

Background: the anthropometrical measures and indexes are essential elements in research on human development. Measuring the measurement of the human physique to identify the developmental rules has been studied for a long time and in many places worldwide. Objectives: to confirm the anthropometrical measurement and indexes of first-grade pupils of Kinh, Khmer, and Champa folk in the Mekong Delta. Materials and methods: a cross-sectional descriptive study of 1694 first-grade pupils at elementary, middle, and high school in the Mekong Delta from September 2020 to June 2021. The sample size was selected according to the cluster sampling method. Results: The number of males and females was not significantly different. The proportion of children of the Kinh and Khmer ethnic groups is similar and superior to the Champa ethnic group. At the elementary and middle school, the Kinh ethnic boys and girls' weight is highest (p<0,05). Until high school, the Kinh ethnic pupils' weight was lower than the Khmer or Champa ethnic pupils' (p<0,05). At the same age and same sex, we recorded that the children's weight was 3-10kg higher than that reported by the Department of Medicine, Dentistry and Pharmacy at Can Tho University in 1999 (p<0.05). The Kinh ethnic pupils' vertical and sitting height is higher than the others (p<0,05). The nutritional status of children in Can Tho has gradually improved compared with the study of Le Dinh Van in Thua Thien Hue and the WHO report in 2007. Almost BMI indexes in first-grade pupils of elementary and middle school are <18,5. The nutritional status of students of all ethnicities improved significantly when they reached the age of 15. Our Skelie indexes show that almost boys and girls have long legs, outperforming Le Dinh Van's results and the Faculty of Medicine, Dentistry and Pharmacy report at Can Tho University in 1999 (p<0.05). QVC is only relatively accurate in older children aged 16 years or older, so our results are for reference only. Conclusions: Most measurements and anthropometric indices were higher in boys than in girls (p<0.05). The Kinh ethnic pupils' anthropometrical measures and indexes are higher than the Khmer or Champa ethnic

pupils' ones at the first grade of elementary and middle school, but they are lower than the others in the first grade of high school. Measurements and anthropometric indexes of primary school students improved significantly compared to previous studies (p<0.05). The growth in height, especially the length of the lower limbs, is clearly improved.

Keywords: anthropometrical, measures, indexes, first-grade pupils

I. INTRODUCTION

The research of anthropometric measures and indexes is one of the important elements in research on human development. In medicine, researchers usually investigate and assess the physical and nutritional status, the physical and health status, etc., on large scales to identify the changes in body physique among stages, age groups, races, etc. [1].

Measuring the human physique to identify developmental rules has been studied for a long time and in many places worldwide.

This study aimed to confirm the anthropometric measures and indexes of first-grade pupils of the Kinh, Khmer, and Champa ethnicities in the Mekong Delta.

II. MATERIALS AND METHODS

* Research subject

First-grade pupils of elementary, middle, and high schools in Mekong Delta satisfied the sampling criteria from September 2020 to June 2021

Inclusion criteria

Criteria included 6, 11, and 15-year-old students who accepted to join the study and were in healthy condition

Exclusion criteria

All of the students have malformations, congenital or acquired abnormalities that affect the anthropometric measures such as kyphosis, scoliosis, and muscular atrophy, and all of the students are in acute or chronic diseases that affect the physical development such as asthma, tuberculosis, edema, anemia, etc. weren't chosen into the criteria

* Research method

Research design: a cross-sectional descriptive study.

Sample size and sampling method: cluster sampling.

$$N = \frac{Z^2_{(1-\alpha/2)} \times \sigma^2}{d^2} => N=1680$$

Sampling method

We selected the cluster sampling as follows: firstly, we randomly drew 5 out of 13 provinces in the Mekong Delta. In each selected province, a random selection was similarly conducted to select 1 elementary school, 1 middle school and 1 high school. In each selected school, a similar random drawing was conducted to select any number of classes in grade 1, grade 6, and grade 10 so that the required number of the sample is sufficient.

* Research content:

We confirmed the anthropometric measures: weight, vertical height, and sitting height of first-grade pupils of ethnics and the anthropometric indexes: BMI, QVC, Pignet, and Skelie of first-grade pupils of ethnics.

III. RESULTS

Participants included 1694 pupils in grade 1 (6 years old), grade 6 (11 years old), and grade 10 (15 years old).

3.1. General characteristics

Table 1. Distribution of male pupils by ethnics and age

Age	Kinh (n%)	Khmer (n%)	Champa (n%)	Total (n%)
6	125 (39.2%)	138 (43.3%)	56 (17.5%)	319 (38.94%)
11	158 (50.6%)	118 (37.8%)	36 (11.6%)	312 (38.09%)
15	82 (43.61%)	75 (39.89%)	31 (16.5%)	188 (22.97%)
Total	365 (44.56%)	331 (40.41%)	123 (15.03%)	819 (100%)

Table 2. Distribution of female pupils by ethnics and age

Age	Kinh (n%)	Khmer (n%)	Champa (n%)	Total (n%)
6	126 (42.9%)	110 (37.4%)	58 (19.7%)	294 (33.6%)
11	146 (43.6%)	148 (44.2%)	41 (12.2%)	335 (38.28%)
15	96 (42.1%)	120 (52.6%)	30 (5.3%)	246 (28.12%)
Total	368 (42.05 %)	378 (43.2%)	129 (14.75%)	875 (100%)

3.2. The anthropometric measures of first-grade pupils

Table 3. Dimensions of weight, vertical height, and sitting height by ethnic

Age	Ethnics	n	Weight (kg)	Vertical height (cm)	Sitting height (cm)
6	Kinh	251	24.72 ± 6.01	120.44 ± 6.11	64.2 ± 4.22
	Khmer	248	18.82 ± 3.33	115.26 ± 6.13	60.26 ± 4.41
	Champa	114	19.28 ± 3.24	116.62 ± 5.41	62.35 ± 3.88
11	Kinh	304	41.47 ± 9.43	148.55 ± 6.7	75.37 ± 4.38
	Khmer	266	31.79 ± 6.24	142.28 ± 7.3	70.25 ± 5.03
	Champa	77	37.57 ± 8.25	145.41 ± 8.09	74.59 ± 5.8
15	Kinh	178	46.98 ± 8.1	159.15 ± 8.13	80.27 ± 5.02
	Khmer	195	48.79 ± 6.72	159.52 ± 7.04	79.94 ± 4.29
	Champa	27	49.01 ± 15.38	158.84 ± 6.48	83.81 ± 3.99

Table 4. Dimensions of weight, vertical height, and sitting height of the male pupils' ethnics

Age	Ethnics	n	Weight (kg)	Vertical height (cm)	Sitting height (cm)
6	Kinh	125	25.72 ± 6.53	121.05 ± 6.1	64.45 ± 3.77
	Khmer	138	19.05 ± 3.51	115.44 ± 6.2	60.3 ± 4
	Champa	56	19.89 ± 3.43	117.54 ± 5.7	62.83 ± 3.52
11	Kinh	158	41.94 ± 10.35	147.68 ± 7.36	74.91 ± 4.63
	Khmer	118	30.54 ± 6.05	141.6 ± 7.02	70.39 ± 4.69
	Champa	36	36.45 ± 8.72	143.7 ± 8.47	73.27 ± 5.21
15	Kinh	82	49.42 ± 8.31	165.48 ± 5.91	83.39 ± 3.89
	Khmer	75	52.27 ± 6.36	164.5 ± 6.44	81.75 ± 4.88
	Champa	15	51.03 ± 19.91	160.63 ± 6.59	84.9 ± 4.47

Table 5. Dimensions of weight, vertical height, and sitting height of the female pupils' ethnics

Age	Ethnics	n	Weight (kg)	Vertical height (cm)	Sitting height (cm)
6	Kinh	126	23.73 ± 5.28	119.83 ± 6.09	63.96 ± 4.62
	Khmer	110	18.54 ± 3.08	115.03 ± 6.05	60.04 ± 5.35

Age	Ethnics	n	Weight (kg)	Vertical height (cm)	Sitting height (cm)
	Champa	58	18.7 ± 2.96	115.72 ± 4.99	61.88 ± 4.18
11	Kinh	146	40.96 ± 8.33	149.49 ± 5.78	75.86 ± 4.05
	Khmer	148	32.79 ± 6.22	142.81 ± 7.5	70.14 ± 5.3
	Champa	41	38.56 ± 7.79	146.92 ± 7.52	75.75 ± 6.1
15	Kinh	96	44.89 ± 7.33	153.74 ± 5.42	77.6 ± 4.31
	Khmer	120	46.62 ± 6.02	156.4 ± 5.45	78.81 ± 3.44
	Champa	12	46.5 ± 6.48	156.6 ± 5.85	82.45 ± 2.91

3.3. The anthropometric indexes of first-grade pupils

Table 6. BMI, QVC, Pignet, Skelie indexes by ethnics

Age	Ethnics	n	BMI	QVC	Pignet	Skelie
6	Kinh	251	16.88 ± 3.13	3.92 ± 11.32	37.97 ± 9.4	87.93 ± 8.65
	Khmer	248	14.1 ± 1.69	12.75 ± 6.52	44.12 ± 5.25	91.71 ± 9.74
	Champa	114	14.09 ± 1.41	11.21 ± 6.24	44.78 ± 4.24	87.38 ± 8.55
11	Kinh	304	18.7 ± 3.59	8.21 ± 15.27	39.64 ± 14.09	97.38 ± 7.95
	Khmer	266	15.57 ± 1.87	17.48 ± 7.4	48.93 ± 6.22	103.39 ±18.76
	Champa	77	17.64 ± 3.06	14.03 ± 10.32	43.35 ± 10.63	95.68 ± 14.01
15	Kinh	178	18.51 ± 2.64	14.78 ± 11.38	42.89 ± 10.88	98.62 ± 9.87
	Khmer	195	19.13 ± 1.95	14.31 ± 9.6	40.44 ± 8.32	99.81 ± 8.76
	Champa	27	19.29 ± 4.93	12.83 ± 17.72	39.86 ± 21.86	89.64 ± 5.46

Table 7. The male of the ethnics' BMI, QVC, Pignet, Skelie indexes

Age	Ethnics	n	BMI	QVC	Pignet	Skelie
6	Kinh	125	17.38 ± 3.49	2.93 ± 12.59	36.61 ± 10.58	88.09 ± 8.66
	Khmer	138	14.23 ± 1.94	12.29 ± 6.7	43.59 ± 6.12	91.74 ± 8.69
	Champa	56	14.29 ± 1.48	10.68 ± 7.07	44.13 ± 4.35	87.23 ± 6.31
11	Kinh	158	19.1 ± 3.88	3.88 ± 15.43	37.22 ± 15.27	97.44 ± 8.49
	Khmer	118	15.1 ± 1.8	17.48 ± 7.61	50.43 ± 6.19	101.6 ± 10.35
	Champa	36	17.57 ± 3.67	14.08 ± 10.15	43.82 ± 11.54	96.71 ± 14.67
15	Kinh	82	17.99 ± 2.43	17.17 ± 10.97	44.32 ± 10.6	98.62 ± 6.22
	Khmer	75	19.28 ± 1.65	16.2 ± 10.3	40.96 ± 7.79	101.71 ± 10.88
	Champa	15	19.52 ± 6.16	12.65 ± 21.61	38.04 ± 27.76	89.36 ± 5.75

Table 8. The female of the ethnics' BMI, QVC, Pignet, Skelie indexes

Age	Ethnics	n	BMI	QVC	Pignet	Skelie
6	Kinh	126	16.38 ± 2.65	4.9 ± 9.86	39.32 ± 7.87	87.77 ± 8.67
	Khmer	110	13.92 ± 1.3	13.34 ± 6.26	44.79 ± 3.82	91.68 ± 10.97
	Champa	58	13.89 ± 1.31	11.72 ± 5.33	45.41 ± 4.06	87.53 ± 10.33
11	Kinh	146	18.26 ± 3.21	12.89 ± 13.68	42.26 ± 12.2	97.31 ± 7.34

Age	Ethnics	n	BMI	QVC	Pignet	Skelie
	Khmer	148	15.94 ± 1.85	17.49 ± 7.25	47.72 ± 5.99	104.81 ± 23.34
	Champa	41	17.71 ± 2.45	13.98 ± 10.59	42.95 ± 9.88	94.78 ± 13.52
15	Kinh	96	18.96 ± 2.74	12.74 ± 11.38	41.66 ± 11.01	98.62 ± 12.19
	Khmer	120	19.04 ± 2.11	13.13 ± 8.98	40.12 ± 8.64	98.63 ± 6.92
	Champa	12	19.01 ± 2.99	13.06 ± 12.1	42.14 ± 11.76	89.98 ± 5.31

IV. DISCUSSION

4.1. General characteristics of first-grade pupils

Our study found the gender ratio to be similar. The proportion of children of Kinh and Khmer ethnics was similar and superior to that of Champa, which is consistent with the distribution of ethnic groups in the Mekong Delta.

Compared to the study of the faculty of medicine – odonto-stomatology - pharmacy carried out in 1999 [9] and the study published by Le Dinh Van [20], our sample size did not differ much.

4.2. The anthropometric measures of first-grade pupils

In elementary and middle schools, the weight of Kinh boys and girls reached the highest value ($p < 0.05$). However, by high school, the weight of Kinh children was lower than that of Khmer and Champa ($p < 0.05$). At the same age and same sex, we recorded that the children's weight was 3-10kg higher than that reported by the Department of Medicine, Odonto-Stomatology and Pharmacy at Can Tho University in 1999 ($p < 0.05$). This proves that the nutritional status of children in Can Tho has gradually improved. The study of Le Dinh Van in Thua Thien Hue and the WHO report in 2007 also noted that the weight of children in our study was superior to that of children in Thua Thien Hue and the weight of children in the world in 2007 ($p < 0.05$).

The vertical height of the Kinh ethnic is also higher than that of other ethnic groups, except for Kinh girls at the age of 15, whose standing height is lower than that of other ethnic groups ($p < 0.05$). At the same age and same sex, we recorded that the standing height of children was 4-9cm higher than that reported by the Faculty of Medicine, Dentistry and Pharmacy at Can Tho University in 1999 ($p < 0.05$). This once again proves that the nutritional status of Can Tho children has gradually improved.

As well as the standing height, the sitting height of children in primary and secondary school age groups of Kinh and 2 ethnic groups is superior to that of other ethnic groups ($p < 0.05$). However, in the first grade of high school, other ethnic groups outperformed the Kinh ($p < 0.05$).

4.3. The anthropometric indexes of first-grade pupils

BMI indexes in the elementary and middle school of Kinh boys and girls reached the highest value ($p < 0.05$) but was lowest in the first grade of high school ($p < 0.05$). Thus, the nutritional status of students of other ethnicities is improved significantly when they reach the age of 15. Most of the BMI indexes of children in primary and secondary schools are < 18.5, which is at the underweight level, until the beginning of high school, this index will reach the normal level. The BMI index is significantly improved compared to other national researchers, but our BMI is still lower compared to the 2007 WHO report.

QVC indexes of boys and half of all ethnic groups are in the average, and weak range, only the Kinh boys in the first grade of primary and secondary school and the Kinh girls in the first- grade of primary school are healthy [5]. Meanwhile, Pignet indexes of both sexes at all first grades are extremely weak [5]. Thus, the QVC and Pignet indexes show that children's physical fitness classification is inappropriate. According to the Faculty of Medicine, Odonto-Stomatology and Pharmacy of Can Tho University and the opinion of Le Dinh Van, the QVC index is only relatively accurate in older children aged 16 years and older, so our results are indicative only for reference.

In Skelie indexes, our results show that most children of both sexes have long legs, which is superior to the results of Le Dinh Van and the report of the Faculty of Medicine, Odonto-Stomatology and Pharmacy of Can Tho University in 1999 (p< 0.05), with only a few age exceptions belonging to the medium length leg group. Among them, there are also many children with very long legs, and this is an acceptable result for the height development of children.

V. CONCLUSIONS

Throughout a cross-sectional descriptive study of 1694 first-grade pupils of elementary, middle, and high school in the Mekong Delta from April 2020 to June 2021, we confirm the following conclusions: most of the anthropometrical measures and indexes of male pupils are higher than that of female pupils (p<0.05). Besides, the Kinh ethnic pupils' anthropometrical measures and indexes are higher than the Khmer or Champa ethnic pupils' ones at the first grade of elementary and middle school, but they are lower than the others at first grade of high school (p<0.05).

The anthropometrical measures and indexes are significantly improved compared to previous studies (p<0.05). And the Skelie indexes in the study show that children have long to very long legs (from 90 to over 100). Thus, the height growth, mainly the length of the lower limbs, is significantly improved.

It can be concluded that a lot of attention should be paid to nutrition and health care programs for first-grade pupils.

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