SOME MORPHOLOGICAL AND PHYSICAL CHARACTERISTICS OF JARAI AND EDE PEOPLE SETTLING IN THE CENTRAL HIGHLANDS IN 2019

Nguyen Minh Tung[1], Nguyen Van Ba[1], Tran Ngoc Anh[1]

SUMMARY

Objectives: To describe some morphological and physical characteristics of the Jarai adult and Ede communities who settled in the Central Highlands in 2019. **Subjects and methods:** *A cross-sectional descriptive research survey on 11,244 Jarai adults and 2,117 Ede people residing in the Central Highlands.* **Results**: *Average weight of Jarai men was 50.97 ± 3.06 kg, it was 50.93 ± 3.43 kg for Ede men, it was 46.47 ± 3.15 kg for Jarai women, it was 47.90 ± 2.98 for Ede women. The average height of Jarai and Ede male was 161.21 ± 3.53 cm and 162.07 ± 3.89 cm, respectively; that of the Jarai female was 153.39 ± 3.19 and Ede women was 154.36 ± 3.02 cm. The average BMI of Jarai men was 19.60, while the BMI index of Ede men was 19.37; that of Jarai and Ede women was 19.37 and 20.08, respectively. The average Pignet index of male Jarai was 33.59 ± 3.56; male Ede was 32.40 ± 3.53 cm; that of Jarai female was 36.43 ± 2.98 cm; that of Ede female was 34.20 ± 2.10 cm. The average Skelie index in male Jarai was 86.89 ± 1.85; it was 86.78 ± 1.59 for male Ede; it was 87.97 ± 2.21 for Jarai female; it was 87.94 ± 2.04 for Ede female. The average improved QVC index of Jarai and Ede men was 27.44 ± 3.16 and 26.03 ± 2.24; that of female Jarai and Ede was 28.30 ± 2.96 and 28.05 ± 1.43, respectively.* **Conclusion**: *The morphological and physical indexes of the Jarai and Ede adults in the Central Highlands follow the standard of body development in Vietnam*

* Keywords: Morphology; Physical status; Jarai; Ede.

INTRODUCTION

For a long time, there have been many studies on the Vietnamese people's morphology and physical status. However, most of the new results show Vietnamese people's current morphology and physical status in some localities without any specific comparison to find out the causes of differences in physical health between research groups.

In particular, in the Central Highlands, there are few studies on growth in morphology and physical status of the adult population. Only the works of Mai Van Thinh and Dao Mai Luyen referred to this issue, and so far there have been no studies conducted to evaluate morphological, physical as well as physiological indicators of the adult Jarai in the Central Highlands. Therefore, our study aims: *To evaluate the changes of some morphological - physical and physiological indicators of Jarai adults in the Central Highlands compared to the 1990s.*

SUBJECTS AND METHODS

1. Subject

The research was carried on habitants and households of the Jarai and Ede ethnic groups in the four provinces of the Central Highlands. The anthropometric indicators include weight, standing height, sitting height, body circumferences such as head, chest, waist, hip, BMI index, lean mass, fat mass, % fat, Pignet index, Skelie index, improved QVC index.

2. Methods

* Sample size:

To ensure the reliability of the survey, based on specific resources and demographic characteristics, general population distribution, as well as an ethnic minority population in the five provinces of the Central Highlands, we applied the formula to calculate the sample size of 1-rate estimation for the cross-sectional investigation.

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

Of which:

n: Sample size.

p: Estimated rate of population. In this study, we took p = 34.2%.

$Z_{1-\alpha/2}$: The Z value obtained from the data table corresponds to the selected α value.

(Corresponding to 95% confidence, if α = 0,05, $Z_{1-\alpha/2}$ = 1,96)

α: Significance level.

d: Confident limit around the point estimate: Take d = 0.01

$$n = \frac{1.96^2 \times 0.658 \times 0.342}{(0.01)^2} = 8.644.98$$

Thus, the minimum sample size to be studied is 8,645 people. In fact, the study was conducted on 13,361 people.

* Sample selection:

- *Selecting province*: The study was carried out in four provinces in the Central Highlands region, including Dak Lak, Dac Nong, Gia Lai, and Kon Tum.

- *Selecting districts*: For each province, 3 - 4 districts were randomly selected to study, including Krong Buck district, Ea H Leo district, Buon Ho district and Lak district (Dak Lak province); Cu Jut district, Dac Mil district, Dac Lap district and Dac Song district (Dac Nong province); Dac Ha district, Dac To district, Sa Thay district and Kon Tum city (Kontum province); Chu Pa district, Mang Yang district and Dac Doa district (Gia Lai province).

- *Selecting communes:*

In the selected districts of each province, we made a list of all communes, then selected 69 communes for the survey (using systematic random sampling):

+ Make a list of all communes in the province in the order of each district with columns: ordinal number, commune name, cumulative population.

+ Determine the sample distance k by dividing the cumulative population of each province by 30. K = cumulative population/30.

+ Use a random number board to choose a random number with a value between 1 and k.

+ Determine that the first commune to be selected was the commune where the cumulative population is equal to or greater than the value of the selected random number.

+ The second commune was selected by taking a random number plus sample distance k, then comparing it with the cumulative population (2nd commune was the commune whose cumulative population is equal to or greater than the total random number plus k. Furthermore, we continued doing so to select other communes (random number plus 2k, random number plus 3k ...) until 69 communes are selected.

The number of communes is calculated by the following formula:

ni = SNN + (i -1) x k (where i is 1-30).

(List of selected districts and communes is in the bottom section)

- Select a village to interview:

In each selected commune, we made a list of all the villages. Randomly draw 1 - 2 villages to conduct the survey. Village selection was performed at the commune health station only before the survey started.

- Choose the first household:

Draw up a list and number all the households in the village that have been selected for the study. Draw a coin randomly and use the first two numbers in that coin to determine the first number of households (those 2 chosen digits must be less than the total number of households in the village just selected). The first household selected is the one whose ordinal number in the list overlaps with the first 2 numbers of the chosen coin. In case the first two numbers are greater than the total number of households selected, which means they are not in the ordinal number in the list, take back the next two digits of the selected coin to select the first household.

* Method of determining the morphology and physical indexes:

- Standing height: determined by a height ruler mounted on a healthy scale, with a scale of up to 0.1cm. When measuring, the study subject is in an upright position, the heels are close together, the four positions: Occipital bone, back, hips, and heels touch the ruler. Standing height is measured in centimeters (cm).

- Body-weight: determined by a bathroom scale, with an accuracy of 0.1kg and measured before meals for the most accurate weight. Each person only wears thin clothes, no shoes or sandals, stands still in the middle of the scale, with the feet close together. The unit for calculating body weight is the kilogram (kg).

- BMI Index (BMI): also known as body mass index, is calculated by the formula: BMI = Weight (kg)/[Standing height (m)]2 (kg/m^2).

Evaluation of BMI is based on Asian standards: IDI & WPRO BMI.

- Pignet index = Standing height - (Weight + average chest circumference)

According to Nguyen Quang Quyen et al., the smaller the Pignet index is, the better the physical status is.

- Skelie index = 100 * (Standing height - Sitting height) / Standing height.

Skelie index is used to assess the relative length of lower limbs relative to sitting height. The larger the index, the longer the legs.

- Improved QVC index is proposed to evaluate the robusticity of Vietnamese adults calculated by the formula: Improved QVC index = Standing height - (Maximal inhaled thorax perimeter + left thigh perimeter + left arm perimeter).

Improved QVC index is evaluated according to Nguyen Truong Anh [1]

Data processing: Data were collected and processed on SPSS 22.0 program.

RESULTS AND DISCUSSION

Table 1: Anthropometric index of Jarai and Ede people by gender.

Ethnic group, gender / Index	Male (n = 6.124)			Female (n = 7.237)		
	Jarai (n = 5.616)	Ede (n = 508)	p	Jarai (n = 5.628)	Ede (n = 1.609)	p
Weight	50.97 ± 3.06	50.93 ± 3.43	0.512*	46.47 ± 3.15	47.90 ± 2.98	0.000*
Standing height	161.21 ± 3.53	162.07 ± 3.89	0.000*	153.39 ± 3.19	154.36 ± 3.02	0.000*
Sitting height	86.27 ± 2.06	86.78 ± 2.11	0.000*	81.60 ± 1.30	82.13 ± 1.24	0.000*
Head circumference	54.01 ± 0.99	54.88 ± 1.19	0.000*	52.90 ± 0.76	53.47 ± 0.73	0.000*
Average chest circumference	76.64 ± 3.73	78.74 ± 3.67	0.000*	70.49 ± 2.76	72.27 ± 1.96	0.000*
Waist circumference	71.62 ± 2.75	71.82 ± 2.94	0.041*	65.77 ± 2.54	67.28 ± 2.43	0.000*
Hips circumference	87.54 ± 3.36	92.20 ± 3.53	0.000*	85.82 ± 3.04	90.56 ± 2.68	0.000*
BMI	19.60 ± 0.58	19.37 ± 0.65	0.000*	19.37 ± 0.65	20.08 ± 0.64	0.000*
Waist/Hips	0.82 ± 0.03	0.78 ± 0.02	0.000*	0.77 ± 0.06	0.74 ± 0.02	0.000*
Fat mass	6.13 ± 0.46	6.19 ± 0.50	0.001*	9.37 ± 0.49	9.67 ± 0.50	0.000*
Lean mass	44.85 ± 2.76	44.75 ± 3.00	0.231*	37.09 ± 2.85	38.23 ± 2.54	0.000*
% Fat	12.02 ± 0.65	12.14 ± 0.49	0.000*	20.22 ± 1.05	20.20 ± 0.59	0.008*

(Independent samples T-test); ((*) Mann - Whitney U Test))

Table 1 shows that while the average weight of men in Jarai was higher than that of the Ede ethnic group, the value of remaining indicators of the Ede community was higher than that of Jarai people. According to our results: The average BMI of male Jarai was 19.60 ± 0.58; male Ede was 19.37 ± 0.65; after evaluating nutritional status based on Asian standards if it considers the average index of all age groups with normal BMI (> 18.5).

As obviously demonstrated from this table that in women, the ratio of waist circumference/hips circumference was 0.77 ± 0.06 and the percentage of body fat percentage in Jarai ethnic women was 20.22 ± 1.05, which was higher than that of Ede women with the results of 0.74 ± 0.02 and 20.20 ± 0.59, respectively. The average BMI of female Jarai was 19.37 ± 0.65; that of Ede women was 20.08 ± 0.64.

According to our research, the average weight of Jarai and Ede men was 50.97 ± 3.06 kg and 50.93 ± 3.43 kg, respectively. Its value of Jarai female was 46.47 ± 3.15 while Ede female weighed 47.90 ± 2.98, which was higher than the "Vietnamese' physiological constant" (1975), in which the average weight was said to be 45 ± 4.0 kg for men and 43 ± 4.0 kg for women [2].

Our results are lower than those of Mai Van Hung (2015): Average weight in men was 53.21 ± 5.13, and that of women was 45.12 ± 4.66 [3]. It is also higher than the data in the "Anthropometric Atlas of Vietnamese in the working age" (1986), in which the average weight of men was 49.4 ± 3.4 kg, that of women was 44.7 ± 3.2 kg [4].

The average standing height of male Jarai was 161.21 ± 3.53 cm; that of male Ede was 162.07 ± 3.89 cm; its value of female in Jarai and Ede was 153.39 ± 3.19 and 154.36 ± 3.02 cm, respectively. The average standing height in our research was higher than the data in " Vietnamese' physiological constant " (1975), in which average height (at the age of 25 - 49) was said to be 159.0 ± 5.0 cm for male and 149.0 ± 4.0 cm for female [2]. Thus, after every decade, the height has been improved steadily. The result of the chest circumference of men was always higher than that of women in the same age group, which is consistent with the study of Dao Huy Khue carried out on children in Ha Dong [5]. In our study, the average head circumference of Jarai and Ede men and women was 54.01 ± 0.99 cm, 54.88 ± 1.19 cm; 52.90 ± 0.76 cm; 53.47 ± 0.73 cm, respectively. Our results are similar to that of Nguyen Duc Hong, Nguyen Huu Nhan (2004), in which the average head circumference was said to be 54.82 ± 1.55 cm for men and 53.29 ± 1.76 cm for women [6].

145

Table 2: Pignet index by age group and ethnicity.

Ethnics / Age group	Jarai (n = 11.244)		Ede (n = 2.117)		P
	Male (n = 6.124)				
	n	($\bar{X} \pm$ SD)	n	($\bar{X} \pm$ SD)	
15 - 19	331	35.52 ± 3.07	14	33.61 ± 2.02	0.033*
20 - 24	674	34.10 ± 3.47	84	33.56 ± 3.39	0.194*
25 - 29	753	33.32 ± 3.43	155	32.05 ± 3.56	0.000*
30 - 39	1689	32.58 ± 3.39	151	32.00 ± 3.63	0.044*
40 - 49	1204	32.40 ± 2.93	55	32.19 ± 3.77	0.358*
50 - 59	615	34.74 ± 3.18	47	32.38 ± 2.72	0.000*
≥ 60	350	38.36 ± 2.11	2	37.80 ± 4.24	0.818*
	Female (n = 7.237)				
15 - 19	351	37.77 ± 2.90	62	34.98 ± 1.72	0.000*
20 - 24	697	37.45 ± 2.39	374	34.94 ± 1.83	0.000*
25 - 29	883	37.40 ± 2.24	517	34.73 ± 1.77	0.000*
30 - 39	1649	35.27 ± 3.08	540	33.32 ± 2.09	0.000*
40 - 49	1104	34.84 ± 2.57	51	32.99 ± 2.81	0.000*
50 - 59	575	37.29 ± 2.46	62	32.91 ± 2.15	0.000*
≥ 60	369	39.60 ± 1.61	3	37.63 ± 0.58	0.017*

(Independent samples T-test); ((*) Mann - Whitney U Test))

Table 2 shows that the Pignet index of the Jarai ethnic group was higher than that of the E De ethnic group for both men and women. According to Nguyen Quang Quyen et al., the smaller the Pignet index, the better the physical status [7].

This proves that the Ede people are stronger than the Ja Lai people. In his opinion, it can be based on the Pignet index to evaluate specific physical fitness as follows: if Pignet = 29 - 34.9: healthy; Pignet = 35 - 41: Average. Pignet index of men in both ethnic groups in 6 age groups from 15 - 59 is assessed to be healthy, but the age group ≥ 60 was said to be as average. While the Ede women were considered as healthy in 6 age groups except for age group ≥ 60, the female Ja Lai was evaluated as "healthy" in the age group 40 - 49 and other age groups were average. Our results are higher than that of Nguyen Truong An (2004), in which Pignet index of adults in Central Area aged 25 - 49 is measured to be 30.01 ± 8.72 in male and 34.08 ± 9.15 in female [1].

Table 3: Skelie index by age group and ethnicity.

Ethnics / Age group	Jarai (n = 11.244)		Ede (n = 2.117)		P
	Male (n = 6.124)				
	n	($\overline{X} \pm$ SD)	N	($\overline{X} \pm$ SD)	
15 - 19	331	87.31 ± 2.38	14	86.97 ± 1.53	0.828*
20 - 24	674	86.59 ± 1.88	84	86.98 ± 1.11	0.000*
25 - 29	753	86.41 ± 1.47	155	86.95 ± 0.98	0.000*
30 - 39	1689	87.10 ± 1.87	151	86.70 ± 2.14	0.001*
40 - 49	1204	87.19 ± 1.60	55	86.52 ± 2.14	0.000*
50 - 59	615	86.10 ± 1.59	47	86.33 ± 1.00	0.031*
≥ 60	350	87.41 ± 2.24	2	85.56 ± 1.46	0.726*
	Female (n = 7.237)				
15 - 19	351	88.06 ± 2.46	62	87.16 ± 1.32	0.298*
20 - 24	697	88.77 ± 2.50	374	87.82 ± 2.08	0.000*
25 - 29	883	88.96 ± 2.32	517	88.55 ± 2.11	0.004*
30 - 39	1649	87.93 ± 2.25	540	87.75 ± 1.83	0.018*
40 - 49	1104	87.32 ± 1.62	51	87.67 ± 2.71	0.911*
50 - 59	575	87.60 ± 1.61	62	86.38 ± 1.18	0.000*
≥ 60	369	86.62 ± 1.71	3	85.98 ± 1.46	0.223*

(Independent samples T-test); ((*) Mann- Whitney U Test))

In the age group of 20 - 29 and 50 - 59 in the males Jarai ethnic group, the Skelie index was lower than that of the Ede ethnic group, but in the age group of 30 - 49, this index of the Jarai ethnic group was higher.

While Skelie index in the female Jarai ethnic group was higher than that of the Ede ethnic group in the age group 15 - 39 and 50 - 59, only the age group 40 - 49, that of the Ede ethnic group was higher than the other. This index is used to estimate the relative length of the lower extremities. The calculation data shows although the average standing height of men in the Ede ethnic group was 162.07 ± 3.89, higher than that of Ja Lai people (161.21 ± 3.53), but Jarai's legs were longer. Similarly, for women, the Ede ethnic group had an average height of 154.36 ± 3.02, higher than the Jarai group of 153.39 ± 3.19, but the lower limb of the Jarai was longer.

The average Skelie index of the Jarai men was 86.89 ± 1.85; male Ede was 86.78 ± 1.59; that of ethnic women in the Jarai group was 87.97 ± 2.21 and its value of Ede women was 87.94 ± 2.04. Thus, both men and women have medium legs (85 - 89.9) according to the classification of anthropologists (Nguyen Quang Quyen) [7].

Table 4: The QVC index by age group and ethnicity.

Ethnics / Age group	Jarai (n = 11.244)		Ede (n = 2.117)		P
	Male (n = 6.124)				
	n	($\bar{X} \pm SD$)	n	($\bar{X} \pm SD$)	
15 - 19	331	28.68 ± 2.68	14	27.55 ± 0.94	0.011*
20 - 24	674	27.98 ± 2.80	84	26.99 ± 2.25	0.000*
25 - 29	753	27.44 ± 2.83	155	26.16 ± 2.35	0.000*
30 - 39	1.689	27.07 ± 3.22	151	25.73 ± 2.25	0.000*
40 - 49	1.204	25.90 ± 2.70	55	25.30 ± 2.02	0.102*
50 - 59	615	27.98 ± 2.71	47	25.08 ± 1.16	0.000*
≥ 60	350	31.39 ± 2.42	2	29.22 ± 0.23	0.057*
	Female (n = 7.237)				
15 - 19	351	29.63 ± 3.14	62	29.93 ± 1.11	0.740*
20 - 24	697	29.61 ± 3.05	374	28.51 ± 1.36	0.000*
25 - 29	883	29.68 ± 2.15	517	27.93 ± 1.07	0.000*
30 - 39	1.649	27.71 ± 3.00	540	27.76 ± 1.36	0.719*
40 - 49	1.104	27.08 ± 2.63	51	27.34 ± 2.63	0.498*
50 - 59	575	28.26 ± 2.06	62	27.24 ± 1.32	0.000*
≥ 60	369	27.58 ± 3.55	3	29.63 ± 3.71	0.610*

(Independent samples T-test); ((*) Mann - Whitney U Test))

Men in all 7 age groups had average improved QVC of the Jarai group was 27.44 ± 3.16, higher than that of the Ede ethnic group with 26.03 ± 2.24. In the same way, women in the age group 20 - 29 and 50 - 59, the Ja Lai ethnic group had a higher improved QVC than the Ede ethnic group.

Improved QVC is proposed to evaluate the robusticity of Vietnamese adults, Nguyen Truong Anh [1] has classified it as follows: if the improved QVC for men 20.5 - 27.7 is average, then level 27.7 - 34.9 is said to be weak. As for the female, the average level was between 21.9 - 29.1, and the weak one was 29.1 - 36.3. The results in table 4 indicate that in the Jarai group, only male adults aged 25 - 49 were assessed to be in average fitness level. In the Ede ethnic group, there were 6 age groups from 15 - 59 with average physical status. In women, while the age group of 15 - 29, the Jarai ethnic group has a weak physical fitness assessment index, other groups from 15 - 19 and ≥ 60 years old, the Ede ethnic group also has a weak outcome.

CONCLUSION

From the results of measurement and research on physical fitness on 11.244 Jarai and 2,117 Ede people residing in the Central Highlands, we have drawn the following conclusions:

The average weight of the Jarai men was 50.97 ± 3.06 kg, that of Ede men was 50.93 ± 3.43 kg, that of Jarai women was 46.47 ± 3.15 kg, that of Ede women was 47.90 ± 2.98. The average height of Jarai and Ede male was 161.21 ± 3.53 cm and 162.07 ± 3.89 cm, respectively; that of the Jarai female was 153.39 ± 3.19 and Ede women was 154.36 ± 3.02 cm. The average BMI of Jarai men was 19.60, while the BMI index of Ede men was 19.37; that of Jarai and Ede women was 19.37 and 20.08, respectively.

The average Pignet index of male Jarai was 33.59 ± 3.56; male Ede was 32.40 ± 3.53; of Jarai female it was 36.43 ± 2.98; of Ede female it was 34.20 ± 2.10.

The average Skelie index in male Jarai was 86.89 ± 1.85; that of male Ede was 86.78 ± 1.59; that of Jarai female was 87.97 ± 2.21; that of Ede female was 87.94 ± 2.04.

The average improved QVC index of Jarai and Ede men was 27.44 ± 3.16 and 26.03 ± 2.24; that of female Jarai and Ede was 28.30 ± 2.96 and 28.05 ± 1.43, respectively.

REFERENCES

1. Nguyen Truong An. Evaluation of anthropometric status of nutritional fitness and development in Central Vietnam people aged 15 years and over. Medical Doctoral Thesis. Hanoi Medical University 2004

2. Nguyen Tan Gi Trong et al. Vietnamese' physiological constant. Medical Publishing House, Hanoi 1975.

3. Mai Van Hung. Morphological and physical indexes of Vietnamese people. Lambert Academic Publishing 2015.

4. Institute for Labor Protection. Atlat Vietnamese anthropology in working age. Science and Technology Publishing House, Hanoi 147, 1986.

5. Đao Huy Khue. Morphological characteristics, growth and body development of 6 - 17 years old high school students (Ha Dong town, Ha Son Binh). Doctoral Thesis in Biological sciences, Hanoi University 1991.

6. Nguyen Duc Hong, Nguyen Huu Nhan. The ergonomic anthropology curriculum. Hanoi National University Publishing House 2004.

7. Nguyen Quang Quyen. Anthropology and research applications in Vietnamese. Medical Publishing House, Hanoi 1974.