

PECULIARITIES OF THE BODY CONSTITUTION OF 18-22-YEAR-OLD FIRST YEAR STUDENTS OF VARIOUS ETHNICITIES FROM BELARUSIAN STATE MEDICAL UNIVERSITY

Zvláštnosti složení těla 18–22letých studentů prvních ročníků různých etnik z Běloruské státní lékařské univerzity

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Abstract

Belarusian State Medical University (BSMU) is one of the leading medical universities of the Republic of Belarus. Students from different countries of Europe, Asia, Africa, and Latin America alongside with Belarusian students study at the university. The aim of this work was to study the peculiarities of the body constitution of 18-22-year-old students of different nationalities. The group of 511 medical students (225 young men and 286 young women) aged 18 to 22 were examined, 294 of whom were Belarusians and 217 of other nationalities (Turkmen, Lebanese, Iranians and Indians). Anthropometric measurements were carried out, a somatotype was determined, and various indices were calculated (BMI, WHR, WHtR, CI). The significance of the differences in absolute values was determined by using the Mann-Whitney U-test, while the relative values were compared using the Chi-squared test.

Among the students of different ethnicities studying at BSMU, the tallest were the Belarusians (179.40 and 166.41 cm for young men and young women, respectively), the shortest were the Indians (171.48 and 157.81 cm, respectively; in both cases $p < 0.001$); the rest of the groups had an intermediate position according to the body height. The leading somatotype among the Belarusian, Iranian and Turkmen young males were muscular or transitional to muscular (42.0, 44.8 and 50.0% among the surveyed respectively). Many Indians had the thoracic somatotype (38.6%), the Lebanese had a widely represented abdominal somatotype (51.4%, $p < 0.05$). The leading somatotype of the Belarusian and Turkmen young women was stenoplastic (55.5% and 56.3%, respectively). Among the Iranian young women, the morphotype with increased fat deposition was the most common (41.2%, $p < 0.001$). According to the WHtR values indicating the risk of metabolic syndrome, there were 2.5% of overweight cases in the young Belarusian males, while it was observed in 11.4% of the surveyed Indians, 12.5% of the Turkmen (in both cases – $p < 0.05$), 17.2% of the Iranians ($p < 0.01$) and 22.6% of the Lebanese ($p < 0.001$). Among the surveyed females, WHtR showed that 23.5% of the surveyed Iranians and 16.0% of the Indians had this risk (in both cases, $p < 0.001$ when compared to the group of the Belarusian women, who had 1.4% of such cases).

The study of BSMU students from different countries revealed the most significant differences of the analyzed values in the male samples. The considerable differences in height, waist circumference, BMI, WHtR and CI were found between the males from Belarus and Iran, Lebanon. Significant similarities in most anthropometric indicators were found between the students from Belarus and Turkmenistan, both among young males and young females. WHtR and BMI reflected the nutritional status and the risk metabolic disorders better than WHR both in young males and young females.

Key words: anthropometric parameters, somatic indexes, somatotype, medical students from different countries, Republic of Belarus.

Introduction

The study of physical development features plays an important role in biomedical research of different population groups (Полина & Кривицкий, 2016). The long-term impact of environmental factors determines the distribution of constitutional types in populations of different geographical regions, and social and economic conditions affect the implementation of the overall genetic program of the body. An organism is more sensitive to the influence of many factors before adulthood. Youth is the period when active growth of the body is almost complete, but both morphological and psychological maturity of an adult has not been reached yet. At this age, young men and women usually enter different educational institutions.

Belarusian State Medical University (BSMU) is one of the leading medical universities of the Republic of Belarus. Students from different countries of Europe, Asia, Africa, and Latin America alongside with Belarusian students study at the university. Since 1970, the University has trained more than 2000 foreign specialists from almost 100 countries. The enrolment of foreign students has become particularly intense in recent years.

Any student entering a higher educational institution has to adapt to a complex of new factors specific to higher education. This is a complicated multilevel social and psychological process, accompanied by a significant strain of compensatory and adaptive systems of the body. Foreign students coming to study in the Republic of Belarus should adapt not only to studies at universities, but also to life in a foreign country with different climatic, geographical, socioeconomic and cultural factors of life.

Comparative anthropological studies of modern youth of different ethnic groups in the era of globalization and growing migration flows are necessary to study the adaptive abilities and the functional status of the organism, as well as the predisposition to various forms of pathology. In this regard, it is important to take into account the peculiarities of the students' constitution, because they reflect such complex of factors as individual genetic program and the effect of the environmental conditions (Полина & Кривицкий, 2016).

Aim

Since 2017, the Department of Biology of BSMU has been implementing a research project "Comparative characteristics of anthropometric parameters and adaptation capabilities of BSMU students from around the world". Within the framework of this research, we have conducted the following study. The aim of this work is the comparative study of the constitutional peculiarities of 18-22-year-old students from different countries.

Methodology

A cross-sectional anthropometric study was carried out in BSMU in 2018/2019. The group of 511 medical students

(225 young men and 286 young women) aged 18 to 22 was examined, 294 of whom were Belarusians and 217 of other nationalities (71 Turkmen, 31 Lebanese, 46 Iranians, and 69 Indians). For each examinee, a decimal age was calculated out of the date of examination and the date of birth. All the studies were conducted in accordance with the requirements of biomedical ethics, so all students signed informed consent to take part in the research.

All measurements were carried out in the morning by an anthropological measuring specialist. Body measurements (body weight and height, waist and hip circumferences) were carried out with special anthropometric equipment (anthropometer, electronic scales, measuring tape) in compliance with the principles adopted in anthropometry (Нерашева, 2017). All instruments were validated following the standard methods of the manufacturers, and the balances were zero calibrated. Height was measured to the nearest 0.1 cm in an upright standing position without shoes using a Harpenden Stadiometer (DKSH, Switzerland). Body weight was measured by an electronic weighing scale (Tanita, Japan) to the nearest 0.1 kg with the lightest clothing and without shoes. Waist and hip circumferences were measured with a metric tape to the nearest 0.1 cm.

The following indices and measurements were calculated (Rębacz-Marón, 2015).

The data from the measurements were used for the calculation of BMI (body mass index) by the following formula: $BMI = \text{body weight [in kg]} / \text{height [in m]}^2$. Determination of underweight, overweight and obesity was carried out according to WHO recommendations. Hence the criterion of underweight was BMI below 18.5 kg/m^2 , that of overweight – BMI above 25.0 kg/m^2 , and that of obesity – over 30.0 kg/m^2 (Waist Circumference and Waist-Hip Ratio, 2011).

WC (Waist Circumference [in cm]). According to WHO recommendations, in males 18 years of age or older the upper limit of waist circumference is 94.0 cm, that in females is 80.0 cm. Overweight in men and women is diagnosed when waist circumference is 94.0–102.0 cm and 80.0–88.0 cm, respectively. Abdominal obesity is diagnosed when WC exceeds 102.0 and 88.0 cm, respectively. (Waist Circumference and Waist-Hip Ratio, 2011).

WHR (Waist-to-Hip Ratio) – was calculated by the following formula: $WHR = \text{waist circumference [in cm]} / \text{hip circumference [in cm]}$. The risk of metabolic disorders is observed when WHR is 0.90 and 0.85 or higher, in men and women respectively (Waist Circumference and Waist-Hip Ratio, 2011).

WHtR (Waist-to-Height Ratio) was calculated by the following formula: $WHtR = \text{waist circumference [in cm]} / \text{body height [in cm]}$. The normal WHtR for both sexes is 0.5 or less. The WHtR exceeding 0.5 indicates overweight (Gibson, S., Ashwell, M. (2020). If the index is higher than 0.52 for men and 0.53 for women, the risk of type II diabetes increases significantly.

Corpulence index (CI), also known as the Rohrer's Index, characterizes the density of the body. It was calculated by the following formula: $CI = \text{body weight [g]} / \text{body height [cm]}^3 \times 100$.

In addition to measurements, the study program also included visual somatotyping. Identification of somatotypes was carried out visually using the V.V. Bunak methodology for young men and I.B. Galant methodology for young women. These methodologies are united by the common criteria of classification, taking into account the ratio of body components such as muscles, fat, bones along with the shape of the chest, abdomen and back. These classification methodologies allow to unite several somatotypes into one. As the number of students surveyed is still small, asthenic, thoracic and thoracomuscular somatotypes of young men were considered as thoracic somatotype. Muscular-thoracic and muscular somatotypes were united into the muscular one. Muscular-abdominal, abdominal-muscular

and abdominal types comprised the abdominal one. Stenoplastic somatotype of young women included asthenic and stenoplastic ones. Mesoplastic somatotype united mesoplastic, athletic and subathletic ones; picnic and euriplastic somatotypes were considered as picnic one (Терако & Саливон, 1989; Нерашева, 2017).

Statistical analyses of the obtained data were conducted by mean Statistica 10 software. Basic descriptive statistics were computed: Means and standard deviation values (SD), Median (M). The parameters of international students (Turkmen, Lebanese, Iranians, and Indians) were compared to those of the Belarusians. The significance of the differences in absolute values was determined by using the Mann-Whitney U-test (the non-parametric equivalent of one-way analysis of variance), while the relative values were compared using the Chi-squared test. The significance of differences was determined from the level of $p < 0.05$ and above. The data were analyzed in relation to the gender and represented in tables. The effect size (ES) was calculated for all the tests we performed. We used Cohen's d as an effect size measurement for comparisons of two mean values (a d value of 0.20 indicates a small effect, 0.50 indicates a medium effect, 0.80 indicates a large effect, 1.20 indicates a very large effect) (Cohen, 1988; Барникова, Самсонова & Ципин, 2019).

Results

Table 1 shows the main anthropometric parameters and somatic indexes of the 18–22-year-old students from BSMU 2018/2019 research. The data of the young Lebanese women were not included in the table because of the difficulty of sampling associated with the small number of BSMU students from the region.

Height. The tallest are the Belarusian students (young men – 179.40 cm and young women – 166.41 cm), the shortest are the Indian men and women (171.48 cm and 157.81 cm, respectively; $p < 0.001$ for both sexes when compared to the Belarusians). The Belarusian men are 4.29–5.22 cm ($p < 0.05 - p < 0.001$) taller than the Iranians, the Lebanese and the Turkmen, while the Belarusian women are 3.59 cm taller than the Turkmen and 5.41 cm taller than the Iranians (in both cases, $p < 0.001$).

Body weight. The Iranian (78.65 kg) and Lebanese (76.94 kg) males have the highest body weight and it is 6.65 and 4.94 kg higher than that of the Belarusians. The body weight of the young men from Belarus and Turkmenistan is close in its values, while the body weight of the Indians is 7.09 kg ($p < 0.001$) lower than the Belarusians. The women from Turkmenistan have the lowest body weight (55.93 kg) while the women from Iran have the highest body weight (63.74 kg).

BMI. Average values of the index are maximal for the young men from Iran and Lebanon, they are 3.42 and 3.05 kg/m^2 higher than the index values for the Belarusians (in both cases, $p < 0.001$). For the remaining ethnic groups, BMI values are similar to those of the control group (Belarusian students) and do not differ significantly. BMI of females is the highest among the Iranians and the Indians, while the index for these ethnic groups is 3.47 ($p < 0.01$) and 1.72 kg/m^2 higher than for the Belarusians.

The waist circumference (WC) of the young Lebanese and Iranian men exceeds the data of the Belarusians by 5.24–5.53 cm ($p < 0.01$); the differences in measures between the Belarusians, the Turkmen and the Indians are within the margin of error. The Iranian women have the highest rate of WC (73.78 cm). It is 6.11 cm higher than for the Belarusian women ($p < 0.01$). The women from India have WC 2.46 cm higher than the Belarusians. WC of the Turkmen women does not differ from the Belarusians.

Table 1: Main anthropometric parameters and somatic indexes of the 18-22-year-old students from BSMU 2018/2019 research

		Height, cm	Weight, kg	BMI, kg/m ²	WC, cm	HC, cm	WHR	WHtR	CI
Young men									
Belarus	N	81	81	81	81	49	49	81	81
	Mean	179.40	72.00	22.28	75.98	95.56	0.80	0.42	1.24
	SD	6.76	1.22	2.93	6.83	8.00	0.06	0.03	0.16
	M	177.40	70.00	21.91	75.60	96.00	0.79	0.42	1.22
Iran	N	29	29	29	29	6	6	29	29
	Mean	174.71**	78.65	25.70***	81.51**	93.08	0.79	0.47***	1.47***
	SD	7.66	19.36	5.67	10.71	7.26	0.05	0.06	0.33
	M	175.70	75.40	24.82	80.50	92.20	0.79	0.46	1.39
	Cohen's d	0.65	0.41	0.76	0.62	0.33	0.18	1.05	0.89
Turkmenistan	N	40	40	40	40	29	29	40	40
	Mean	175.11*	70.25	22.85	78.55	94.40	0.82***	0.45**	1.31
	SD	8.48	13.53	3.68	7.92	8.61	0.06	0.04	0.22
	M	175.85	69.65	21.98	76.80	94.80	0.82	0.44	1.26
	Cohen's d	0.56	0.14	0.17	0.35	0.02	0.33	0.85	0.36
India	N	44	44	44	44	32	32	44	44
	Mean	171.48***	64.91***	22.00	75.50	92.52*	0.81**	0.44	1.28
	SD	5.72	1.47	4.45	9.76	9.19	0.04	0.05	0.25
	M	171.25	61.65	21.78	74.15	92.45	0.82	0.43	1.24
	Cohen's d	1.27	0.52	0.07	0.06	0.35	0.20	0.49	0.19
Lebanon	N	31	31	31	31	20	20	31	31
	Mean	174.18***	76.94	25.33***	81.22**	101.59*	0.80	0.47***	1.46***
	SD	6.38	14.82	4.55	9.81	8.87	0.06	0.06	0.27
	M	174.40	77.70	25.78	80.50	102.90	0.80	0.47	1.49
	Cohen's d	0.79	0.36	0.80	0.62	0.71	0.00	1.05	0.99
Young women									
Belarus	N	213	213	213	213	115	115	213	213
	Mean	166.41	58.51	21.12	67.67	95.27	0.71	0.41	1.27
	SD	6.10	8.28	2.68	5.51	6.05	0.04	0.03	0.17
	M	166.20	57.00	20.75	66.50	94.00	0.71	0.40	1.26
Iran	N	17	17	17	17	8	8	17	17
	Mean	161.00***	63.74	24.59**	73.78**	98.80	0.73	0.46***	1.53**
	SD	5.04	15.78	5.98	9.38	14.12	0.03	0.06	0.38
	M	161.40	59.30	24.24	70.80	93.75	0.73	0.45	1.50
	Cohen's d	0.97	0.42	0.75	0.79	0.33	0.57	1.05	0.88
Turkmenistan	N	31	31	31	31	25	25	31	31
	Mean	162.82***	55.93	21.10	67.07	93.89	0.72	0.41	1.30
	SD	5.72	7.78	2.81	5.44	5.78	0.04	0.04	0.19
	M	162.40	56.90	20.93	67.40	94.20	0.73	0.41	1.27
	Cohen's d	0.61	0.32	0.01	0.11	0.23	0.25	0.00	0.17
India	N	25	25	25	25	20	20	25	25
	Mean	157.81***	57.18	22.84	70.13	95.65	0.72	0.44***	1.45***
	SD	6.07	13.38	4.53	9.99	8.53	0.03	0.06	0.27
	M	159.50	53.50	22.01	66.20	94.20	0.71	0.44	1.40
	Cohen's d	1.41	0.12	0.46	0.31	0.05	0.28	0.63	0.80

Note: BMI – body mass index; WC – waist circumference; HC – hip circumference; WHR – waist-to-hip ratio (WC/HC), WHtR – waist-to-height ratio (WC/height); CI – corpulence index (weight (g) / height (cm³) × 100); significance of the difference with a control group (Belarusian students): * – $p < 0.05$, ** – $p < 0.01$, *** – $p < 0.001$

The Lebanese males have the maximum values of the hip circumference (101.59 cm), which is 6.03 cm higher than for the Belarusians ($p < 0.05$). The values of hip circumference are minimal in the Indian males (less than those of the Belarusians by 3.04 cm, $p < 0.05$). Among females, the Iranians have the largest hip circumference (98.80 cm), which is 3.53 cm larger than that

of the Belarusians. The differences between the young Turkmen, Indian and Belarusian women are insignificant.

The WHR index. Average WHR index values vary between 0.79–0.82 for the males and between 0.71–0.73 for the females. Only the Indian and the Turkmen males had significant differences in the index values as compared to Belarusians ($p < 0.001$)

and $p < 0.01$ respectively). However, since the ES value was small, these differences may not have a biological significance. In other cases the values did not differ significantly.

The values of the **WHtR index** are minimal (0.42) for the Belarusian men and are significantly lower than among the Iranians (0.47, $p < 0.001$), the Lebanese (0.47, $p < 0.001$) and the Turkmen (0.45, $p < 0.01$). In females, WHtR values are minimal for the Belarusians and the Turkmen (0.41); differences in the index are significant ($p < 0.001$) between the Belarusian and Iranian (0.46), as well as Indian (0.44) women.

Corpulence index. The average values of the corpulence index are the lowest among the Belarusian men, followed by the Indians (1.28), the Turkmen (1.31), the Lebanese (1.46, $p < 0.001$ when compared to the Belarusians), and the Iranians (1.47, $p < 0.001$). The Belarusian women have the lowest index values, followed by the Turkmen (1.30), then the Indian (1.45, $p < 0.001$), and the Iranian (1.53, $p < 0.01$) women.

Tables 2 and 3 present data on the assessment of somatic status of BSMU students according to somatotyping, measurements and calculated indices.

The conducted somatotype determination made it possible to estimate the peculiarities of the constitution of the students of BSMU in a complex. Somatotype is a complex of morphological

features of an individual caused by the quantitative development and ratio of three main somatic components – fat, muscles and skeleton. The leading somatotype for the young Belarusian, Iranian and Turkmen men is muscular and transitional to it (42.0, 44.8 and 50.0% among the surveyed, respectively). In the groups of Indians and the Lebanese, the muscular type of body composition is found only in 38.4% and 32.5% of cases. In the case of the Indians, the thin body composition is common (38.6%), in the case of the Lebanese the abdominal morphotype prevails (51.4%, $p < 0.05$ in comparison with the Belarusians). In addition to the Lebanese, the somatotype with a significant development of fat deposition is also common for the Iranian males (34.5%). The abdominal somatotype is represented in 28.4% of the Belarusian men, while the thoracic one in 29.6%.

Among the surveyed females, the leading type of body composition of the Belarusian and Turkmen women is stenoplastic, i.e. thin-composed (55.8% and 56.3%, respectively). Picnic somatotype is extremely rare in the young Belarusian women (5.7%), which cannot be said about the Iranians, where the morphotype with increased fat deposition is the most common (41.2%, $p < 0.001$). The Indian women have a predominant mesoplastic somatotype (48.0%), while the Belarusian women also have a large representation of this somatotype (38.5%).

Table 2: Categories of somatic indexes of the males from BSMU (absolute values and %)

	Belarus (n=81)		Iran (n=29)		Turkmenistan (n=40)		India (n=44)		Lebanon (n=31)	
	n	%	n	%	n	%	n	%	n	%
Somatotype:										
Thoracic	24	29.6	6	20.7	9	22.5	17	38.6	5	16.1
Muscular	35	42.0	13	44.8	20	50.0	16	38.4	10	32.5
Abdominal	22	28.4	10	34.5	11	27.5	11	23.0	16	51.4*
BMI:										
Underweight	6	7.4	1	3.4	6	15.0	10	22.7*	1	3.2
Norm	63	77.7	16	55.2*	22	55.0**	27	61.4	13	41.9***
Overweight and obesity	12	14.9	12	41.4**	12	30.0*	7	15.9	17	54.9***
WHtR (WC/Height):										
≤ 0.5 (Norm)	79	97.5	24	82.8**	35	87.5*	39	88.6*	24	77.4***
> 0.5 (overweight)	2	2.5	5	17.2**	5	12.5*	5	11.4*	7	22.6***
≥ 0.52 (risk of type II diabetes)	0	0.0	4	13.8***	4	10.0**	5	11.4**	5	16.1***
WHR (WC/HC):										
≥ 0.90 – excess visceral fat	0	0.0	0	0.0	1	3.5	0	0.0	1	5.0
< 0.90 – norm	49	100.0	6	100.0	28	96.5	32	100.0	19	95.0
Waist circumference (WC):										
< 94.0 – norm	79	97.5	26	89.7	39	97.5	40	90.9	27	87.1*
94.0-101.9 – overweight	2	2.5	1	3.4	1	2.5	4	9.1	4	12.9*
> 102.0 – abdominal obesity	0	0.0	2	6.9	0	0.0	0	0.0	0	0.0

Note: significance of differences with the control group (students from Belarus): * – $p < 0.05$; ** – $p < 0.01$; *** – $p < 0.001$.

Numerous studies have confirmed that body weight remains one of the leading indicators of nutritional status and physical development. The calculation of BMI allowed us to estimate the prevalence of normal, deficient and excessive body weight (including obesity) among different ethnic groups.

Underweight is found in isolated cases among the young Iranian (3.4% of the total ethnic sample) and Lebanese (3.2%) men, spread slightly more among the Belarusians (7.4%) and Turkmen (15.0%) and frequently represented in the group of the Indians (22.7%, $p < 0.05$ in comparison with the Belarusians). BMI within the norm limits is typical of 77.7% of the Belarusians, 61.4% of the Indians, 55.2% of the Iranians ($p < 0.05$),

55.0% of the Turkmen ($p < 0.01$) and only of 41.9% of the Lebanese ($p < 0.001$). Overweight (including obesity) is least frequently observed among the Belarusians and the Indians (14.9% and 15.9%, respectively), but is much more common among the Turkmen (30.0%, $p < 0.05$), the Iranians (41.4%, $p < 0.01$) and the Lebanese (54.9%, $p < 0.001$).

In addition to BMI, WC measurements and calculated indices such as WHR and WHtR are used to determine overweight and the presence of the most dangerous abdominal obesity.

WC are within the norm for majority of surveyed Belarusian men (97.5%), as well as for the majority (87.1–97.5%) of the representatives of other nationalities. Compared to the

Belarusians, the differences between the Lebanese reach the level of statistical significance ($p < 0.05$). WC indicated obesity only in isolated cases (12 people) and abdominal obesity of two Iranians.

The WHR measurements revealed only two cases of excess visceral fat among foreign students (in a Lebanese and Turkmen students). The WHtR values (WC/height) showed 2.5% of overweight cases among the young Belarusian males, while overweight was observed among 11.4% of the Indians, 12.5% of the Turkmens (in both cases $p < 0.05$), 17.2% of the Iranians ($p < 0.01$) and 22.6% of the Lebanese ($p < 0.001$). In addition, 13.8% of the Iranians, 16.1% of the Lebanese (in both cases $p < 0.001$), 11.4% of the Indians and 10.0% of the Turkmens (in both cases $p < 0.05$) are at risk of developing type II diabetes.

In terms of BMI, underweight within the range of 12.0% to 17.6% is observed in the young women. The body weight of the majority of females is within the normal range (77.9% of the Belarusians, 74.2 and 60.0% ($p < 0.05$) in the samples of the Turkmens and the Indians), but only the Iranians have slightly

lower body weight (41.2%, $p < 0.001$ in comparison with the Belarusians). Overweight (including obesity) is least common for the Belarusian (7.6%) and Turkmen (9.7%) women, but is significantly more common among the Indians (28.0%, $p < 0.01$) and the Iranians (41.2%, $p < 0.001$).

100% of the young Turkmen women and 97.2% of the Belarusians are in norm of WC. In the other ethnic groups, only 76.5% of Iranian ($p < 0.001$ when compared to the Belarusians) and 84.0% of Indian women ($p < 0.01$) are within the norm of WC. Most elevated WC values suggest overweight, but 5.9% of the Iranian ($p < 0.001$) and 4.0% of Indian women ($p < 0.01$) showed abdominal obesity.

WHR values for the young women of different nationalities were within the normal range, while WHtR values showed overweight in 23.5% of the Iranian and 16.0% of the Indian surveyed females (in both cases, $p < 0.001$ when compared to a group of the young Belarusian women with 1.4% of such cases). The risk of type II diabetes occurred in 11.8% ($p < 0.001$) of the Iranian and 8.0% ($p < 0.01$) of the Indian women and.

Table 3: Categories of somatic indexes of the females from BSMU (absolute values and %)

	Belarus (n=213)		Iran (n=17)		Turkmenistan (n=31)		India (n=25)	
	n	%	n	%	n	%	n	%
Somatotype:								
Stenoplastic	119	55.8	6	35.6	18	56.3	9	36.0
Mesoplastic	82	38.5	4	23.2	11	34.4	12	48.0
Picnic	12	5.7	7	41.2***	3	9.3	4	16.0*
BMI:								
Underweight	31	14.5	3	17.6	5	16.1	3	12.0
Norm	166	77.9	7	41.2***	23	74.2	15	60.0*
Overweight and obesity	16	7.6	7	41.2***	3	9.7	7	28.0**
WHtR (WC/Height):								
≤ 0.5 (norm)	210	98.6	13	76.5***	31	100.0	21	84.0***
> 0.5 (overweight)	3	1.4	4	23.5***	0	0.0	4	16.0***
≥ 0.53 (risk of type II diabetes)	1	0.5	2	11.8***	0	0.0	2	8.0**
WHR (WC/HC):								
≥ 0.90 – excess visceral fat	0	0.0	0	0.0	0	0.0	0	0.0
< 0.90 – norm	115	100.0	8	100.0	27	100.0	4	100.0
Waist circumference (WC):								
< 80.0 – norm	207	97.2	13	76.5***	31	100.0	21	84.0**
80.0-87.9 – overweight	6	2.8	3	17.6**	0	0.0	3	12.0*
> 88.0 – abdominal obesity	0	0.0	1	5.9***	0	0.0	1	4.0**

Note: significance of differences with the control group (students from Belarus): * – $p < 0.05$; ** – $p < 0.01$; *** – $p < 0.001$

Discussion

According to the received data, among the students of different ethnic groups studying in the first year of BSMU, the tallest are the Belarusians (179.40 and 166.41 cm for young men and young women, respectively), the shortest are the Indians (171.48 and 157.81 cm; in both cases $p < 0.001$); the rest of the groups have an intermediate position according to the height. Variations in height in different regions of the world are posed, in large part, by genetic factors. One of the most important environmental factors is the nutritional factor. After analyzing the considerable amount of data on height of young modern men in Europe, North Africa, Asia and Oceania, as well as the peculiarities of nutrition, living standards in these regions, the Czech authors concluded that height is related to the amount of proteins consumed (especially animal proteins), as well as the human development index, low birth rate (i.e., more resources per child), and the level of urbanization (Grasgruber, Cacek, Kalina, & Sebera, 2014; Grasgruber, Sebera, Hrazdira, Cacek, & Kalina, 2016).

The variations of other anthropometric indices, as well as somatic indices (body weight, BMI, and other indices) revealed to us body composition peculiarities of the surveyed students of different ethnic origin. In addition, these groups of indicators are more affected by a complex of environmental factors than height and can also be adjusted to a certain extent if their values reach the critical level.

The problem of overweight according to the BMI is very common among the young Iranian and Lebanese men, 41.4 and 54.9% of whom are overweight and obese, respectively. The young women have a high proportion of overweight (including obesity) in 41.2% of the Iranian and 28.0% of the Indian surveyed women.

The prevalence of overweight and obesity in Lebanon is a national problem (Mallat et al., 2016). Overweight and obesity are particularly common among men. In a study of the adult, relatively young (mean age 39) Lebanese population, conducted by S. Mallat and co-authors, 70.6% of men and 34.3% of women

are overweight and obese. Even among the students of the Lebanese University, representing the younger cohort of the population, overweight was identified in 36.3% of young men. By investigating the relationship between psychological stress and the presence of excess weight, the authors find this only in the surveyed females. At the same time, there is a sufficient amount of works showing that individuals with extreme degrees of obesity have more symptoms of psychological distress. A.A. Linda and her co-authors suggested that their research did not reveal such a significant correlation because the number of persons with class II/III obesity was small among the students (Linda, Pascale, Wissam, Zeina, & Isabelle, 2016).

The obesity problem in Iran is serious. Among women aged 20–30 surveyed in 1999–2000, 31.7% had overweight (including obesity), and by the age of 30 to 40, the percent of such women increased to 53.6% (Bakhshi, Seifi, Biglarian, & Mohammad, 2012). Women with low level of education, living in cities and unemployed, were more likely to be overweight. Another study suggested that 66.6% of adult women and 57.1% of men in the country were overweight. In addition, 24.6% and 13.3% of them, respectively, were obese (Babai et al., 2016). Even in school years, the percentage of overweight children in Iran is high. According to the 2016 data, 31.5% of girls and 39.9% of boys aged 8–12 in Tehran have been already overweight (Farajpour, PishgahRoodsari, Salehiniya, & Soheilipour, 2018).

Thus, the high proportion of overweight and obese people among students from Lebanon and Iran is a reflection of the general problem in these countries. The situation is different in other countries. A group of college students surveyed in India in the academic year 2017/18 showed that most male and female students were within the normal range of BMI (58.5% and 52.8%, respectively). The proportion of those who were underweight (32.1 and 26.4%) was also high, while overweight was less common (9.4 and 20.8%) (Kumar, Sathe, & Sathe, 2018). In our study, the young Indian women were also more likely to be overweight than the young men, but the proportion was slightly higher (28.0% and 15.9% respectively). This can be explained by the small number of Indian students we examined. Meanwhile, the proportion of overweight people in India has been increasing over the past 20 years. This is testified by the study of physical development of 5–17-year-old children and adolescents from different regions of India in dynamics (Khadilkar, Khadilkar, Cole, Chiplonkar, & Pandit, 2011).

There are not enough publications disclosing the overweight problem in Turkmenistan. According to WHO data of 2008, 41.5% of the country's adult population (over 20 years) were overweight and 13.2% were obese. The prevalence of overweight is higher in men (44.8%) than in women (38.5%), while the prevalence of obesity is slightly higher in women (13.5%) than in men (12.9%). No similar data could be found for the child and adolescent population. The only data available for us from 2000 suggests that only 1.6% of girls aged 15–19 were obese (Nutrition, Physical Activity and Obesity. Turkmenistan. WHO, 2013). In our study, only 1.4% of students in the total Turkmen group were obese.

The Belarusian students were the least overweight and obese: 14.9% in males and 7.6% in females. However, the situation deteriorates sharply with age. According to the WHO, 57.2% of adult men and 57.5% of women in Belarus are overweight, obesity is observed in 20.0% and 27.8% of individuals, respectively (Nutrition, Physical Activity and Obesity. Belarus. WHO, 2013).

However, the metabolic risk can be also diagnosed by indexes other than BMI: WC, WHR and WHtR. Such results are slightly different from those obtained using BMI. Thus, for example, the BMI values were normal only for 55.2% of the

Iranian males, but WC and WHtR data were normal for 89.7% and 82.8% of the Iranian males, respectively. A study of 1,000 Iranian adults found that WC and WHtR were more informative for determining metabolic risks, especially for women, than BMI and WHR (Hajian-Tilaki, Heidari, Hajian-Tilaki, Firouzjahi, & Bagherzadeh, 2014). Using all these three indicators (WC, WHR, and WHtR) to diagnose central obesity in rural women from northern Iran, the authors concluded that comprehensive studies are the best obesity indicator related to health in future (Veghari, Salehi, & Vaghari, 2018). A number of researchers preferred WHtR for the diagnosis of metabolic risk as an informative gender-independent indicator that takes into account body proportions, and is easy to calculate (Ashwell, Gunn, & Gibson, 2012; Rajput et al., 2014). In our study, according to WHtR values, 16.0% of the Indian females, 22.6% of the Lebanese males, 23.5 and 17.2% of the Iranian females and males have a risk of metabolic disorders, which is quite high.

It should also be taken into account that for Asian populations, due to their physique and metabolism, the thresholds for all indicators (BMI, WC, WHR and WHtR) should be slightly lower than those of the Western groups (Hajian-Tilaki et al., 2014; Dudeja et al., 2001; Waist Circumference and Waist-Hip Ratio, 2011).

The distribution of somatotypes also shows the presence of a significant group with increased fat deposition among the Iranian and Lebanese males (abdominal somatotypes were found in 34.5% and 51.4% of those surveyed, respectively), while the Indians have a dominant thin-complexed (thoracic) somatotype (38.6%). The Belarusian and Turkmen women have a high proportion of individuals with stenoplastic somatotype (55.8 and 56.3%), while the Iranian women have a picnic somatotype (41.2%). The picnic type is characterized primarily by increased fat deposition, the extremities seem to be shortened due to their high thickness. The trunk is plump, with shortened neck, wide rounded shoulders, cylindrical chest, convex abdomen, and wide pelvis.

The study of adaptation of female students and their anxiety level depending on the somatotype in the conditions of the North (Алексеева, & Николаева, 2013) has shown that there is a certain correlation between the somatotype and the adaptive capacity of the organism. Favorable course of adaptation is observed in hypertensive individuals (picnic, euriplastic somatotypes), which may be explained by the prevalence of vagal tone in vegetative regulation. Among the female students of normosthenic somatotype, the highest percentage of persons with strained course of adaptation (36.1%) is observed. Differences in physical development and functional state of the organism depending on sex, age, somatotype (Шкляр, 2006) are registered in the course of studies at the university. This testifies to the necessity to take into account the somatotype during dynamic observation of these processes.

Unfortunately, the percentage of females among Iranian and Lebanese students studying in BSMU is small. This was reflected in the insufficient number of them in the samples (17 Iranians and 9 Lebanese young women). Because of this limited number, the young Lebanese women were not included in the study. This somewhat restricted the obtained results and created a certain difficulty in their interpretation.

It should be noted that the work is only the first stage of the comprehensive research of modern youth from different countries. We are going to increase the number of students in all samples and take into consideration additional factors such as social, economic, psychological, physiological status of the students, etc. However, due to problems associated with the COVID 19 pandemic, the research was delayed.

Conclusions

The study of BSMU students from different countries revealed the most significant differences of the analyzed values in the male samples. The considerable differences in height, waist circumference, BMI, WHtR and CI were found between the males from Belarus, Iran and Lebanon. Significant similarities in most anthropometric indicators were found between the students from Belarus and Turkmenistan, both among males and females. Our study had some partial limitations due to insufficient number of female students from Iran and Lebanon. The most variable parameter among all the ethnic groups of both sexes was the height. Maximal differences of height (7.92–8.60 cm, $p < 0.001$) alongside with very large ES (1.3–1.4) were noted between the students from Belarus and India.

WHtR and BMI reflected the nutritional status and the risk metabolic disorders better than WHR both in males and females. The most frequent WHtR and BMI beyond their normal values with abdominal somatotype were more frequently observed among the Iranians and Lebanese. The female Students from Belarus and Turkmenistan were similar in their constitution and had the smallest number of cases when the indices were beyond the normal range.

Anotace

Běloruská státní lékařská univerzita (BSMU) je jedna z předních lékařských vysokých škol v Běloruské republice. Na univerzitě studují studenti z různých zemí Evropy, Asie, Afriky a Latinské Ameriky, jakož i běloruští studenti. Tato práce je zaměřena na specifikaci typů postav 18 až 22letých studentů různých národností. Předmětem studie bylo 511 studentů medicíny (225 chlapců a 286 dívek) ve věku 18 až 22 let, z toho 294 Bělorusů a 217 zástupců jiných národností (Turkmenů, Libanonců, Íránců a Indů). Byla provedena antropometrická měření, stanoven somatotyp a vypočteny různé indexy (BMI, WHR, WHtR, CI). Významnost rozdílů v absolutních hodnotách byla stanovena pomocí Mann-Whitneyho U-testu a relativní hodnoty byly porovnány pomocí chí-kvadrát testu.

Mezi studenty různých národností studujícími na BSMU jsou nejvyšší Bělorusové (179,40 a 166,41 cm u chlapců a dívek příslušně), nejnižší jsou Indové (171,48 a 157,81 cm; v obou případech $p < 0,001$); zbytek skupin zaujímá střední postavení z hlediska tělesné výšky. Mezi somatotypy běloruských, íránských a turkmenských mužů převažuje svalový nebo přechodné k němu (42,0, 44,8 a 50,0 % mezi zkoumanými příslušně). Mnoho Indů má hrudníkový somatotyp (38,6 %), zatímco mezi Libanonci je rozšířen břišní somatotyp (51,4 %, $p < 0,05$). Mezi běloruskými a turkmenskými dívkami převažuje stenoplastický somatotyp (55,8 % a 56,3 % příslušně). Mezi íránskými dívkami je nejčastější morfotyp se zvýšenou depozicí tuků (41,2 %, $p < 0,001$). Podle hodnot WHtR, které naznačují riziko metabolického syndromu, bylo u běloruských hochů zaznamenáno pouze 2,5 % případů nadváhy, zatímco u jiných etnických skupin chlapců se nadváha vyskytuje u 11,4 % zkoumaných Indů, 12,5 % Turkmenů (v obou případech – $p < 0,05$), 17,2 % Íránců ($p < 0,01$) a 22,6 % Libanonců ($p < 0,001$). Výpočet WHtR ukázal, že mezi zkoumanými dívkami má nadváhu 23,5 % Íránek a 16,0 % Indek (v obou případech $p < 0,001$ ve srovnání se skupinou Bělorusek, které měly 1,4 % takových případů).

Studie studentů BSMU z různých zemí odhalila nejvýznamnější rozdíly v analyzovaných ukazatelích u chlapců. Mezi hochy z Běloruska a Íránu v Libanonu byly zjištěny významné rozdíly v délce těla, obvodu pasu, BMI, WHtR a CI. Významná podobnost ve většině antropometrických ukazatelů byla zjištěna u studentů z Běloruska a Turkmenistánu, a to jak u chlapců, tak u dívek. Indexy WHtR a BMI odrážely stav výživy a hrozbu metabolických poruch lépe než WHR u chlapců i dívek.

Klíčová slova: antropometrické ukazatelé, somatické indexy, somatotyp, studenti medicíny z různých zemí, Běloruská republika.

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