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BMI OF FEMALE STUDENTS NEWLY ENROLLED AT TODOR KABLESHKOV UNIVERSITY OF TRANSPORT

Introduction

In the academic year 2011/2012 we carried out a study on the anthropometric measurements of the newly-enrolled female students at the Todor Kableshkov University of Transport. According to some previous studies (Popov,1969) a slight increase in height and weight of female has been observed with the increase of age during the studies at the university, while according to other studies (Karapetrov, 1978) such changes in anthropometric measurements are reported also at later age.

Methods

Besides the conventional anthropometry, in our study we calculated the individual body mass index or index Kettle established in the mid-nineteenth century. This index gained wide popularity in the 1950s and 1960s, when the problem of obesity in the USA and Europe reached considerable levels. The BMI values are mainly approximate proportions because the ideal weight depends on whether it is primarily due to muscles or subcutaneous fat. A problem, especially with athletes, is that muscles are heavier than fats. Hence, according to the BMI, athletes may find themselves with "overweight" without that ever being true. It is why BMI has been used mostly for statistical information as an indicator of the degree of population obesity since 1980s.

Results

The study involved 78 female first-year students at the University of Transport. The indicators under examination were height, weight, skin-fold, waist circumference and BMI.

The statistical results of BMI are presented in Table 1.

Table 1. Statistical characteristics of BMI

\bar{X}	<i>S</i>	<i>mx</i>	<i>As</i>	<i>Ex</i>	<i>V</i>	<i>Max</i>	<i>Min</i>	<i>R</i>
23,1	1,35	0,21	-0,09	-0,17	1,8	26,1	20,3	5,8

The BMI coefficient of 18.5-24.99 for adults is considered as normal weight. Of the participants in the study, 9/10 fall within this range, but there is a serious displacement (72%) to the upper limit, which proves the tendency to overweight. The coefficient of 25 is considered as obesity, which refers to 10% of the female students.

Table 2 shows the values of the weight and height ratio and the respective physical status of the body.

Table 2. BMI and body physical status

Physical status	Body Mass Index
Underweight	below 18.5
Severe malnutrition	below 16.0
Average malnutrition	16.00 – 16.99
Mild malnutrition	17.00-18.49
Normal weight	18.5 – 24.99
Overweight	over 25.00
Pre-obesity	25.00 – 29.99
Obesity	over 30.00
Excessive obesity	over 40.00

Further, the analysis clarifies the main problems, which physical education faces: the reduction of hypo-dynamics and related negative effects that immediately occur in BMI.

According to the examinations connected with the Eurofit test system implementation, the BMI as an indicator of the general health works in combination with coefficients of subcutaneous fat (skin-fold) and the waist/hips ratio. With high values of the three variables, there are high risks to individual's health.

The "skin-fold" indicator facilitates the examinations to establish subcutaneous fat mass. There are disputes about the reliability of the method as it is accompanied by a number of objective and subjective factors during the measurement: the state of the body (hydration or dehydration), skin moisture (using bioelectrical impedance), the quality of equipment used and the experience of those who carry out the study.

The most common method when with using skin-fold is the 7-point method of Jackson and Pollock. It requires 7 measurements at different points of the body, which makes it relatively laborious for the conditions of study. The method is also of long duration and the probability of errors in calculations is high. It is why for the purpose of our examinations we used a reliable way to quickly find the index measuring not the skin-fold itself but directly the amount of subcutaneous fat. The method was developed by P. Deurenberg, 1991 and includes BMI index (BMI) and what is most important, it does not require special equipment. The essence of the method is in the following formula:

$$SF\% = (1,2 \times BMI) + (0,23 \times age) - 5,4 \quad (1)$$

where SF is the subcutaneous fat measured in percentage (%). The calculation is made quickly and the analysis of the results is carried out according to a scale developed by V. Heyward, 1996 (Table 3).

Table 3. Index of subcutaneous fat (in %)

Malnutrition	Below average	Average	Over average	Obesity
up to 8%	9-22%	23%	24-31%	more than 32%

The results obtained for subcutaneous fat in the study are closely related to the level of BMI and are presented in Table 4.

Table 4. Statistical characteristics of subcutaneous fat (in %)

\bar{X}	<i>S</i>	<i>mx</i>	<i>As</i>	<i>Ex</i>	<i>V</i>	<i>Max</i>	<i>Min</i>	<i>R</i>
26,6	1,6	0,25	-0,11	-0,07	2,48	30,3	23,3	7

All participants, except for 4, fall in the same category: above the average (24-31 % subcutaneous fat), which once again proved the increased tendency to overweight among most examined female students.

In our study the average values of BMI for the entire group of female students are 23.1 and 26.6% of subcutaneous fat respectively. We can compare these data with national survey in Britain where with average BMI values of 25, the subcutaneous fat of females aged 16-24 years is 31%.

Discussion

For the last years a number of publications have reported insufficient security of BMI index regarding body health, even in combination with the index of subcutaneous fat. It has been established that it is significant where fats are located but not just what their quantity is.

Anthropometric indicator "Waist" successfully completes the previous two indicators. According to some studies (Bjorntorp, 1992) the fats in the abdominal wall lead to a greater risk of cardiovascular disease and diabetes than those in other parts of the body. The statistical processing of the results of research in waist circumference is shown in Table 5. The correct measurement of waist circumference in combination with BMI helps to establish the actual physical development of the female students and the risk, if any, for their health (Table 6).

As it can be seen from the table, there is a dependency between the waist circumference and BMI and the potential levels of risk: even with a circumference below the neutral value (88 cm) but with increased values of BMI, the body faces high levels of risk.

Table 5. Statistical characteristics of waist circumference

\bar{X}	<i>S</i>	<i>mx</i>	<i>As</i>	<i>Ex</i>	<i>V</i>	<i>Max</i>	<i>Min</i>	<i>R</i>
72,6	2,97	0,46	-0,1	-0,8	8,8	79	67	12

Table 6. Ratio of BMI, waist circumference and body physical status

Weight category	BMI	Obesity: type	Waist circumference below 88 cm	Waist circumference over 88 cm
Underweight	- 18,5	-	-	-
Normal	18,5-24,9	-	-	-
Overweight	25-29,9	-	Increased risk	High risk
Obesity	30-34,9	I	High risk	Very high risk
Obesity	35-39,9	II	Very high risk	Very high risk
Excessive obesity	40,0+	III	Extremely high risk	Extremely high risk

The data obtained are important for anthropometric study of young people to motivate them to change lifestyle and raising raise awareness of necessity for physical activity.

From the study on BMI and the related anthropometric indicators, the following conclusions can be drawn:

1. A significant part of participants in this study have normal weight, but with a tendency to increase it, which accompanied with the increased levels of hypo-dynamics of young people results in deterioration of the body physical status.
2. Nearly 10 % of those who were surveyed are overweight combined with high levels of subcutaneous fat and waist circumference, which is a prerequisite for an increased risk of diseases.
3. However, it is largely possible to correct a considerable part of the negative results of the study, especially in regard to obesity and waist circumference.

References

Попов, Г. и кол.(1969) Изследване върху физическото развитие и физическата дееспособност на постъпващи студенти от ВМЕИ, Трудове на ВИФ, т.XII, 3/1969 (Popov, G. and co-authors. Study on physical development and physical fitness of incoming students at the Technical University, Proceedings of VIF, vol.XII, 3/1969)

Карапетров, Гр.(1978) Съпоставяне на някои антропометрични показатели на сегашните студенти със студенти преди 15-16 години, Доклад на конгрес на анатомите, В, 1978 (Karapetrov, Gr. Comparison of some anthropometric indicators of current students with students 15-16 ago, Congress of Anatomists, V., 1978)

Deurenberg, P., Westrate, J.A., Seidell, J.C. (1991) BMI to body fat percentage formula, BR J Nutr, 3, 1991.

Heyward, V.H., Stolarczyk, L.M. (1996) Applied body composition assessment, Champaign.Human Kinetics, 1996, p. 90-8.

Bjorntorp, P. (1992) Abdominal fat distribution and the metabolic syndrome, J Cardiovasc Pharmacol, 1992; 20 Suppl 8:S 26-8.

Petkov, K., Panayotov, V., Bonova, I., Palatova, B. Implementing a complex methodology for weight reduction in obese people

Panayotov, V. Features and time dynamics of the body mass index and the ponderal index of professional bodybuilders during the 1980-2012 period

*BMI OF FEMALE STUDENTS NEWLY ENROLLED AT TODOR KABLESHKOV
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Introduction: The paper presents the results of a study where besides using the conventional anthropometry, the individual Body Mass Index (BMI) or Kettle Index was calculated. Being established in the mid-nineteenth century, Kettle Index gained wide popularity in the 1950s and 1960s when the problem of obesity in the developed countries acquire serious levels. The aim was to prove the relationship between anthropometric parameters and Body Mass Index as well as the possible health risks of the individual. Methods: The study was carried out on 78 first-year female students at the Todor Kableshkov University of Transport (VTU). The indicators examined were: height, weight, skin fold, waist circumference and BMI. Descriptive statistics was used with data processing and different methods were applied to establish the anthropometric parameters: Body Mass Index or Kettle Index; quantitative subcutaneous fat according to the method developed by Deurenberg; comparative analysis of the link between waist circumference; BMI and the state of the individual's body. Results: The study showed that the average BMI for the entire group of students was 23.1 and subcutaneous fat of 26.6% respectively. Nearly 10% of those being examined are overweight combining high levels of subcutaneous fat and waist circumference, which is a prerequisite for increased risk of disease. Discussion: In the academic year 2011/2012 a study of anthropometric indicators of the newly-enrolled female students was carried out at the Todor Kableshkov University of Transport (VTU). In compliance with some studies (Popov, 1969) a slight increase of size and weight is observed with increasing the age of women during the time of study at university while according to others (Karapetrov, 1978) changes in anthropometric indicators are reported to a later age. According to the research related to introduction of Euro fit tests, BMI as an indicator of general health of the body works in combination with the coefficients of subcutaneous fat (skin fold) and the waist/hips ratio. With big values of the three variables, there are high health risks for individuals. According to some studies (Bjorntorp, 1992), the abdomen fat leads to a greater risk of cardiovascular disease and diabetes than the fats in other parts of the body. The considerable part of participants in this study had normal weight but with a tendency of its increasing that could result in bad condition of the organism. Using the advantages of physical education, it is largely possible to correct most of negative results obtained through the study, especially in relation to obesity and waist circumference. References: Deurenberg P, Weststrate JA, Seidell JC (1991). Br J Nutr., 65(2),105-14. Bjorntorp P (1992). J Cardiovasc Pharmacol, 8S, 26-8.