Study of body mass index (BMI), body fat percent (%BF), and waist to hip ratio (WHR) in male physical education students

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Abstract:

The purpose of this study was to investigate body mass index (BMI), body fat percent (%BF) and waist-hip ratio (WHR) of physical education male students of Shahid Chamran University and comparison with national and international body composition standards. *Material*: Subjects were seventy five male students physical education male students of Shahid Chamran University of mean age (23.21±2.78), mean height (174±5.71) and mean weight (70.07±9.43) who were selected randomly. Some of body composition indices were determined with body composition analyzer apparatus (bioelectrical impedance apparatus). *Results*: Descriptive characteristics of subjects include: body fat percent (19.37±3.62), waist-hip ratio (0.80±0.037) and body mass index (23.18±2.68). To categorize and regulate data we used descriptive analyzes, to calculate Pearson correlation coefficient we used presumption analyzes and to compare the obtained data with national standards we used T-test statistical procedure. There are significant correlations between body mass index and waist-hip ratio (P=0.709, r=0.001), between body mass index and body fat percent (P=0.783, r=0.001) and between body fat percent and waist-hip ratio (P=0.809, r=0.001). There are significant differences between mean body mass index and its national standard (P=0.001), between mean waist-hip ratio and its national standard (P=0.001) and between mean body fat percentage and its national standard (P=0.001). *Conclusions*: Results revealed that according to national standards of body fat percentage and body mass index of subjects, they were assigned to more than intermediate limitation; it may be due to abnormal nutrition, unregulated exercise or physical activity and heredity.

Keywords:
Body composition, body fat percentage (%BF), body mass index (BMI), waist-hip ratio (WHR)

Мехзад Шабани, Саед Шакериан, Роу-холах Фатеми. Исследование индекса массы тела (ИМТ), процента жира (% BF) и соотношения объема талии к бедру (WHR) у студентов мужского пола департамента физического воспитания. *Це-лью* данного исследования было изучение индекса массы тела (ИМТ), процента жира (% BF) и соотношение талии и бедер (WHR) студентов департамента физического воспитания мужского пола Шахид Чамран университета в сравнении с национальными и международными стандартами состава тела. *Материал*: Испытуемые 75 студентов мужского пола департамента физического воспитания Шахида Чамран университета, средний возраст (23,21 ± 2,78 лет), средний рост (174 ± 5,71 см) и средний вес (70,07 ± 9,43 кг), которые были выбраны случайным образом. Некоторые из показателей соста-ва тела были определены с помощью аппа-рата анализатора состава тела (аппарата биоэлектрического сопротивления). *Резуль-таты*: Описательные характеристики субъектов включают в себя: процент жира (19,37 ± 3,62), соотношение талии и бедер (0,80 ± 0,037) и индекс массы тела (23,18 ± 2,68). Для классификации и регулирования данных мы использовали описательные анализы. Для вычисления коэффициента корреляции Пирсона мы использовали ги-потезу и сравнили полученные данные с на-циональными стандартами. Также исполь-зовали статистическую процедуру t-тест. Установлены значимые корреляции между индексом массы тела и соотношения талии и бедер (P = 0,709, r = 0,001), между индек-сом массы тела и процентом жира в теле (P = 0,783, r = 0,001) и между процентом жира в организме и отношением талии и бедер (P = 0,809, r = 0,001). Отмечаются существенные различия между средним индексом массы тела и ее национальным стандартом (P = 0,001), между средним соотношением талии и бедер и их национальным стандартом (P = 0,001), а также между средним процентом жировых отложений и его национальным стандартом (P = 0,001). *Выводы*: Результа-ты показали, что в соответствии с нацио-нальными стандартами процента жировых отложений и индекса массы тела студенты были отнесены к группе риска . Это может быть связано с неправильным питанием, физическими упражнениями или нерегули-руемой физической активностью и наслед-ственностью.

состав тела, процентное содержание жира, индекс массы тела, соотношение талии и бедер.

Мехзад Шабані, Саєд Шакеріан, Ро-ухолах Фатемі. Дослідження індексу маси тіла (IMT), відсотка жиру (% BF) і співвідношення об'єму талії до стег-на (WHR) у студентів чоловічої статі департаменту фізичного виховання. *Метою* даного дослідження було ви-вчення індексу маси тіла (IMT), відсо-тка жиру (% BF) і співвідношення талії і стегон (WHR) студентів департаменту фізичного виховання чоловічої статі Ша-хід Чамран університету в порівнянні з національними та міжнародними стан-дартами складу тіла. *Матеріал*: Випро-бовувані 75 студентів чоловічої статі де-партаменту фізичного виховання Шахіда Чамран університету, середній вік (23,21 ± 2,78 років), середній зріст (174 ± 5,71 см) і середня вага (70,07 ± 9,43 кг) , які були обрані випадковим чином. Деякі з показників складу тіла були визначені за допомогою апарату аналізатора складу тіла (апарату біоелектричного опору). *Результати*: Описові характеристики суб'єктів включають в себе: відсоток жиру (19,37 ± 3,62), співвідношення та-лії і стегон (0,80 ± 0,037) і індекс маси тіла (23,18 ± 2,68). Для класифікації та регулювання даних ми використовували описі аналізи. Для обчислення коефі-цієнта кореляції Пірсона ми використову-вали гіпотезу і порівняли отримані дані з національними стандартами. Також ви-користовували статистичну процедуру t-тест. Встановлено значущі кореляції між індексом маси тіла і співвідношення талії і стегон (P = 0,709, r = 0,001), між індексом маси тіла і відсотком жиру в тілі (P = 0,783, r = 0,001) і між відсотком жиру в організмі і співвідношенням талії і сте-гон (P = 0,809, r = 0,001). Відзначаються істотні відмінності між середнім індексом маси тіла та її національним стандар-том (P = 0,001), між середнім співвідно-шенням талії і стегон і їх національним стандартом (P = 0,001), а також між се-реднім відсотком жирових відкладень і їх національним стандартом (P = 0,001) . *Висновки*: Результати показали, що у від-повідності з національними стандартами відсотка жирових відкладень і індексу маси тіла студенти були віднесені до групи ризику. Це може бути пов'язано з неправильним харчуванням, фізичними вправами чи нерегульованої фізичною активністю і спадковістю.

склад тіла, процентний вміст жиру, ін-декс маси тіла, співвідношення талії і стегон.

Introduction

Overweight and obesity are major, and increasing, public health concerns in all parts of the globe. Obesity increases the risk of chronic health consequences including hypertension, hypercholesteroaemia, hyperglycaemia, type II diabetes and cardiovascular diseases. In Australia, 19% of adult males and 22% of adult females are considered obese and the direct health care costs of obesity are estimated at approximately $830 million annually (Thorburn et al. 2005). To relate obesity directly to health risks, assessment of both total body fat deposition and distribution as subcutaneous or visceral fat are important. Methods frequently used to determine overall body fatness include Body Mass Index (BMI; body mass (kg)/stature (m)^2) and percentage body fat (%BF). However, a number of studies have shown that it is not

appropriate to use a single BMI cut-off point to detect obesity as different BMI-%BF relationships have been observed in different ethnic groups (Deurenberg-Yap M et al. 2000; Deurenberg P et al. 2003). Using anthropometry, a previous study found that the BMI value of 23kg/m2 for young Japanese adults equates with a BMI value of 25kg/m2 for Australian Caucasians (Kagawa et al. 2006).

The use of BMI in this way has a number of limitations, including its inability to distinguish between fat mass and non-fat mass (Norgan & Ferro-Luzzi, 1982; Garn et al. 1986; Ross et al. 1988). These limitations may become an important issue when comparing ethnic groups with distinctively different body proportions or physiques. Several studies have suggested that the relationship between BMI and %BF (i.e. the BMI–%BF relationship) varies with age, gender and ethnicity (Schaefer et al. 1998; Deurenberg et al. 2002; Chang et al. 2003).

Longitudinal study which it performed in Hardward University during 27 years on 19292 students with mean age 46.6 years old had been shown that rate of mortality in men who had body mass index (BMI), 26 kg/m2 , 1.67 times is more than men who had body mass index, 22,5 kg/m^2 (Altan O. et al. 1999). Body mass index in male students of Thrtoww University is reported as 22.8 kg/m^2 (Jurimae.T et al. 1991), but by Clasey et al in Virginia University, it is reported as 24.7 kg/m^2 (Clasey. Jl. et al. 1999).

In this study, we investigated BMI, percent body fat, and waist - hip ratio in male students of physical education and sport sciences field and we compared them with Iran national and international standards.

Methodology

The study was approved by the Human Research Ethics Committees of Shahid Chamran University of Ahwaz. In this study, we measured body mass index (BMI), percent body fat (%BF), and waist to hip ratio (WHR) by using Bioelectrical Impedance apparatus

Subjects

Statistical population included 162 students of physical education and sport sciences field of Shahid Chamran University Ahwaz Iran and we selected simple randomly 75 students from statistical population.

Measurements

Test performed at 8 AM and subjects were fasting and they had not done any body activity before test. Test had been done through using Bioelectrical Impedance apparatus producted by GWON Corporation Korea, model Olympia.

Statistical analysis

To demonstrate means and standard deviation of study variables (BMI, %BF, and WHR) we used quantify statistical procedures and to determine relationships between measured variables - Pearson correlation coefficient; to determine difference between measured variables and Iran national and international standards we used independent T-test. Statistical analysis was done by using SPSS software version 17.

Results

In this research, students had height, 174 ± 5.71 Cm and weight, 23.18 ± 2.68. Total subjects' data are given in table 1, means and standard deviations of study variables (BMI, %BF, and WHR) are shown in table 2, percentage of BMI, BF, and WHR according to Iran national norm exhibit in table 3, percentage of BF, and WHR and percentage of BMI according to international standard are respectively given in table 4 and table 5, comparison

Table1.

Total subjects data

variable	Mean and standard deviation	Minimum	Maximum
Age	23.21 ± 2.78	18	26
Height	174 ± 2.78	165	193
Weight	70.07 ± 9.43	54.10	102.7

Table2.

Means and standard deviations of study variables (BMI, %BF, and WHR)

variable	Mean and standard deviation	Minimum	Maximum
%BF	19.37 ± 2.78	11.80	32.90
BMI	23.18 ± 5.71	18.30	33.90
WHR	0.80± 9.43	0.70	0.94

between variables in this research (BMI, %BF, and WHR) with Iran national standard are presented in table 6, and relationships between study variables - in table 7. In this study, significant level was 0.05.

According to table 3, body fat percentage of most subjects in three age classifications assigned to in moderate to high and high classifications, body mass index of most subjects in three age groups assigned to in moderate, moderate to high and high classifications and waist-hip ratio of most subjects in three age classifications assigned to in moderate classification.

In table 4 we can see that percentage of body fat of most subjects assigned to moderate and good classifications and waist - hip ratio of most subjects in three age groups assigned to excellent classification.

Table 5 exhibits that body mass index of most subjects

Table3.

Percentage of BMI, BF, and WHR according to Iran national standard

Very high		High		Moderate to high		Moderate		Moderate low		Low		Very low		variable
%	No	%	No	%	No	%	No	%	No	%	No	%	No	
17	13	43	32	24	18	13	10	3	2	0	0	0	0	%BF
16	12	20	15	22	16	20	15	8	6	13	10	1	1	BMI
1	1	5	2	7	5	28	22	21	16	21	16	18	14	WHR

Table4.

Percentage of BF and WHR according to International national standard

Bad		Moderate		Good		Excellent		Low		Variable
%	No	%	No	%	No	%	No	%	No	
22	17	39	29	34	25	5	4	0	0	%BF
0	0	2	1	4	3	94	71	0	0	WHR

Table5.

Percentage of BMI according to International national standard

Fat		Overweight		Normal		Thin		Variable
%	No	%	No	%	No	%	No	
3	2	16	12	80	60	0	0	BMI

Table 6.

Comparison between variables in this research (BMI, %BF, and WHR) with Iran national norm

Variable	t	Significant levels
BMI	2.531	0.013*
%BF	9.724	0.001®
WHR	-6.301	0.001®

*: $P < 0.05$, ®: $P < 0.01$.

Table7.

Relationships between study variables

Variable	BMI	%BF	WHR
BMI	1	r = 0.783 P = 0.001®	r = 0.709 P = 0.001®
%BF	r = 0.783 P = 0.001®	1	r = 0.809 P = 0.001®
WHR	r = 0.709 P = 0.001®	r = 0.809 P = 0.001®	1

®: $P < 0.01$.

in three age groups are assigned to normal classification.

In table 6 we present comparison between variables in this research (BMI, %BF, and WHR) with Iran national standard. Obtained results from this table show that there are significant differences between subjects BMI, %BF, and WHR with theirs Iran national standard (respectively P < 0.013, P < 0.001, and P < 0.001).

Table 7 shows that there are relationships between BMI and %BF (r = 0.783, P = 0.001), between BMI and WHR (r = 0.709, P = 0.001), and between WHR and %BF (r = 0.809, P = 0.001).

Discussion

In the study it is reported that body mass index of male untrained athletics from Thrtoww university of Estonia was 22.8 kg/m² (Jurimae.T et al, 1991). Clasey. Jl. et al reported that body mass index of male trained students from Virginia University was 24.7 kg/m² (Clasey. Jl et al, 1999). Observed difference in results of this study can occur due to various economic, social, and cultural conditions which there are in different universities. Having compared results of this research with World Health Organization (WHO) standard, we determined that %79 male students of physical education filed of Shahid Chamran University of Ahwaz have optimal weights and they are healthy and can be assigned to minimum danger rate.

Mean body mass index of students, comparing with its national standard shows that they can be assigned to classification "moderate to high". Probable reason of current result can increase percentage of body fat. Also mean BMI of male physical education students of Shahid Chamran University of Ahwaz, compared with its national standard, shows that there is significant difference between their mean BMI (Masaharu Kagawa et al, 2007).

Waist - hip ratio in this study is in significant correlation with body mass index (r= 0.709, P=0.001). Current result is in accordance with Altan O. et al research's results that it likelihood was due to accumulating body fat in waist and hips (Altan O. et al, 1999).

Ninety four percent of male physical education students of Shahid Chamran University of Ahwaz located excellent WHR range, that is why they were put into minimum danger rate and they had low abdomen fat (Bray G.A., 1985).

In this research it is shown that there is positive significant correlation between percentage of body fat and waist - hip ratio (r = 0.809, P = 0.001). In general, body composition of students in this study, in comparison with Iran national standard, in better situation in respect to health. Body mass index of subjects was higher than Iran national standard that may be due to increased weight of subjects and can be as resulted from intake of additional kilo calories from food materials and also it possibly could be caused by irregular daily activities (Ronald K et al, 2006).

In general, in this research we determined suitable correlation between percentage of body fat, waist - hip ratio, and body mass index in subjects that could be caused by low daily activity and increased kilo calories intake through elevated food consumption, which can result in increasing of body fat in waist and hips and also can result in increased body mass index (Masaharu Kagawa et al, 2007).

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