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Original/*Obesidad*

Anthropometric obesity indices in relation to age, educational level, occupation and physical activity in Bulgarian men

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Abstract

Objective: **The objective of this study was to estimate the level of obesity and its relationship to age, educational level, occupation and physical activity in adult Bulgarian men.**

Material and methods: **The sample included 1010 men, aged 18-50 years old, from town of Plovdiv, Bulgaria. The study was made in period 2004-2008. The body height, weight and waist circumference were measured. Overweight and obesity were defined according to the international cut-off points of body mass index (BMI). The abdominal obesity was assess by the categories of waist-height ratio (WHTR).The age, educational level, occupation and physical activity of each person were investigated through inquiry. For statistical analysis the SPSS package was used.**

Results: **The results shown that 42.1% of investigated men were overweight and 19.4% of them were with obesity.With irregular WHTR and central obesity were 66.1% of all cases. The percent of men with general and central obesity increases with age. In the case of both general and central obesity, the differences between physical and intellectual workers are significance, even after controlling the age.WHTR has a greater potential for differentiating persons with different occupations than BMI. The age and occupation were the most significant factors affecting the general and abdominal obesity. The educational level has a significant impact on abdominal accumulation of fat.The connection between level of physical activity and BMI and WHTR was lower.**

Conclusion: **The study finds that the men working and living in that particular urban area have significant differences in terms of overweight and obesity. The educational level, occupation and age have a serious potential to influenced their body nutritional status.**

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Key words: Obesity indices. Anthropometry. Men. Factors.

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ÍNDICES ANTROPOMÉTRICOS DE LA OBESIDAD EN RELACIÓN CON LA EDAD, NIVEL EDUCATIVO, OCUPACIÓN Y ACTIVIDAD FÍSICA EN LOS HOMBRES BÚLGAROS

Resumen

Objetivo: **El objetivo del presente estudio fue estimar el nivel de obesidad y su relación con la edad, nivel educativo, ocupación y actividad física en los hombres adultos búlgaros de zona urbana.**

Material y métodos: **La muestra incluyó hombres 1010, de 18-50 años de edad, de la ciudad de Plovdiv, Bulgaria. El estudio se realizó en el período 2004-2008. Se midieron la circunferencia del cuerpo altura, peso y cintura. El sobrepeso y la obesidad se definen según los puntos de corte internacional de índice de masa corporal (IMC). La obesidad abdominal fue evaluar las categorías de relación de la altura de la cintura (CT). La edad, nivel educativo, ocupación y actividad física de cada persona se investigaron a través de la consulta. Para el análisis estadístico el SPSS paquete fue utilizado.**

Resultados: **Los resultados muestran que 42,1% de los hombres investigados eran sobrepeso y 19,4% de ellos eran obesos. Con CT irregular y obesidad central fueron 66,1% de los casos. El porcentaje de hombres con obesidad general y central aumenta con la edad. En el caso de la obesidad central y general, las diferencias entre los trabajadores físicos e intelectuales son significación, incluso después de controlar la edad.CT tiene un mayor potencial para diferenciar las personas con diversas ocupaciones que BMI. La edad y la ocupación fueron los factores más importantes que afectan la obesidad general y abdominal. El nivel educativo tiene un impacto significativo en la acumulación de grasa abdominal.La conexión entre el nivel de actividad física e IMC y CT fue menor.**

Conclusiónes: **El estudio encuentra que los hombres trabajan y viven en ese particular área urbana tienen diferencias significativas en términos de sobrepeso y obesidad. El nivel educativo, ocupación y edad tienen un potencial grave influenciado su estado nutricional del cuerpo.**

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Palabras clave: *Índices de obesidad. Antropometría. Hombres. Factores.*

Abbreviations

BMI: Body mass index.
BNSI: Bulgarian National Statistics Institute.
WHO: World Health Organization.
WC: Waist circumference.
WHTR: Waist to height ratio.

Introduction

Obesity is a significant global health problem which affects both adults and children. The number of overweight and obese people worldwide is increasing dramatically. According to the World Health Organization (2014)[1] in 2008 over 1.4 billion people aged 20 years or more were overweight. Among them 200 million men and 300 million women were obese. Since 1980 the number of obese people worldwide has doubled. In spite of the efforts to reverse this negative trend it continues to exist. There is ever more proof that obesity is related to increased risk of occurrence of a number of disorders of the cardiovascular system[2], diabetes mellitus type 2[3] , etc. consequently, obesity affects the quality of life[4] and leads to premature death[5]. This makes screening of overweight and obese people of paramount importance in order to reduce the risk of accompanying disorders.

The classification of overweight and obese adults is largely done by means of the body mass index (BMI). It is appropriate for use on young adults because it correlates relatively well with the total quantity of body fat in the body. The results of this relatively simple index need to be treated with caution.The interpretation of the BMI is obstructed in individuals with an increased muscle mass (people involved actively in sports and athletes), in people with a disruption of the water balance (dehydration or edema) and in patients with muscle dystrophy. Furthermore, the percentage of accumulation of body fat increases up to the age of 60-65 in both sexes[6] and in the case of equivalent BMI, it is higher in women than in men[7].

The range of the normal index of body mass (BMI), as defined by the World Health Organization[8] is quite broad -18.5-24.99 kg/m^2.Some people who fall within this range may have considerable central accumulation of fatty tissue, which presents a greater metabolic risk. Therefore the measurement of the extent of the abdominal distribution of fats is important for early detection of possible health risk even among people with normal weight.

Waist circumference (WC) is used ever more frequently for measurement of central obesity among adults[9]. According to the researchers this feature has greater potential for detection of abnormal weight than the BMI.

A number of authors point out the fact that waist circumference as an obesity index improves when related to height[10].The waist to height ratio (WHTR) is a simple and practical anthropometric index that provides additional predictive information that BMI and WC cannot provide[11, 12]. They point out the various reasons why WHTR is a fast and effective global index – it is easy to measure and calculate, its border values (WHTR=0.5) are equally applicable in men, women, children and adults, as well as ethnic groups[13]. They conclude that WHTR is a more sensitive index and a promising alternative to BMI for early warning against health risks. The simple message of this index is that the waist circumference should be less than half of the height.

Obesity is a serious concern for public health in Bulgaria. The results of a study made in 2008 by the Bulgarian National Statistics Institute (BNSI) show that over a half of the Bulgarians are overweight and obese[14].According to these indicators Bulgaria occupies an average position compared to the other countries of Europe. The most alarming data is that Bulgaria has the highest stroke rates in the world and it ranks among the first in cases of myocardial infarction, both etiologically related to overweight conditions[15]. Bulgaria is an East European country in transition, undergoing deep social, economic and infrastructural changes, including changes in health care, business, agriculture, transport, environment, food industry, marketing, education, etc.[16]. In parallel with the changes in the social and economic sphere, occurs a rise in unemployment. A considerable portion of the Bulgarians do not have regular jobs, others are temporally or permanently unemployed. This decreases their social and economic status, respectively their income. Both the low income, and the insecurity cause a rise in the psycho-social stress among the population. Many Bulgarians cannot afford to buy good quality healthy food. They consume high carb, low protein food[17]. At the same time, there are some who have more than one job. In their case stress is combined with hypodynamia, fast food consumption and no time for sports or fitness[18]. The changing eating habits and immobility are the most probable exogenic reasons for increasing cases of obesity in the country[19]. It is also the case that in the last few years there are ever fewer programs to promote a healthier lifestyle. Insufficient resources are spent on health education and prevention of disorders. The great medical and social impact of problems related to overweight in our country require orchestrated efforts of both physicians and researchers, and the state institutions, media, schools, and families to contain the epidemics of obesity by regulating body weight control through models of a healthier lifestyle and nutrition.

In this sense the aim of the present study is to carry out an anthropometric assessment of the general and abdominal obesity in adults from an urban area of Bulgaria and to identify the correlation between obesity and factors such as age, education level, professional and physical activity.

Matherial and methods

The target group consists of 1010 men, aged 18-50 years old (average age 36,45 ± 8,87). The anthropometric study was made in the period 2004-2008 in the second largest administrative city of Bulgaria- Plovdiv. All anthropometric measurements were made according to the classical methodology of Martin and Saller[20]. The body height was taken in upright position, barefoot, with precision of 0,1 cm, with the help of an original anthropometer GPM. The body weight was measured with electronic scales Tanita BC 465, barefoot, with precision rate of 0,1 kg. The waist circumference is read with a tape meter midway between the lower margin of the last rib and the iliac crests after normal exhalation, whereas the hip circumference is measured at the level of the widest circumference of the buttocks and the greater trochanters.

The individuals were divided into 4 age groups aged: 18-20, 21-30, 31- 40, and 41-50. Surveys were made to determine their level of education, occupation, and sports habits. On the basis of a survey to determine their level of education they were divided into three groups: primary education, secondary education and higher education.

Depending on the type of occupation, the men were allocated in two groups – physical workers and intellectual workers. The men referred to the first group worked in various factories (moulders, fitters, carpenters).The men allocated in the second group were intellectual workers (office workers, programmers). Depending on their sport practices they were divided into two groups- athletes practicing some sports (at least 60 minutes weekly) and those not involved in any sport activity whatsoever.

BMI is calculated on the basis of body weight to height ratio (kg/m^2). The BMI values are divided on the basis of the international classification of World Health Organization[17] as follows: underweight (BMI < 18.4 kg/m^2), normal weight (BMI 18.5-24.9 kg/m^2), overweight (BMI 25.0-29.9 kg/m^2), obesity (BMI ≥ 30 kg/m^2). They make up the following categories of WHTR by the Ashwell and Hsieh[15] : WHTR < 0.500 and ≥ 0.500. The measurements are analyzed through standard statistical methods using SPSS for Windows. The reliability of the differences between the groups is evaluated using one-way ANOVA. Correlation analyses, ANCOVA, MANOVA and multiple regression analyses were applied.

Results

Table I characterizes the target group of men and the average values and standart deviation in height, weight, body mass index (BMI) and waist to height ratio (WHTR) of men. The average height and weight of the target group is 173.34 ± 7.02 cm and 80.02 ± 13.17 kg (Table I). The average BMI and WHTR rates are 26.64 ± 4.07 kg/m^2 and 0.53 ± 0.07, respectively. Table I also shows mean values of height, weight, BMI and WHTR in the various age groups. One-way ANOVA determines the reliability of the differences between the groups. The height decreases with age considerably, whereas the weight, BMI and WHTR increase.

Table II shows distribution of men in the target group according to different levels of education, occupation and sports activity (Table II).The majority of men are physical workers (77.8%), with secondary education (54.4%) and do not practice any sports in their spare time (51.8 %). Table II characterizes the mean values of BMI and WHTR in men with different education levels, occupation and physical activity (Table II**).** The mean values of BMI and WHTR are above the norm in the groups with primary and secondary education and in the group of physical workers (BMI ≥ 25 и WHTR ≥ 0.500). In both modes of physical activity (practicing sport and not practicing sport) the mean values of both indices are high. In table II also shows the distribution of the men, according to education level, type of occupation and physical activity (Table II**).** Almost all men with BMI < 25, but with WHTR ≥0,500 belong to the physical worker group (95.1%). Over a half of them have secondary education (59.2%) and abstain from sport activities (54.4%).

Table I
Statistical data of the variables in age groups

	Age (years)											
Variables	*18-20y n = 70 Mean*	*SD*	*21-30 y n = 191 Mean*	*SD*	*31-40 y n = 387 Mean*	*SD*	*41-50 y n = 362 Mean*	*SD*	*Total n = 1010 Mean*	*SD*	*F*	p
Height (cm)	177.53	7.30	175.55	7.59	173.55	6.55	171.13	6.35	173.34	7.02	28.91	0.0000
Weight (kg)	75.8	12.00	78.4	12.90	80.6	13.90	81.2	12.60	80.07	13.17	4.66	0.0031
BMI (kg/m^2)	24.01	3.20	25.40	3.67	26.73	4.19	27.72	3.89	26.64	4.07	25.96	0.0000
WHTR	0.46	0.04	0.49	0.06	0.53	0.06	0.56	0.06	0.53	0.07	87.33	0.0000

Note: Mean = Mean values. SD = Standart deviation.F = F-ratio (F-criteria of Fisher). p = level of signifficance. BMI = Body Mass Index. WHTR = Waist to height ratio.

Table II
Distribution of males in different categories of body mass index (BMI) by age, waist to height ratio (WHTR) by age and categories of BMI into categories of WHTR (%)

	Age (years)									% WHTR	
	18-20y		21-30y		31-40y		41-50y		Total	<0.500	≥0.500
Categories according to BMI	n	%	n	%	n	%	n	%	n (%)		
Underweight	0	0.00	0	00.0	1	0.25	0	0.00	1 (0.1)	100.0	0.0
Normal weight	49	70.0	99	51.6	145	37.5	95	26.2	388 (38.4)	73.5	26.5
Overweight	17	24.3	65	34.0	165	42.6	178	49.2	425 (42.1)	13.2	86.8
Obesity	4	5.7	27	14.1	76	19.6	89	24.6	196 (19.4)	0.0	100.0
Total	70	100	191	100	387	100	362	100	1010 (100)		
Categories according to WHTR	n	%	n	%	n	%	n	%	n (%)		
<0.500	56	80.0	110	57.6	125	32.3	51	14.1	342 (33.9)		
≥0.500	14	20.0	81	42.4	262	67.7	311	85.9	668 (66.1)		
Total	70	100	191	100	387	100	362	100	1010 (100)		

Note: Underweight (BMI<18.4). Normal weight (BMI 18.5-24.9). Overweight (BMI 25.0-29.9). Obesity (BMI ≥ 30). Normal WHTR (<0.500). Abnormal WHTR (≥0.500). %WHTR.

Table III shows distribution of males into different categories of body nutritional status according to the BMI, waist to height ratio and distribution of men with different BMI into categories of WHTR (%). In view of the international reference values (Table III), 42.1% of all men included in the study are overweight, and 19.4 % of them are obese. Normal waist to height ratio (WHTR < 0.500) is found in 33.9 % of all men, and irregular ratio and central obesity (WHTR ≥ 0.500) is found in 66.1 % of the cases. The percentage of men with general and central obesity increases progressively with age, reaching, at the age range of 41-50 respective values of 24.6% (BMI ≥ 30) and 85.9 % (WHTR ≥ 0.500). The results of the correlation analysis show a positive, statistically significant relationship between the two obesity indices -BMI and WHTR, and age (BMI vs age r = 0.31, p <0.001 and WHTR vs age r = 0.51, p <0.001).

Table III also shows distribution of men in terms of WHTR values in the BMI categories **(**Table III**).** In the normal weight category the percentage of men with the right waist to height ratio (WHTR < 0.500) is greatest - 73.5%, and in the category of overweight, the percentage drops significantly to 13.2 %, whereas in the obese category all men have an abnormal WHTR. It is noteworthy that even in the Normal weight group there are men with abnormal WHTR. Their number is 103 men, making up 26.5%.

The ANCOVA analysis **(**Table IV**)** measures differences between men performing the two types of professional activities (physical and intellectual), while controlling the possible variations among them caused by the age factor. The results point that in the case of both general and central obesity, the differences between physical and intellectual workers are statistically reliable, even after controlling the age factor. (p = 0.001 for BMI and p = 0.000 for WHTR).

The MANOVA analysis (Table IV) shows that of the two anthropometric obesity indices, the waist to height ratio has a greater potential for differentiating persons with different occupations than BMI (F = 24.70, p = 0.000 for WHTR and F = 12.10, p = 0.001 for BMI). Pillai's test, the most powerful and stable criteria for assessing simultaneous differences between several values, has a high statistical significance (p = 0.000).

Table V presents the results from the multiple regression analysis interpreting the impact of factors age, education, occupation and physical activity on the values of the two anthropometric indices for obesity (Table V). The algorithm of stepwise selection was applied. The results show that the BMI values have considerable impact on the age group of the men (p = 0.0000) and the nature of their occupation (p = 0.0005). The physical activity level and the educational level have smaller impact and therefore remain outside the regression model (p = 0.5168 and p = 0.6463 respectively). Three factors are included in the WHTR model. The most significant factor is age (p = 0.0000), followed by occupation (p = 0.0103) and education

Table III
Statistical data of body mass index (BMI), waist to height ratio (WHTR) and distribution of participants with normal BMI and abnormal WHTR according to different level of factors

Factor level's	BMI				WHTR		Participants with normal BMI and abnormal WHTR	
	N	%	M	SD	M	SD	N	%
Education level								
Primary education	259	25.6	27.53	4.23	0.57	0.07	37	35.9
Secondary education	549	54.4	27.01	3.78	0.54	0.06	61	59.2
University education	202	20.0	24.53	3.94	0.48	0.07	5	4.9
Total	1000	100					103	100
Type occupation								
Physical work	786	77.8	27.25	3.93	0.55	0.07	98	95.1
Intellectual work	224	22.2	24.54	3.86	0.48	0.06	5	4.9
Total	1000	100					103	100
Physical activity level								
Practicing sport	487	48.2	26.57	4.08	0.53	0.07	47	45.6
Not practicing sport	523	51.8	26.72	4.07	0.54	0.07	56	54.4
Total	1010	100					103	100

Note: N =number of participants. %=relative part of participnts. Mean =mean value. SD=standart deviation.
BMI (Body Mass Index). WHTR (Waist to height ratio).

Table IV
Statistical data of ANCOVA and MANOVA analysis

Variable	ANCOVA analysis					
	Source of variation	Mean Square			F	p
BMI	*Covariates*					
	Age	462.82			31.05	0.000
	Main Effects					
	Type occupation	180.43			12.10	0.001
	Explained	872.03			58.50	0.000
	Residual	14.90				
	Total	16.60				
WHTR	*Covariates*					
	Age	0.48			128.48	0.000
	Main Effects					
	Type occupation	0.09			24.70	0.000
	Explained	0.73			193.84	0.000
	Residual	0,00				
	Total	0.00				
	MANOVA analysis					
	Hypoth. SS	Error SS	Hypoth MS	Error MS	F	p
BMI	180.43	15008.52	180.43	14.90	12.10	0.001
WHTR	0.09	3.79	0.09	0.00	24.70	0.000
	Pillai's test Value 0 .03674 Sig. of F 0.000					

Note: F (F-ratio). P= signifficance level of F-value. BMI (Body Mass Index). WHTR (Waist to height ratio). Hypoth SS=Hypothetical sum of square. Error SS=Error sum of square. Hypoth MS= Hypothetical mean of square. Error MS=Error mean of square. F =F-ratio (F-criteria of Fisher). Sig. of F=significance of F (p-level).

Table V
Statistical data of multiple regression analysis

Dependent Variable BMI		
	Beta	*p*
Variables included n the Model		
Age	0.2177	0.0000
Type occupation	-0.135	0.0005
Variables excluded in the Model		
Physical activity level	0.0193	0.5168
Education level	-0.020	0.6463
Dependent Variable WHTR		
	Beta	*p*
Variables included n the Model		
Age	0.3745	0.0000
Type occupation	-0.108	0.0103
Education level	-0.110	0.0057
Variables excluded in the Model		
Physical activity level	-0.038	0.1500

Note: BMI (Body Mass Index). WHTR (Waist to height ratio). Beta=values of regression coefficient Beta. p=level of signifficance.

level (p = 0.0057). Physical activity remains outside the model.

Discussion

The mean values of the studied characteristics – height, weight, BMI and WHTR give a general picture of the physical status and weight of the target group of adult male working-age population in Bulgaria (between 18-50 years old).

Body height is an important parameter that has an effect on the accumulation and distribution of fat. Our study identifies a negative correlation between height and age – e.g. height decreases significantly with age, the differences in mean values between the youngest and the oldest is 6.4 cm. Lower height in adults may be due to a combination of a number of factors – on the one hand, height physiologically decreases with ageing (as a result of osteoporosis, kyphosis, changes in the foot arch, etc.), and on the other hand the difference between the height lines of the different generations (a manifestation of a secular trend). The latest large-scale study of physical development of the population was carried out in the last century, in the period 1989-1993 by the Yordanov et al.[21] of the Institute of Experimental Morphology and Anthropology at The Bulgarian Academy of Science. The study covers a target group of men and women aged from 30 to 40 years. The results of the study are representative for the country and reflect the anthropological characteristics of the middle-aged adult population of Bulgaria during the transition period between two social and economic systems. The anthropological data cited in the study refer to individuals aged from thirty to forty, therefore correct comparison with our results can be done only regarding the same age range. The data from our study shows a slightly greater mean height of the male adult population aged 30-40 years (173.55 ± 6.55cm), compared to the data for the same age group of Bulgarian population collected at the end of the 20th century (171.64 ± 5.95 cm).

The individual's body weight is an index of high ecosensitivity, which accounts for its significance in accounting for the impact of social and economic conditions, characteristics of nutrition, lifestyle and professional activity. Unlike stature, the body weight values change negatively with age. The Body mass index (BMI) measuring the weight to height ratio is useful to identify the nutritional status of the individuals. In a some of studies document that BMI is affected by age and sex[22]. Our results confirm the increase of overweight with age in individuals between 21 and 50, including obesity, which is alarming, as it affects men in working age. It is particularly worrying that the early signs of overweight are observed as early as the age of 21-30, when mean values of BMI are already above the upper margin of 25 (25.40 ± 3.67). The total percentage for the entire study is 42.1 %, for obesity – 19.4 %. Our results match the data from a monitoring study on the distribution of obesity in Bulgaria made in 2004 by the National Centre of Public Health and Analyses[23]. According to the study the occurrence of overweight among men aged 30-59 years of age is between 33 and 50 %, and obesity reaches 22.1%. Similar frequency of some categories of BMI is observed in adult males from neighboring countries like Serbia[24] and Turkey[25].

The problem with obesity becomes even more prominent when we examine the results for WHTR. The waist to height ratio is used to assess the distribution of fat throughout the body. Although health risks related to central accumulation of fats are acknowledged by everybody, in practice the WTHR parameter in Bulgaria is used less frequently than the BMI. Our results are analogical to those of other studies[26] and confirm the increase of WTHR values with age in the age range from 41 to 50. During the same period the relative share of men with central accumulation of fats is four times as height as it was compared to the period 18-20 years.

The analysis of the results sows that there is high correlation between the two types of anthropometric obesity indices. In the group of men with normal BMI, most men are characterized by normal WTHR values. But it is also evident that even among those men who have normal weight there are some with incorrect distribution of fats (26.8%). This group of men in particular needs preventive health education. It could be done by specialists doing field anthropological research, or during routine medical checkups, because these indi-

viduals face higher health risk. Our conclusion corresponds to other studies which show that the correlation between waist circumference and height may be useful for early detection of potential risk of future cardiovascular and metabolic disorders in people with normal body mass[27].

A number of studies provide new information on the spread of overweight and obesity and the health risks for groups of the population with different social, economic and age status measured in terms of education level, income, or marital status[28].

The results from our research show a connection between the two obesity indices and the factors education, occupation and physical activity. The men with primary and secondary education have higher mean values for both indices and differ considerably in their nutrition status than those with higher education. Detailed results can be found in other studies, which point out that BMI and WHTR decrease with higher levels of education[29]. The probable financial status of persons with different education levels, their nutritional habits and interest in healthy lifestyle may explain this phenomenon[30].

There are considerable differences in terms of overweight and obesity between the groups with different occupations. Physical workers are characterized by BMI and WHTR above the norm, whereas intellectual workers have considerably lower normal or subnormal mean values of BMI and WHTR. And due to the fact that age is a powerful ubiquitous biological factor that can minimize the risk of general and abdominal obesity in older adults, we applied the ANCOVA analysis. Even after corrections were made for age, we found that the nutrition status of men whose occupations involve physical activity is considerably different from that of men involved in intellectual work. This means that the type of occupation matters, regardless of age.This is probably related to the different educational level of the men. Physical workers are generally with secondary education, whereas intellectual workers predominantly have higher education.

Many transversal epidemiological studies report inverse relationship between physical exercise and overweight[31].There is, however little information on the types of physical activity patterns which prevent the population from becoming overweight. The results show that higher levels of amateur physical activity (jogging, swimming, cycling, and fitness) are more effective than moderate and lower levels (walking, gardening, household chores, etc.)[32.] According to some researchers the weight loss depends most of all on the frequency and length of the physical exercises[33]. The recommended minimal level of healthy physical activity is 150 minutes/week[34]. Although successful weight loss through physical activity is relatively slow, it is the more effective weight control strategy in the long term than is weight control through diets.

When the men participating in our study were divided into groups – practicing sport once a week and not practicing sport, it is evident that there are no significant differences between them in terms of mean values of BMI and WHTR. The smaller effect of the physical activity is probably due to the lower rate of physical activity (60 minutes/week). It is probably only a mitigating factor for age-related weight gain. Prevention of overweight and obesity probably requires more intensive physical exertion and sport for leisure.

In order to identify the risk of overweight and obesity in the target group of population at different ages, educational levels, occupation, and physical activity, we applied a multiple regression analysis. It showed that age and occupation are the most significant factors affecting the general (BMI) and abdominal (WHTR) obesity. The level of education has a significant impact on abdominal accumulation of fat- e.g. better educated men will probably have lower risk of abdominal obesity than their less educated peers. The connection between the level of physical activity and BMI and WHTR is weaker.

Conclusion

Regardless of the fact that this is a transversal study which includes only some of the factors affecting the nutritional status, the indices show that overweight and obesity are a serious problem in the region covered by the study. Plovdiv is the second largest administrative city in Bulgaria. The study finds that the men working and living in that particular urban area have significant differences in terms of overweight and obesity. The level of education, the occupation and age have a serious potential to affect overweight and obesity. At the same time there must be greater emphasis on improving opportunities for physical activities which are essential for prevention, especially considering increased urbanization and ageing of the population and the increasing time spent on sedentary activities. Studies of this kind help improve the understanding of the complex interaction of the various factors that cause the increase of fatty tissue in the human body. This allows the development of better, scientifically proven measures for human overweight and obesity management measures.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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