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Which is the Best Anthropometric Technique to Identify Obesity: Body Mass Index, Waist Circumference or Waist-Hip Ratio?

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A B S T R A C T

This study was designed to define the most suitable anthropometric technique among body mass index (BMI), waist circumference (WC) and waist-hip ratio (WHR) as indices of obesity in adult people living in Adana, a Southern province of Turkey. A random sample design was used. A total of 900 individuals (men and non-pregnant women aged 25–65 years) were enrolled in the study. Of subjects, 50.9% were females. Anthropometric measurements were performed. Data were analysed using statistical package program. The prevalence of obesity among adults living in Adana was 20.8% 28.4% when defined using BMI, 30.5% by WC and 15.8% 42.0% by WHR. Truncal obesity and gynoid obesity showed similar prevalence with 26.6%, in the same age group. Waist circumference, BMI and WHR identified different proportions of the population, as measured for obesity prevalence. The most common methods for diagnosing overweight and obesity are based on BMI (kg/m^2). However, BMI is suboptimal marker for total body fat percentage and even less suitable to assess body fat distribution. WHR is the most useful measure of obesity and the best simple anthropometric index in predicting a wide range of risk factors and related health conditions.

Key words: *Turkey, anthropometry, obesity, BMI, waist circumference, waist-hip-ratio*

Introduction

Obesity is a common chronic health problem which contributes significantly to morbidity as well as overall mortality. The prevalence of obesity in some low income countries is as high as, or even higher than, the prevalence reported in developed countries, and it seems to be rapidly increasing[1]. There is considerable evidence that overweight and obesity have emerged as epidemics in developed countries since 1980s[2]. In most countries, the prevalence of obesity is higher in women than in men, and in urban areas than in rural[1]. It is estimated that there are 250 million people with body mass index (BMI) ≥30 in the world which is 7% of world population[3]. The strongest evidence that obesity has an adverse effect on health comes from population-based prevalence (cross-sectional) and incidence (longitudinal) studies[4]. Because of its importance to health, body composition is commonly investigated in epidemiologic, clinical and population studies. Therefore, reliable methods for measurement of body fat and fat distribution are important. During the past decade, investigators have emphasized the accuracy of newer techniques, such as dual-energy x-ray absorptiometry, magnetic resonance imaging, and computed tomography, for measuring body composition; nevertheless, anthropometry is the most widely used method, and it has recently been used to estimate fat distribution[5,6]. The distinct advantages of anthropometric methods are that they are portable, non-invasive, inexpensive, and useful in field studies, and there is a substantial literature available on the subject[7]. Although precise and sophisticated techniques for measuring body fat distribution are available, they are generally not appropriate except for specific research settings[8,9]. Simple anthropometric measurements have been used as surrogate measurements of obesity and have more practical value in both clinical practice and for large-scale epidemiological studies.

Body mass index, which relates weight to height, is the most widely used and simple measure of body size, and is frequently used to estimate the prevalence of obe-

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sity within a population. High BMI has been found to be consistently associated with an increased risk of cardiovascular disease (CVD) and type 2 diabetes, yet this measurement does not account for variation in body fat distribution and abdominal fat mass, which can differ greatly among populations and can vary substantially within a narrow range of BMI[10,11]. Several studies in adults have reported a strong positive association between cardiovascular risk factors such as hypertension, lipid and glucose concentrations and abdominal adiposity (measured by WC and WHR) than overall adiposity (measured by BMI)[12,13] although high BMI has also been reported as being one of the most important risk factors for type 2 diabetes[14–21]. Thus, measurements of waist circumference (WC) and waist-hip ratio (WHR) have been viewed as alternatives to BMI, with both measures regularly used in the clinical and research settings. Waist circumference has been shown to be the best simple measure of both intra-abdominal fat mass and total fat[22,23]. Despite the fact that a close relationship is apparent between abdominal adiposity and risk of CVD, the current WC cut-off points suggested by the World Health Organization (WHO) are not based on associations with CVD risk factors, but rather on their correlation with corresponding values of BMI[11,24].

It is important to differentiate pathological obesity from simple obesity. The incidence of obesity-related cardiovascular and metabolic diseases is more frequently associated with upper-body obesity than lower-body obesity[25–27]. Previously, it was assumed that these two types could be differentiated using WHR, but it turned out that WC is a more appropriate indicator[28,29,30]. However, there is no consensus about the best cut-off points to be used for identifying individuals at risk. Some investigators suggested to use two cut-off points for each gender based on established cut-off points for BMI: a WC >94 cm (level 1; overweight, BMI >25 kg/m^2) and >102 cm (level 2; obese, BMI >30 kg/m^2) in men and for women >80 and >88 cm, respectively[28]. Others proposed WC >100 cm for adults ≤40 years and WC >90 cm for adults >40 years, for both men and women[15].

The aim of this study is to explore the appropriateness, feasibility and validation of the methods used in measuring and rating obesity, the related sociodemographic determinants, the advantages and disadvantages of different measurement techniques in an adult population in Adana, southern province of Turkey in 2003.

Materials and Methods

Sample

Our population was Adana city population. The sample size was calculated using PEPI[31]. The total population of Adana was 1.849.478. The maximum acceptable difference was set as 5% with a design effect as 2. A total of 3 clusters (low, intermediate and high income groups) with 300 persons (900 total) in each cluster and an estimated true rate at 30% provided a 95% confidence interval.

This study is a cross-sectional home-based survey. Sampling procedure was as follows: First, areas of enumeration districts of the population census were randomly selected. Then, identification of dwellings was performed. Only 25–65 years old men and non-pregnant women were interviewed by two medical students from the sixth grade and a family medicine resident. Interviews were performed at home using a questionnaire form. Sociodemographic details, personal and family medical histories were recorded. Anthropometric measurements were performed using the Monica Manual[32]. Non-response/refusal rates underwent statistical adjustment by using appropriate sampling weights.

Informed consent was obtained after the procedures had been fully explained to participants. Ethic Committee of Faculty of Medicine, Cukurova University approved the study.

Height and weight measurements

Heights of the participants were measured to the nearest half centimeter. The subject was asked to remove shoes and stand with his/her back to the rule. The back of head, back, buttocks, calves and heels touched the upright. The head was positioned so that the top of the external auditory meatus was in the same level with the inferior margin of the bony orbit. Weight was measured to the nearest tenth of a kilogram. The subject was asked to remove shoes and was lightly dressed only. Obesity was assessed using BMI formula (BMI=weight/height^2 [kg/m^2]); underweight <18.5 kg/m^2; normal=18.5–24.9 kg/m^2; overweight=25.0–29.9 kg/m^2; obese ≥30.0 kg/m^2).

Measuring waist and hip circumference

The subject was asked to stand with feet 12–15 cm apart, weight equally distributed on each leg and to breathe normally. The observer either sat or knelt in front of the subject to place the tape. The waist girth was measured at the mid-point between the iliac crest and the lower margin of the ribs. The hip girth was recorded as the maximum circumference around the buttocks posteriorly and anteriorly by the symphysis pubis. Measurements were taken to the nearest 0.5 cm. For each of waist and hip circumference, two measurements to the nearest 0.5 cm were recorded. If the variation between two measurements was greater than 2 cm, a third measurement was taken. The mean of the two closest measurements was accepted.

WC≥94 cm in males was accepted as overweight, whereas WC ≥102 cm as obese; (≥80 cm and ≥88 cm in females, respectively). WHR was obtained by dividing the mean waist circumference by the mean hip circumference. WHR ≥1.0 in males was accepted as overweight, whereas WHR ≥ 0.95 as obese; (≥0.85 and ≥0.80 in females, respectively).

Quality control

All members of the survey team were trained in all measurements. Visual quality control was a continuous part of the field work. Retraining and examining of survey team members were performed on a weekly basis. Completed questionnaires were checked for illegible answers and unanswered questions, before leaving an area.

Statistics

Data were analysed using a statistical package program. Pearson chi-square, Student's *t*, ANOVA and Mann-Whitney U-Wilcoxon rank sum tests were used. One-way variance analysis and multiple regression analysis were performed. Correlation coefficients between BMI, WC or WHR and the selected continuous variables were computed. Statistical significance between differences in categoric variables and BMI, WC or WHR were evaluated by Student's *t* test. Continuous variables were evaluated by the Pearson's product moment correlation coefficients. Difference of independent samples was assessed by both the unpaired *t* test (equality of variances was additionally tested) and by the Mann-Whitney U-Wilcoxon rank sum test.

Results

Sociodemographic features of subjects are presented in Table 1. The majority of subjects were married (90.6%). Of subjects, 36.7% were primary school graduates. As educational status improved, percentage of obesity in females decreased (p=0.001). The obesity prevalence according to BMI was 28.4%. Of subjects, 38.3% (n=345) were overweight. Male and female obesity was 19.0% (n=84) and 37.6% (n=172), respectively. Obesity was higher in subjects with older age till 55–65 years of age. In 55–65 years of age rate of obesity decreased. There was significant relationship between obesity and age groups (p=0.001). Obesity was more frequent in married subjects than singles (p=0.001), in subjects with lower educational and socioeconomic status than the ones with higher (p=0.002, p=0.001, respectively). No significant relationship could be found between ethnicity and obesity measured by BMI (p>0.05). According to WC, the majority were in the normal group (48.3%). The percentages according to WHR were 58.0% and 42.0% for the

TABLE 1
SOCIODEMOGRAPHIC DETAILS OF SUBJECTS (n=900)

Sociodemographic details		Gender					
		Female		Male		Total	
		n	%*	N	%*	N	%**
Age groups (years)	25–29	97	54.8	80	45.2	177	*19.7*
	30–34	72	48.0	78	52.0	150	*16.7*
	35–39	84	59.6	57	40.4	141	*15.7*
	40–44	67	47.2	75	52.8	142	*15.8*
	45–49	69	54.3	58	45.7	127	*14.1*
	50–54	45	42.5	61	57.5	106	*11.8*
	55–59	12	38.7	19	61.3	31	*3.4*
	60–65	12	46.2	14	53.8	26	*2.9*
Socioeconomic status	Low	149	49.3	153	50.7	302	*33.6*
	Intermediate	154	51.2	147	48.8	301	*33.4*
	High	155	52.2	142	47.8	297	*33.0*
Educational status	Illiterate	137	83.5	27	16.5	164	*18.2*
	Rudimentary writing/reading skills	26	52.0	24	48.0	50	*5.6*
	Primary school	146	44.2	184	55.8	330	*36.7*
	Secondary school	28	35.9	50	64.1	78	*8.7*
	High school	78	47.6	86	52.4	164	*18.2*
	University	43	37.7	71	62.3	114	*12.6*
Marital status	Married	398	48.8	417	51.2	815	*90.6*
	Single	23	51.1	22	48.9	45	*5.0*
	Divorced/widowed	37	92.5	3	7.5	40	*4.4*
Ethnicity	Turkish	294	50.9	284	49.1	578	*64.2*
	Kurdish	*123*	*49.2*	*127*	*50.8*	*250*	*27.8*
	Eti Turks	41	56.9	31	43.1	72	8.0

*row percentage, **column percentage

TABLE 2
OBESITY ACCORDING TO BODY MASS INDEX, WAIST CIRCUMFERENCE AND WAIST-HIP RATIO

Obesity category	Body mass index						Waist circumference						Waist-hip ratio					
	Male		Female		Total		Male		Female		Total		Male		Female		Total	
	N	%*	n	%*	n	%**	N	%*	n	%*	N	%**	N	%*	n	%*	n	%**
nonobese obese	358	81.0	286	62.4	644	71.6	393	88.9	221	48.3	614	68.2	364	82.4	158	34.5	522	58.0
Obese	84	19.0	172	37.6	256	28.4	49	11.1	237	51.7	286	31.8	78	17.6	300	65.5	378	42.0
Total	442	49.1	458	50.9	900	100	442	49.1	458	50.9	900	100	442	49.1	458	50.9	900	100

*row percentage, **column percentage

normal and obese people, respectively (Table 2). Obesity was more frequent in females than males according to BMI, WC and WHR (p=0.001, Table 2).

Discussion

Obesity and sociodemographic details

Obesity and overweight are increasing in Turkey[33]. The overall prevalence of obesity in adults was 18.6% in 1990. Ten years later, the prevalence was 21.9%, which shows a relative increase rate of 17.7%. As it is true for most of the countries, overweight is more common in men and obesity in women in Turkey[33]. The prevalence of overweight is higher in males than females and it is higher than the rate for overall Turkey (51.0% vs. 15.1%)[34]. In this study, it is possible that the same factors such as older age, female gender, lower educational and socioeconomic status affected obesity.

Methods (techniques) of measurement

The data reported here suggested that there is a progressive increase in weight, and therefore in BMI, in both men and women up to 50 years of age, with women with a higher mean of BMI. The increase is particularly in the 20–29 years of age, amounting to 5–6 kgs in men and 6–7 kgs in women. In our study, obesity prevalence measured by WHR was found to be higher than that by BMI and WC. The reason may be due to comprehensiveness of WHR including android type of obesity. Our results are similar to those of 19 countries in WHO MONICA study phase 2 (1987–1992) (WC≥102 cm in males, ≥88 cm in females)[15,16].

A central distribution of body fat, indicated by a high WHR, has been shown to be associated with other risk factors, many chronic diseases (e.g., hypertension, cardiovascular disease, non-insulin-dependent diabetes, stroke) and mortality[35]. However, it suffers from serious limitations in relation to its use in statistical analyses and the interpretation of the results[36–39]. More recently, it has been argued that WC alone might convey equally valid information as WHR and BMI in measuring abdominal fat and be at least as strongly associated as with other risk factors[17,24,40]. If this were the case, the use of this single measurement would simplify the interpretation of epidemiological data as well as the public health recommendations relating to weight management.

Although BMI and WC are highly correlated, there were large differences in the prevalence estimates of overweight and obesity defined by BMI in comparison with those defined by waist action levels. The differences in the prevalence produced by the two techniques were smallest for obesity in men. This may be affected by the fact that waist action levels are defined separately for men and women but the recommendation based on BMI is the same for men and women. To determine the applicability of the waist action levels in identifying subjects with overweight or obesity, even other criteria than sensitivity and specificity in relation to BMI and WHR can be applied[41]. One such criteria is the relation of the waist action levels to morbidity and mortality. Currently, no prospective studies using these specific cut-off points for WC have been published in the literature. Moreover, the relationship between obesity and health outcomes can be modified by other factors such as lifestyle, genetic predisposition, and comorbidity in the population. Therefore, the interpretation of WC in different populations may be different. Further data in each population on the effects of fat storage in specific regions of the body on health are needed before the applicability of a single measure. Lean et al.[24] have suggested two action levels for WC based on BMI and WHR. According to their results, men with WC ≥94 cm and women with WC ≥80 cm should gain no further weight (waist action level 1), and men with WC ≥102 cm and women with WC ≥88 cm should reduce their weight (waist action level 2). These action levels have been tested in British[24] and Dutch[40] populations in which very high sensitivities and specificities, in relation to cut-off points based on BMI and WHR, were observed. However, in the lean population of Hong Kong Chinese, for example, Ko et al.[42] observed a very low sensitivity of waist action level 1. The applicability of the proposed action levels in other populations remains to be shown.

The prevalence of overweight varied considerably among populations whether defined by WC (≥94 cm for men, ≥80 cm for women) or by BMI (25–29.9 kg/m^2 for both men and women). In men, especially, the difference between the prevalences using the two techniques in several populations was 20% or more, with BMI giving higher prevalences of overweight than WC. In women, the two techniques gave more consistent results, with the maximum difference of 10%. Furthermore, in women, there was no consistency regarding which of the two techniques gave a higher prevalence of overweight[24,40,42].

Body mass index

The definitions of overweight and obesity recommended by the WHO (BMI>25 and 30 respectively) are a result of the relationship between BMI with morbidity and mortality outcomes[11,43]. BMI is the most frequently used measure of obesity because of the robust nature of the measurements of weight and height, and the widespread use of these measurements in population health surveys. However, BMI does not take into account the proportion of weight related to increased muscle or the distribution of excess fat within the body, both of which affect the health risks associated with obesity. Individuals with a similar BMI can vary considerably in their abdominal-fat mass, with premenopausal women typically having half the abdominal-fat mass of men[44]. For this reason, a measure of obesity that takes into account the increased risk of obesity-related diseases because of the accumulation of abdominal fat is not desirable.

Waist-hip-ratio

Waist-hip-ratio was previously acknowledged as the clinically accepted method of identifying patients with excess abdominal fat accumulation. However, more recently, WC alone has been suggested as being a more practical technique of intra-abdominal fat mass and total body fat. Indeed, WC has been found in some studies to be more closely correlated with the level of abdominal visceral adipose tissue than is WHR[45–47]. Another reason for superiority of WC over BMI is that for the Chinese individuals, who make up one quarter of the world's population, the cut-off points for BMI for detection of cardiovascular risk factors are lower than the criteria set by WHO. The best evidence was provided by Hwu et al.[48] who found that postmenopausal Chinese women with abdominal obesity carried a higher metabolic and cardiovascular risk than those without obesity and that it was the WC rather than the BMI that predicted the risk in those women. Although the BMI may be below 25, visceral fat may be increased; thus WC becomes particularly important with people whose BMI is between 22 and 29[49]. In a comparison of the utility of various anthropometric measures in identifying CVD risk factors in a Hong Kong population, Ho et al. found that BMI and WC proved most effective for men, while WC and WHR were preferable for women[48]. Waist circumference may provide a useful index reflecting general and central obesity. In order to identify true differences between the three techniques in their ability to identify individuals at greatest risk of CVD, a standardized method of comparison needs to be used, rather than the conventionally used arbitrary cut-off points for obesity. For this reason, the risk of diabetes, hypertension and dyslipidaemia by obesity status is based on quartiles of BMI, WC and WHR.

Measurement

For assessing the true differences in body girth measurements among populations, it is crucial that the methods are standardized across populations, as small differences in the anatomical measurement levels can produce very different results[50]. However, our evidence suggests that WC alone may provide the best anthropometric correlate of abdominal obesity. It has been shown to be the anthropometric measure most consistently associated with changes in abdominal, particularly visceral adipose tissue over time or in response to weight loss interventions in both male and female patients.

This is consistent with the notion that abdominal obesity as reflected by WC and WHR is more directly related to cardiovascular risks than overall obesity as indicated by BMI. Furthermore, BMI cannot distinguish fat from muscle mass, and hence risks tend to be overstated in muscular athletes and understated in older persons whose muscle mass is replaced by fat to varying degrees[51]. Despite being the most commonly used obesity index in scientific publications and the index of choice by the WHO, the International Association for the Study of Obesity and the International Obesity Task Force, little is known about BMI regarding its level of understanding, use and awareness of the proposed cut-off values among the general public[52].

WHR may be an acceptable indicator in women as a predictor of cardiovascular risks but its unique characteristic of being a ratio of two changeable girth measurements (waist and hip) can make its readings sometimes misleading. For instance, one's body weight can be doubled without affecting one's WHR if both the waist and hip girths increase simultaneously at the same rate. Also, people usually know their WC but are often ignorant about their hip circumference. These drawbacks make WHR of little value as a simple indicator of cardiovascular risks for the public. Although WC has been shown to be highly correlated with the amount of visceral body fat measured by computer tomography, it would be more reasonable and direct to use cardiovascular events and metabolic variables as the outcome measures in the selection of anthropometric indices[17,29]. Waist circumference has the advantage of being the simplest as it involves only one measurement. Waist action levels of 94 cm for men and 80 cm for women based on an European sample were proposed, and the WHO recommended that a smaller WC of 90 cm for Asian men and the same WC of 80 cm for women should be adopted, although the supporting data were not given[24,52].

It is common clinical experience that hip measurements in the severely obese are difficult and unreliable. Both WC and particularly WHR suffer from measurement errors. BMI measurement is simple and routine and therefore appears to be more appropriate. *WHR is the most useful measure of obesity and the best simple anthropometric index in predicting a wide range of risk factors and related health conditions.*

Using WC for screening CVD risk factors needs preliminary specific studies in different ages and in a population of varied ethnic backgrounds.

Limitations

It should be noted that this study has primarily concerned with the prevalence and anthropometric techniques of obesity and suffers from a number of limitations. First, a potential shortcoming of both the present and earlier validations of the WC action levels is that they derive from an žarbitrary definition' of a raised WHR (≥0.95 males and ≥0.8 females). These thresholds for WHR were cited as representing an emerging consensus from epidemiological investigations. The above WHR thresholds appear reasonably robust in identifying higher levels of visceral adipose tissue in male subjects, but substantial misclassification rates have been reported among middle-aged and older females. The present study did not consider markers of insulin resistance or impaired glucose tolerance within population in order to refine metabolic risk estimation. Second, as our aim in this study was to show only the prevalence and anthropometric techniques of obesity in Adana, we are planning to perform a future study about the ones with BMI <18.5 kg/m^2 and between 25–29.9 kg/m^2 and the contributing nutritional factors and third, we would like to point out that we have not explored a potential »gene dosage« influence versus environment.

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REFERENCES

1. FILOZOF C, GONZALEZ C, SEREDAY M, MAZZA C, BRAGUİNSKY J, J Obesity Reviews, 2 (2001) 99. — 2. Anonymous: Obesity – preventing and managing the global epidemic – Report of a WHO Consultation on obesity. Global Prevalence and Secular Trends in Obesity, Geneva (1997) World Health Organization: Geneva (1998). — 3. SEIDELL JC, J of Clinical Obesity, 1 (1998) 1. — 4. GROOP LC, SALORAUTA C, SHANK M, BONDONNA RC, FERRANNİNİ E, DE FRONZO RA, J Clin Endocrinol Metab, 72 (1991) 96. — 5. GORAN MI, GOWER BA, TREUTH M, NAGY TR, Int J Obes, 22 (1998) 549. — 6. MORENO LA, FLETA J, MUR L, J Pediatr Gastroenterol Nutr, 25 (1997)175. — 7 WANG J, THORNTON JC, KOLESNIK S, PIERSON RN, Ann NY Acad Sci, 904 (2000) 317. — 8. SEIDELL JC, BJORNTORP P, SJOSTROM L, SANNERSTEDT R, KROTKIEWSKI M, KVIST H, Int J Obes Relat Metab Disord, 13 (1989) 289. — 9. ROSS R, SHAW KD, MARTEL Y, DE GUISE J, AVRUCH L, Am J Clin Nutr, 57 (1993)470. — 10. FIELD AE, COAKLEY EH, MUST A, Arch Int Med, 161 (2001) 1581. — 11. World Health Organization. Obesity – Preventing and Managing the Global Epidemic: Report of a WHO Consultation on Obesity. Geneva: World Health Organization, 1998. — 12. VISSCHER TL, KROMHOUT D, SEIDELL JC, Int J Obes Relat Metab Disord, 26 (2002)1218. — 13 HO SC, CHEN YM, WOO JL, LEUNG SS, LAM TH, JANUS ED, Int J Obes Relat Metab Disord, 25 (2001) 1689. — 14. HARTZ A, RUPLEY D, RIMM A, Am J Epidemiol, 119 (1984) 71. — 15. OHLSON LO, LARSSON B, SVARDSUDD K, Diabetes, 35 (1985) 1055. — 16. HAFFNER S, MITCHELL B, STERN M, HAZUDA H, PATTERSON J, Int J Obes Relat Metab Disord, 16 (1992)177. — 17. POULIOT MC, DESPRESJP, LEMIEUX S, Am J Cardiol, 73 (1994) 460. — 18. RICHELSEN B, PEDERSEN SB, Int J Obes Relat Metab Disord, 19 (1995) 169. — 19. HAN T, VAN LEER E, SEIDELL J, LEAN M, BMJ, 311 (1995)1401. — 20. ZHU S, WANG Z, HESHKA S, HEO M, FAITH MS, HEYMSFIELD SB, Am J Clin Nutr, 76 (2002) 743. — 21. CHAN J, RIMM E, COLDITZ G, STAMPFER M, WILLETT W, Diabetes Care, 17 (1994) 961. — 22. HAN TS, MCNEILL G, SEIDELL JC, LEAN ME, Int J Obes Relat Metab Disord, 21 (1997) 587. — 23. LEMIEUX S, PRUD'HOMME D, BOUCHARD C, TREMBLAY A, DESPRES JP, Am J Clin Nutr, 64 (1996) 685. — 24. LEAN M, HAN T, MORRISON C, BMJ, 311 (1995) 158. — 25. KISSEBAH AH, VYDELINGUM N, MURRAY R, EVANS DJ, HAVTZ AJ, KALKHOFF RK, ADAMS PW, J Clin Endocri Metab, 54 (1982) 254. — 26. PASCOT A, LEMIEUX I, PRUD'HOMME D, TREMBLAY A, NADEAU A, COUILLARD C, BERGERON J, LAMARCHE B, DESPRES JP, J Lipid Res, 42 (2001) 2007. — 27. HUNTER GR, GIGER JN, WEAVER M, STRICKLAND OL, ZUCKERMAN P, TAYLOR H, J Natl Black Nurses Assoc, 11 (2000) 7. — 28. LEAN MEJ, HAN TS, SEIDELL JC, Lancet, 351 (1998)853. — 29. RANKINEN T, KIM SY, PERUSSE L, DESPRES JP, BOUCHARD C, Int J Obes Relat Metab Disord, 23 (1999) 801. — 30. TAYLOR RW, JONES IE, WILLIAMS SM, GOULDING A, Am J Clin Nutr, 72 (2000) 490. — 31. PEPI [computer program]. Version 4.0. Salt Lake City (UT): Computer Programs for Epidemiologists; (2001). — 32. World Health Organization. Monica Manual, Part III, Section I, Population Survey Data Component. Geneva: World Health Organization (1992). — 33. YUMUK VD, Obesity Reviews, 6 (2005) 9. — 34. TEZCAN S, ALTINTAS H,SONMEZ R, AKINCI A, DOGAN B, CAKIR B, BILGIN Y, 8 (2003) 660. — 35. BJÖRNTORP P, Ann Med, 24 (1992) 15. — 36. ASHWELL M, LEJEUNE S, MCPHERSON K, BMJ, 312 (1996) 377. — 37. HSIEH SD, YOSHINGA H, Int J Obes, 19 (1995) 585. — 38. DESPRES JP, MOORJANI S, LUPIEN PJ, TREMBLAY A, NADEAU A, BOUCHARD C, Arteriosclerosis, 10 (1990) 497. — 39. ALLISON DB, PAULTRE F, GORAN MI, POEHLMAN ET, HEYMSFIELD SB, Int J Obes, 19 (1995) 644. — 40. HAN TS, VAN LEER EM, SEIDELL JC, LEAN MEJ, BMJ, 311 (1995) 1401. — 41. MOLARIUS A, SEIDELL JC, Int J Obes 22 (1998) 719. — 42. KO GTC, CHAN JNC, WOO J, COCKRAM CS, Int J Obes, 20 (1996) 791. — 43. HO SY, LAM TH, JANUS ED, Ann Epidemiol, 13 (2003) 683. — 44. LEMIEUX S, PRUD'HOMME D, BOUCHARD C, TREMBLAY A, DESPRES JP, Am J Clin Nutr, 58 (1993) 463. — 45. IACOBELLIS G, ASSAEL F, RIBAUDO MC, Epicardial fat from echocardiography: a new method for visceral adipose tissue prediction. Obes Res, 11 (2003) 304. — 46. DESPRES JP, PRUD'HOMME D, POULIOT MC, TREMBLAY A, BOUCHARD C, Am J Clin Nutr, 54 (1991) 471. — 47. FERLAND M, DESPRES JP, TREMBLAY A, Br J Nutr, 61 (1989) 139. — 48. HWU CM, FUH JL, HSIAO CF, Menopause, 10 (2003) 73. — 49. BRAY GA, Postgrad Med, 114 (2003) 19. — 50. SEIDELL JC, CIGOLINI M, CHARZEWSKA J, ELLSINGER BM, CONTALDOF, Acta Med Scand Suppl, 723 (1988) 189. — 51 WILLETT WC, DIETZ WH, COLDITZ GA, N Engl J Med, 341 (1999) 427. — 52. WHO/IASO/IOTF. The Asia-Pacific Perspective. Redefining Obesity and Its Treatment. Sydney: Health Communications; 2000.

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KOJA JE NAJBOLJA ANTROPOMETRIJSKA TEHNIKA ZA ODREĐIVANJE PRETILOSTI: INDEKS TJELESNE MASE, OPSEG STRUKA ILI OMJER STRUK-BOKOVI?

S A Ž E T A K

Ovo je istraživanje osmišljeno kako bi se utvrdilo koja je od antropometrijskih tehnika (indeks tjelesne mase (BMI), opseg struka (WC) ili omjer struk-bokovi (WHR)) najprikladnija za određivanje pretilosti kod odraslog stanovništva Adane, južne provincije u Turskoj.

Ispitanici su izabrani nasumičnim odabirom. U ovo istraživanje bilo je uključeno ukupno 900 osoba (muškaraca i žena koje nisu bile trudne, starosne dobi od 25 do 65 godina), od čega 50.9% žena. Provedena su antropometrijska mjerenja i analizirana statističkim programima. Prevalencija pretilosti kod odraslog stanovništva Adane iznosila je 20.8% 28.4% određena pomoću BMI-a, 30.5% pomoću WC-a i 15.8% 42.0% pomoću WHR-a. I trbušni i ginoidni tip debljine pokazali su podjednaku prevalenciju od 26.6%, u istoj starosnoj skupini. Korištenjem različitih antropometrijskih tehnika (WC, BMI i WHR) dobiveni su različiti udjeli pretilosti u populaciji. Iako je BMI (kg/m^2) najčešće korištena metoda za određivanje prekomjerne tjelesne težine i pretilosti, ona nije optimalni pokazatelj udjela masti u tijelu i još je manje pogodna metoda za procjenu raspodjele tjelesne masti. Najkorisnija mjera za procjenu pretilosti i najbolji jednostavni antropometrijski indeks za procjenu za procjenu širokog spektra rizičnih faktora i s njima povezanih bolesti je omjer struk-bokovi (WHR).