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COMPARISON OF ANTHROPOMETRIC PARAMETERS AND DIETARY INTAKE IN YOUNG AND MIDDLE-AGED ADULTS

GENÇ VE ORTA YAŞ YETİŞKİNLERDE ANTROPOMETRİK PARAMETRELER VE DİYET ALIMININ KARŞILAŞTIRILMASI

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ABSTRACT

Objective: This study aims to compare the daily average energy and nutrient intakes, quantities consumed from food groups, and anthropometric measurements of young and middle-aged adults living in Türkiye. Another objective was to examine factors influencing the increase in waist circumference.

Method: This study was carried out on 1052 adults, including young adults aged 20-34 years and middle-aged adults aged 35-64 years. A questionnaire addressing general information about adults and a one-day dietary intake was used in data collection. Anthropometric measurements, including body weight, height, waist circumference, and hip circumference, were performed in the morning hours after an overnight fast by trained researchers using standardized techniques. These measurements were used to calculate the Body Mass Index, Body Adiposity Index, Waist-to-Hip Ratio, and Waist-to-Height Ratio. All data were collected between October 2023 and April 2024 during in-person interviews.

Results: The mean age of young adults was 28.27±2.85 years, while the mean age of middle-aged adults was 44.56±6.75 years. The results achieved in this study revealed that 3.2% of young adults and 17.4% of middle-aged adults were obese ($p<0.05$). Moreover, body adiposity index and metabolic risk (based on waist circumference, waist-hip ratio, and waist-height ratio) were significantly higher in middle-aged adults. The percentage of daily energy intake from saturated fats and the consumption of grains other than bread were higher in young adults, whereas daily intake of fiber, vegetables, fruits, and oily seeds was higher in middle-aged adults ($p<0.05$). Furthermore, daily energy intake, sugar and sugary products consumption, red meat consumption, fruit consumption, and age significantly influenced the increase in waist circumference among adults ($p<0.05$).

Conclusion: This study indicates that there are significant differences in the nutritional status and anthropometric measurements of adults by age. Dietary factors predicting higher waist circumference in young and middle-aged adults are among modifiable targets for individual behavior modification. This study emphasizes the importance of developing strategies for healthy eating and prevention of central obesity among adults.

Key Words: Anthropometry, Dietary Intake, Middle-aged Adults, Young Adults

ÖZ

Amaç: Bu çalışmada, Türkiye'de yaşayan genç ve orta yaş yetişkinlerin günlük ortalama enerji ve besin ögeleri alımlarının, besin gruplarından tükettikleri miktarların ve antropometrik ölçümlerinin kıyaslanması amaçlandı. Diğer bir amaç bel çevresi artışı üzerinde etkili olan etmenlerin incelenmesiydi.

Yöntem: Çalışma 20-34 yaş arası genç yetişkinler ve 35-64 yaş arası orta yaşlı yetişkinleri içeren 1052 yetişkin üzerinde gerçekleştirildi. Veri toplamada yetişkinler hakkında genel bilgileri ve bir günlük besin tüketimini ele alan bir anket kullanıldı. Vücut ağırlığı, boy uzunluğu, bel çevresi ve kalça çevresi dahil olmak üzere antropometrik ölçümler, eğitimli araştırmacılar tarafından standart teknikler kullanılarak bir gecelik açlığın ardından sabah saatlerinde gerçekleştirildi. Bu ölçümler Beden Kütle İndeksi, Vücut Yağlanma İndeksi, Bel-Kalça Oranı ve Bel-Boy Oranını hesaplamak için kullanıldı. Tüm veriler Ekim 2023 ve Nisan 2024 tarihleri arasında yüz yüze görüşmeler sırasında toplandı.

Bulgular: Genç yetişkinlerin yaş ortalaması 28.27±2.85 yıl iken orta yaş yetişkinlerin yaş ortalaması 44.56±6.75 yıldı. Bulgular genç yetişkinlerin %3.2'sinin ve orta yaş yetişkinlerin %17.4'ünün obez olduğunu gösterdi ($p<0.05$). Ayrıca vücut adipozite indeksi ve metabolik risk (bel çevresine, bel-kalça ve bel boy oranına göre) orta yaş yetişkinlerde anlamlı bir şekilde daha yüksekti. Günlük alınan enerjinin doymuş yağlardan gelen yüzdesi ve ekmek dışındaki tahıl tüketimi genç yetişkinlerde; günlük posa, sebze, meyve ve yağlı tohum tüketimi de orta yaş yetişkinlerde daha yüksekti ($p<0.05$). Bunun yanı sıra yetişkinlerin bel çevresindeki artış üzerinde günlük enerji, şeker ve şekerli ürünler, kırmızı et, meyve tüketiminin ve yaşın önemli etkisi vardı ($p<0.05$).

Sonuç: Bu çalışma yetişkinlerin yaşa bağlı olarak beslenme durumlarında ve antropometrik ölçümlerinde anlamlı farklılıklar olduğunu göstermektedir. Genç ve orta yaşlı yetişkinlerde daha yüksek bel çevresini öngören diyetsel faktörler, bireysel davranış değişikliği için değiştirilebilir hedefler arasındadır. Bu çalışma, Türkiye'deki yetişkinlerde sağlıklı beslenmeye ve santral obezitenin önlenmesine yönelik stratejilerin geliştirilmesinin önemini vurgulamaktadır.

Anahtar Kelimeler: Antropometri, Besin Alımı, Orta Yaş Yetişkinler, Genç Yetişkinler

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INTRODUCTION

Healthy eating refers to the consumption of adequate amounts from all food groups to sustain a healthy life [1]. Whole grains, fruits, nuts, vegetables, legumes, shellfish, fish, and foods high in dietary fiber, polyunsaturated fatty acids, and omega-3 fatty acids are examples of healthy foods. From a nutritional standpoint, the main characteristics of low-quality diets are lower intake of nuts, fresh fruits, vegetables, and whole grains and higher intake of added salt and sugar, processed foods, trans and saturated fats, and sugar-sweetened beverages [2].

Disease development is significantly influenced by lifestyle and diet choices. Chronic nutrition-related diseases, sometimes referred to as "lifestyle diseases," include type 2 diabetes, heart disease, obesity, and several inflammatory disorders as well as some malignancies. These diseases result from both unhealthy dietary habits and reduced levels of physical activity. The Western-style diet, which is very common nowadays, has contributed to the increasing incidence of chronic diseases, whereas dietary patterns that promote a high intake of plant-based foods play an effective role in reducing these diseases [3]. Adoption of the Western diet and consumption of ultra-processed foods have significantly contributed to the increasing obesity rates in recent years [4]. Ultra-processed products contain high levels of sugar, salt, and fat but low levels of fiber, micronutrients, bioactive compounds. Moreover, ultra-processed foods are often formulated to create addictive tendencies. It makes making healthy choices more challenging [5]. The widespread availability of these highly rewarding and energy-dense foods has greatly contributed to the obesity epidemic [6]. These obesogenic, inexpensive, readily available foods have become increasingly accessible for all age groups. However, it was reported that young adults have less healthy dietary intakes when compared to other stages of adulthood [7]. Many countries' food supplies are dominated by foods high in sugar, energy, and fat thus it's critical to take action to limit or manage consumption of these foods [8]. The first step to be taken in order to reduce obesity and chronic disease risk is to assess the actual situation through nutrition studies. Anthropometric measurements allow for the assessment of nutritional status and future disease risk [9]. Although body mass index (BMI) is frequently used to categorize obesity, waist circumference—a more precise indicator of the distribution of body fat—has a stronger correlation with death and morbidity [10]. This study aims to compare dietary intakes and anthropometric measurements taken from individuals at different stages of adulthood by following standard protocols and to identify factors influencing waist circumference increase.

METHOD

Study Design and Partipicants

The current study was conducted between October 2023 and April 2024 and was intended to be cross-sectional in nature. Through social media and the communities inside the universities where the researchers worked, participants were invited. Those agreeing to participate were invited to the universities where the researchers worked, for data collection. The reason for this approach was to ensure that all anthropometric measurements and interviews were conducted under standardized conditions using the same calibrated equipment and in a private, controlled environment. Participants were informed in advance about the procedures, duration, and confidentiality of the study, and appointments were arranged according to their availability. Participation was voluntary and based on informed consent. Individuals who were on a special diet, had chronic illnesses, or had undergone surgical obesity treatment were excluded from the study. The sample size was determined utilizing power analysis methodology. The target sample size was calculated as 820, based on an effect size of 0.3, a statistical power of 99%, and a significance level of 0.05. However, a total of 1052 participants were recruited to account for potential data loss or non-response, representing a 20% increase over the calculated sample size. Young adults aged between 20 and 35 years were classified as young adults, whereas those aged between 35 and 64 years were classified as middle-aged adults [11].

Outcome Measures

A survey form was used to collect data, which queried adults' general information (age, regular exercise habits, education level, gender, marital status, smoking status) and daily food consumption records. This questionnaire was prepared by the researchers and administered through face-to-face interviews.

Measurements of Anthropometry: A nutrition professional used established protocols to take anthropometric measurements. With a non-stretchable tape measure, the subjects' height, waist circumference, and hip circumference were measured. Height measurements were taken with the feet together and the head positioned in the Frankfurt plane (eyes and top of the ear at the same level). For waist circumference measurements, arms were placed at the sides and feet were together, and the circumference was measured at the midpoint between the lower rib bone and the top of the hip bone. Hip circumference values were measured at the widest part of the hips [12].

BMIs of individuals were calculated by dividing the weight in kilograms by the square of the height in meters. BMI results were evaluated according to the WHO classification. The World Health Organization defines a waist circumference of more than 80 cm for women and 94 cm for men as a risk for metabolic diseases. A waist circumference of more than 88 cm for women and 102 cm for men is defined as high risk for metabolic disease. There are also metabolic risk cut-off points for waist-hip ratio and waist-height ratio. Waist-hip ratio is obtained by dividing waist circumference by hip circumference. A waist-hip ratio of more than 0.85 in women and more than 0.90 in men is considered a risk for the development of metabolic diseases [13]. One may calculate the waist-to-height ratio by dividing the waist circumference by the height. A ratio greater than 0.5 denotes a higher risk to health [14]. These cut-off points were used in the study for obesity and metabolic risk assessment based on anthropometric measurements.

To estimate body fat percentage, a simple mathematical equation was used to calculate the body adiposity index using height (m) and hip circumference (cm) data: [(Hip circumference/height$^{1.5}$)-18] [15].

Dietary Intake: A one-day food intake record was obtained from participants by using a retrospective recall method. Quantities and portions were determined by using a photographic food catalog [16]. The energy values, nutrient values, and amounts of food groups consumed were determined by using a nutrition software program named 'Nutrition Information Systems', which is suitable for Turkish foods.

Ethical Approval

Ethical approval for this study was obtained from the Health Sciences Ethics Committee of Çankırı Karatekin University (date: 16.10.2023, approval number: 9).

Statistical Analysis

The Statistical Package for Social Sciences 23.0 (SPSS 21.0; IBM Corp., Armonk, NY, USA) was used to analyze data and generate tables. The normality of the data was assessed using the Kolmogorov-Smirnov test. Numerical and percentage data were used to present categorical data. Descriptive analyses using mean and standard deviation were used for continuous variables. In addition, one-way ANOVA was used to compare continuous variables between adult stages, and Pearson's chi-squared test was used to assess categorical data. Linear regression analysis was used to determine the variables influencing waist circumference. Statistical significance was defined as a p-value of less than 0.05 [17].

RESULTS

The distribution of participants' sociodemographic traits by stage of maturity is shown in Table 1. Gender distribution and smoking habits were found to be similar across adulthood stages (p>0.05). Nonetheless, notable distinctions were noted between the cohorts concerning the remaining characteristics assessed. Even though the number of married individuals was higher in the middle adulthood group, their education level was found to be lower (p<0.001). Regular exercise habits were significantly more prevalent among young adults in comparison to middle-aged adults (p=0.004).

Table 1. Sociodemographic characteristics of all participants by adulthood stages (n=1052)

Variables		Adulthood Stages			p
		Young Adulthood (n=568)	Middle Adulthood (n=484)	Total (n=1052)	
Age		28.27±2.85	44.56±6.75	35.77±9.55	<0.001**[a] t= -52.279
Sex	Men	267(47.00)	250 (51.70)	517 (49.10)	0.138 X^2=2.257
	Women	301 (53.00)	234 (48.30)	535 (50.90)	
Marital status	Single	273 (48.10)	38 (7.90)	311 (29.60)	<0.001** X^2=202.930
	Married	295 (51.90)	446 (92.1)	741 (70.40)	
Level of education	≤Middle school	141 (24.80)	232 (47.90)	373 (35.50)	<0.001** X^2=65.636
	High school	220 (38.70)	152 (31.40)	372 (35.40)	
	University	207 (36.40)	100 (20.70)	307 (29.20)	
Smoking	No	365 (64.30)	315 (65.10)	680 (64.60)	0.796 X^2=0.077
	Yes	203 (35.70)	169 (34.90)	372 (35.40)	
Regular exercise	No	485 (85.40)	441 (91.10)	926 (88.00)	0.004* X^2=8.131
	Yes	83 (14.60)	43 (8.90)	126 (12.00)	

*Number (Percentage), X^2:Pearson Chi-Square Test, [a]:Independent Samples t test, p values are defined as *< 0.01 and **<0.001.*

The anthropometric characteristics of the subjects are shown in Table 2 according to their stage of adulthood. Young adults had a significantly higher mean height than middle-aged individuals (p=0.02). On the other hand, middle-aged adults had larger hip circumference, body mass index, waist circumference, and body weight (p<0.001). Middle-aged adults have significantly higher rates of overweight and obesity, as well as metabolic risk markers and body adiposity index (p<0.05).

Table 3 provides a comparison of daily dietary intake among participants by adulthood stages. The percentage of daily energy intake from saturated fats is higher in young adults than in middle-aged adults (10.6% and 9.9%, respectively, p<0.05). Moreover, the daily consumption of vegetables, fruits, and dietary fiber intake is significantly higher in middle-aged adults (p<0.05). Conversely, the consumption of grains other than bread is higher in young adults (p<0.05). The intake of energy, other nutrients, and food groups is similar between young and middle-aged adults (p>0.05).

Table 4 presents the results of a multivariable linear regression analysis examining factors associated with waist circumference. The analysis identified statistically significant associations between waist circumference and daily energy intake (β=0.110, p=0.002), consumption of sugars and sugary products (β=0.060, p=0.037), types of bread (β=0.125, p<0.001), red meat consumption (β=0.074, p=0.011), and age (β=0.386, p<0.001). While the effect sizes for most variables were relatively small, their statistical significance suggests a potential relationship that warrants further exploration. Additionally, fruit consumption was negatively associated with waist circumference (β=-0.058, p=0.043), indicating that a 100 g increase in fruit intake may correspond to a modest decrease in waist circumference.

DISCUSSION

In the current study, food consumption and anthropometric measurements of young and middle-aged individuals in Turkey were compared. To further understand the impact of energy, nutrients, and food categories on abdominal fat accumulation, the association between waist circumference, age, energy, and food groups was also examined. In young and middle-aged people, these measures showed statistically significant results.

The nutritional and health status of adults is often assessed using anthropometric measurements. [18]. One of these measurements, body mass index (BMI), is commonly used to characterize and classify individuals' anthropometric features. It is regarded as a risk factor for the development of numerous health problems as well as a metric for detecting overweight and obesity. However, it does not provide precise information about body fat percentage and distribution [10]. In the present study, it was found that the BMI of individuals in middle adulthood was significantly higher when compared to young adults, and the prevalence of pre-obesity and obesity was also higher in middle-aged adults. Ogden et al. [19] found that adults 40-59 had a higher prevalence of overweight and obesity than persons 20-39, which is consistent with this finding. A prior study that included a sample of Norwegian men and women and followed them for 11 years discovered that as people aged, their BMI and the prevalence of being overweight or obese both rose [20]. As one ages, a drop in basal metabolic rate (BMR) could result in an increase in body weight. For many adults, BMR accounts for 60-75% of daily energy expenditure, thus it is important to maintain a healthy body weight. Every ten years, aging is linked to a 1%-2% drop in BMR, in part because of aging-related reductions in lean mass. Furthermore, people tend to become less physically active and experience a decrease in muscle mass as they age [21]. In the present study, the lower prevalence of regular exercise among middle-aged adults compared to young adults may have contributed to the increase in BMI.

The global obesity epidemic has often been defined by using BMI, but less is known about individuals' fat distribution and age-related changes in body shape [22]. In the present study carried out on Turkish adults, it was found that waist circumference, waist-hip ratio, and waist-height ratio were higher in middle-aged adults when compared to young adults, and a greater number of middle-aged adults were at risk for metabolic issues based on waist circumference, waist-hip ratio, and waist-height ratio. Some changes in hormonal mechanisms occurring with advancing age (such as estrogen deficiency in women and a decrease in testosterone levels in men) can lead to changes in body composition and an increase in waist circumference [22]. Additionally, the decrease in BMR and physical activity with increasing age can also increase body fat percentage and waist circumference. Age-related changes in body composition can result in sarcopenia, a progressive condition associated with aging. Sarcopenic obesity, a type of obesity, refers to a condition characterized by a decrease in muscle mass and skeletal strength, and an increase in body fat, particularly visceral fat, with advancing age. Visceral fat surrounding internal organs stimulates inflammatory processes, constituting a significant risk factor for cardiovascular diseases and diabetes development [23].

Comparing the energy and nutritional intake of middle-aged and young persons is one of the study's goals. The daily calorie consumption of young and middle-aged adults did not differ significantly. However, it was discovered that young adults consumed less fruits and vegetables on a daily basis and a higher percentage of their energy from saturated fats. Individuals are more vulnerable to factors that negatively shape their food choices at certain periods of their lives. Generally, it is reported that children and adolescents do not adhere to recommended dietary guidelines and have low diet quality [24].

Table 2. Anthropometric characteristics of the sample by adulthood stages (n=1052)

Variables		Adulthood Stages			p
		Young Adulthood (n=568)	Middle Adulthood (n=484)	Total (n=1052)	
Height		169.30 ±8.43	167.55±9.36	168.50±8.90	0.02* t=3.104
Weight		66.99±11.60	74.48±12.59	70.43±12.62	<0.001** t= -10.034
BMI		23.28±3.00	26.54±4.09	24.78±3.90	<0.001** t= -14.812
Classification according to BMI	Underweight	24 (4.20)	2 (0.40)	26 (2.50)	<0.001** X^2=169.020
	Normal weight	392 (69.10)	169 (35.00)	561 (53.40)	
	Pre-obese	133 (23.50)	228 (47.20)	361 (34.40)	
	Obese	18 (3.20)	84 (17.40)	102 (9.70)	
WC (cm)		82.67±12.96	91.98±13.55	86.95±14.02	<0.001** t= -11.367
Metabolic risk to WC	Normal	402 (70.80)	189 (39.00)	591 (56.20)	<0.001** X^2=111.523
	Risk	75 (13.20)	102 (21.10)	177 (16.80)	
	High risk	91 (16.00)	193 (39.90)	284 (27.00)	
HC (cm)		98.37±10.24	105.48±11.41	101.64±11.36	<0.001** t= -10.655
WHR		0.84±0.09	0.87±0.08	0.85±0.09	<0.001** t= -5.392
Metabolic risk to WHR	No risk	342 (60.20)	223 (46.10)	565 (53.70)	<0.001** X^2=21.006
	Risk	226 (39.80)	261 (53.90)	487 (46.30)	
WHtR		0.49±0.07	0.55±0.08	0.52±0.08	<0.001** t= -13.192
Metabolic risk to WHtR	No Risk	340 (59.90)	131 (27.10)	471 (44.80)	<0.001** X^2=113.652
	Risk	228 (40.10)	353 (72.90)	581 (55.20)	
Body Adiposity Index		26.80±5.12	30.92±6.74	28.69±6.26	<0.001** t= -11.230

** <0.05 and ** <0.001, Values presented here are average ± standard deviation. Data is given as numbers (percent) for the following variables: Classification according to BMI, metabolic risk to WC, HC, WHR, and WHtR. Continuous data were analyzed with Independent Samples t test, and categorical data were analyzed with Pearson's Chi-square test. BMI;body mass index, WC:waist circumference, HC:hip circumference, WHR:waist-to-hip ratio, WHtR:waist-to-height ratio.*

However, in recent years, young adults have also been proposed to be prioritized among groups with unhealthy eating habits [25]. This is because individuals in young adulthood experience educational and economic transitions that can limit access to sufficient, safe, and nutritious foods [26]. When compared, the daily fiber intake of middle-aged and young adults was found to be lower in young adults. Results from another study carried out in Türkiye support this finding [27]. It is likely that the lower daily intake of vegetables and fruits and the higher consumption of processed foods among young adults have led to such a result. Using a linear regression model to examine the factors influencing waist circumference in the study's participants, it was found that, among Turkish adults, daily energy intake (kcal) and total bread consumption (g) increased waist circumference by 0.002 cm and 0.012 cm per unit increase, respectively. Other studies have also revealed a substantial positive connection between waist circumference and refined bread consumption [28,29], which is consistent with these findings. In the present study, the type of bread was not asked, and analyses were conducted based on total bread consumption. Bread is a commonly preferred, filling, and inexpensive food in Türkiye. Moreover, it is known that refined bread consumption is more prevalent in Turkish society [27]. These results suggest that a diet with a high glycemic index may support abdominal obesity [30]. Sugars and sugary products, due to their low fiber content, high energy density, and higher glycemic index in comparison to low-glycemic index and high-fiber foods, provide less satiety, trigger hunger and overconsumption, and increase lipogenesis [31]. In the present study, we found that an increase in daily sugars and sugary products (g) consumption had an effect on waist circumference increase (β= 0.060, p=0.037). Konieczna et al. [31] found that an increase in sweet consumption increased waist circumference. Similarly, a prospective study reported a significant positive relationship between energy intake from sugary snacks and waist circumference [29]. Thus, it can be stated that increased sugar and sugary product consumption may increase fat deposition in the waist circumference.

Our findings have shown that red meat consumption has an effect on increasing waist circumference (β= 0.074, p=<0.011). Even though there is a study contradicting the present results, indicating an inverse relationship between red meat consumption and waist circumference [29], other studies supported the results achieved in the present study [32,33]. As stated by TÜBER, the recommended daily intake of red meat for an adult within a healthy dietary plan is reported to be 20-30 g [34].

Table 3. Comparison of dietary intakes of the sample by adulthood stages (n=1052)

Macro-nutrients and foods	Adulthood Stages			p
	Young Adulthood (n=568)	Middle Adulthood (n=484)	Total (n=1052)	
Energy (kcal)	2106.23±731.43	2105.21±699.03	2105.76±716.37	0.982 t=0.023
Carbohydrates (g)	268.40±103.19	267.40±99.24	267.94±101.34	0.873 t=0.160
Carbohydrates (%E)	52.15±8.79	52.28±9.61	52.21±9.17	0.826 t= -0.219
Protein (g)	75.90±30.15	75.63±30.99	75.77±30.53	0.886 t=0.144
Protein (%E)	14.94±3.82	14.76±3.55	14.85±3.70	0.443 t=0.767
Fat (g)	77.99±37.24	76.89±34.55	77.48±36.01	0.622 t=0.493
Fat (%E)	32.84±8.81	32.51±8.81	32.68±8.81	0.544 t=0.607
Saturated fatty acid(%E)	10.66±3.42	9.97±3.14	10.34±3.31	0.001** t=3.393
Cholesterol (mg)	199.50±135.76	186.81±146.88	193.66±141.06	0.146 t=1.456
MUFA (%E)	11.36±4.00	11.80±4.63	11.57±4.31	0.099 t= -1.635
PUFA (%E)	8.82±4.81	8.74±4.67	8.78±4.75	0.796 t=0.258
Fiber (g)	29.81±13.80	33.78±14.82	31.64±14.41	<0.001*** t= -4.489
Dairy products (g)	141.48±146.86	141.93±138.28	141.69±142.91	0.960 t= -0.051
Red meat (g)	58.14±69.40	56.30±72.75	57.30±70.94	0.675 t=0.420
White meat(g)	14.43±44.81	12.48±44.89	13.54±44.84	0.483 t=0.702
Fish (g)	6.28±35.65	9.33±46.24	7.68±40.87	0.228 t= -1.206
Eggs (g)	23.32±30.36	22.23±30.96	22.82±30.63	0.563 t=0.578
Bread (g)	204.11±145.46	209.99±149.66	206.82±147.37	0.520 t= -0.644
Other cereals (g)	96.42±64.56	87.76±63.16	92.43±64.03	0.029* t=0.267
Vegetables (g)	267.96±199.56	320.11±218.30	291.96±209.91	<0.001*** t= -4.045
Fruits (g)	87.55±133.36	113.97±146.35	99.71±140.04	0.002** t= -3.062
Fats (butter, oil, margarin) (g)	43.06±26.98	44.99±29.13	43.95±27.99	0.265 t= -1.115
Nuts and seeds (g)	19.08±25.87	22.39±24.51	20.60±25.30	0.034* t= -2.121
Sweets and sugary products (g)	27.95±34.58	28.38±30.50	28.15±32.75	0.835 t= -0.208

*Values presented here are average ± standard deviation. p values are defined as * <0.05, **<0.01 and ***<0.001 in comparisons between adulthood stages. Data was analyzed by using the Independent Sample t-test. E:Energy, MUFA:Monounsaturated fatty acids, PUFA: polyunsaturated fatty acids.*

Table 4. Analysis of factors influencing the waist circumference by using linear regression model

Variables	B	SE	β	t	p
Energy (kcal)	0.002	0.001	0.110	3.157	0.002**
Sweets and sugary products (g)	0.026	0.012	0.060	2.092	0.037*
Fruits (g)	-0.006	0.003	-0.058	-2.024	0.043*
Bread (g)	0.012	0.003	0.125	3.873	<0.001***
Red meat (g)	0.015	0.006	0.074	2.546	0.011*
Age (year)	0.566	0.041	0.386	13.939	<0.001***

Adj. R^2=0.207, F (6, 1045)=46.760, p<0.001

p<0.05, **<0.01, and *<0.001. Linear regression analysis was used. SE:Standard error.*

Most of the adult Turkish population does not consume an adequate amount of fruits, with daily intake being approximately half of the requirement [34]. Adequate consumption of fresh fruits can have various beneficial effects on health, including the prebiotic effects of bioactive fibers in their content, as well as their roles in weight control, healthy living, and healthy aging [35]. In the present study, an increase of 100 grams in fruit consumption was found to decrease waist circumference by 0.6 cm. Additionally, other studies also reported inverse relationships between fruit consumption and waist circumference [36,37]. Factors such as the low energy density, high water content, and high fiber content of fruits may contribute to weight control [29].

In the present study, age was found to be a significant determinant of waist circumference (β= 0.566, p=<0.001). Similarly, in a longitudinal study carried out by Vargas et al. [38] on individuals aged 60 and above living in southern Brazil, it was found that waist circumference increased by 25.6% with increasing age. In the TEKHARF study, it was also found that there was a positive association between age and waist circumference in men and women [39]. Considering age-related changes in waist circumference among adults helps understand this process of change and acquire more knowledge in this field.

While there are many studies carried out on adult dietary habits and intake, there is no study comparing dietary habits and intake among adults in Türkiye according to adulthood stages. The increasing adult population in Türkiye, as in many other countries, underscores the need for this information. Furthermore, the large sample in the present study plays an important role, both for representing the general Turkish population and for enhancing statistical power by limiting the influence of outliers or extreme values. One of the study's advantages is that anthropometric parameters like waist circumference, height, weight, and hip circumference are measured directly by researchers, reducing the possibility of inaccuracies resulting from participant self-reporting data.

Limitations

Dietary intake data were collected using a one-day 24-hour recall method. This method is widely used in large-scale epidemiological studies due to its feasibility [33,39], particularly in studies with large sample sizes such as the current study (n=1052). However, since it may not fully reflect long-term dietary habits at the individual level, its use was considered a limitation of the study. Moreover, reliance on participant self-reporting for the records may have led to inaccuracies. In addition, physical activity was assessed only by asking whether participants engaged in regular exercise or not, without using a standardized or detailed measurement tool.

CONCLUSION

In conclusion, the results achieved in the present study suggest that reducing total energy intake, decreasing consumption of bread, red meat, and sugary products, and increasing fruit consumption could be promising approaches to reduce waist circumference in adults. Moreover, aging is a determinant of increased waist circumference, therefore increasing tendencies toward healthy eating and increasing participation in physical activity among individuals in this age group, as well as developing approaches to slow down hormonal metabolism changes, could help prevent increases in waist circumference with advancing age during adulthood.

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