Original Research / Özgün Araştırma

Factors Affecting Overweight and Obesity among Urban Adults: A Case of Samsun Province, Turkey

Kentsel Yetişkinlerde Aşırı Kilo ve Obeziteyi etkileyen faktörler: Samsun İli Örneği, Türkiye

*Mehmet Bozoğlu[1], Uğur Başer[*1], Şeyma Orak[1], Hümeyra Kalelioğlu[1], Shamsheer ul Haq[1]*

ABSTRACT

Objective: The aim of this study was to examine the impacts of genetic, behavioral, and socio-economic factors on the prevalence of overweight and obesity among urban adults. **Methods:** The primary data of this study was derived from 384 adult individuals using the non-grouped one stage random likelihood sampling procedure in the urban area of Samsun province of Turkey. The ordered probit model was used to estimate factors affecting overweight and obesity among urban adults. **Results:** The research results show that the prevalence of overweight and obesity among urban adults were 30.7% and 21.1, respectively. The ordered probit model result revealed that age, number of siblings, marital status, employment, number of obese family member, BMI of mother and breastfeeding duration had statistically significant positive effects on the likelihood of overweight and obesity among the urban adults, while paying attention toward fat, sugar and salt contents in foods and dieting behavior had statistically significant negative effects on the likelihood of overweight and obesity. **Conclusions:** In order to decrease the prevalence of overweight and obesity among the urban adults, they should be eating healthy foods and do enough physical activities, and these should be a part of their lifestyle forever.

Key words: Urban adults, overweight, obesity, ordered probit, Samsun

ÖZET

Amaç: Bu çalışmanın amacı, genetik, davranışsal ve sosyo-ekonomik faktörlerin yetişkinlerde aşırı kilo ve obeziteye etkisinin ortaya konulmasıdır. **Yöntem:** Çalışmanın verileri, Samsun İli kent merkezindeki yetişkinler arasından rastgele olasılık örnekleme yaklaşımı kullanılarak seçilen 384 yetişkin ile yapılan anketlerle elde edilmiştir. Aşırı kilo ve obeziteye etkili faktörlerin belirlenmesinde sıralı probit modeli kullanılmıştır. **Bulgular:** Araştırma sonuçları, kentsel yetişkinlerde aşırı kilo ve obezitenin sırasıyla %30.7 ve %21.1 olduğunu göstermektedir. Model sonuçları; yaş, kardeş sayısı, medeni hal, istihdam edilme, ailedeki obez birey sayısı, annenin BMI'ı ve bebeklik dönemindeki emzirilme sürenin kentsel yetişkinlerde aşırı kilo ve obeziteyi istatistiki olarak pozitif etkisinin olduğu; buna karşın diyet yapma alışkanlığı, gıdaların yağ, şeker ve tuz içeriğine dikkat edilmesi gibi davranışların istatistiki olarak anlamlı negatif etkilerinin olduğunu göstermektedir. **Sonuç:** Aşırı kilo ve obezitesinin önlenebilmesi için kentsel yetişkinlerin sağlıklı beslenmeleri ve yeterli fiziksel aktivite yapmaları, bunları yaşam tarzlarının bir parçası haline getirmeleri gerekli görülmektedir.

Anahtar kelimeler: Kentsel yetişkin, aşırı kilo, obezite, sıralı probit, Samsun

INTRODUCTION

Overweight and obesity have become a gigantic health-related issue all over the world. It shows an abnormal and excessive fat accumulation in the human body which causes serious public health problems.[1] Prevalence of overweight and obesity has increased rapidly all over the world and has tripled worldwide since 1975.[2] In 2016, about 2 billion adults in the world were overweight, and 650 million were obese. Overweight and obesity were higher among adult women as compared to adult men in the world. The prevalence rate of overweight in women was 40%, while it was about 39% in men. Similarly, the obesity prevalence in adult women (15%) was higher than adult men. The fundamental cause of obesity and overweight is an energy imbalance between calorie intake and calorie consumption.[3]

In Turkey, there has been also a significant rise in the prevalence of overweight and obesity both in adults and children for the last two decades.[4] The report issued by the Ministry of Health pointed out that 29% of women and 15% of men were obese. Similarly, 37% of male and 29% of females was overweight in the country.[5] Moreover, Adulthood obesity prevalence anticipates described that 44% of men and 26% of women will be obese in 2020, and in 2030, this prevalence rate will be 51% in men and 25% in women. The improper meals pattern, growing sedentary lifestyle, decrease in home time, high consumption of energetic food and drinks, low physical activity, and some environmental factor like genetic disposition contributes a lot in overweight and obesity.[1,6-8] Consequently, overweight and obesity became a global health problem due to their contribution to non-communicable diseases such as diabetes, cardiovascular disease, cancer, hypertension, hypertension, musculoskeletal disorders, and behavioral problems.[3, 9-11] These chronic diseases caused by overweight and obesity were a major cause of premature deaths. In general, the substantial rise in mortality due to non-communicable diseases such as Ischemic heart disease (17.6%), Alzheimer disease (46.1%), and Diabetes (28.0%) was observed from 2005 to 2016 in the country. Similarly, the Ischemic heart diseases exhibited no change in its position in causing premature deaths, but Alzheimer diseases got 7th position from 8th and diabetes got 9th position in Turkey.[12]

The significance of this study on overweight and obesity was underlined by their adverse health outcomes, increasing contribution to deaths, and their increasing prevalence rate. In this context, many cross-sectional studies were conducted all over the world. Some of them focused on the prevalence rate of obesity and overweight among adults and youth,[13,14] and some described the effective factors on overweight and obesity.[1, 15-16] Similarly, in Turkey, most of the studies focused on the prevalence of obesity, and its associated health risk.[17-18]

Additionally, the nationwide studies and growing prevalence rate of overweight and obesity among Turkish people signify the importance of exploring the effective factors on overweight and obesity to take early prevention steps for Turkish people. Lack of exploring the factors affecting overweight and obesity among Turkish people, this study might be a forward step toward fulfilling this research gap. Moreover, the study objectives were to determine the prevalence rate of overweight and obesity in urban adults of the Samsun province as well as exploring the factors affecting overweight and obesity.

MATERIALS AND METHODS

Research area

Samsun province consisted of the research population. It has a surface area of 9,579 km^2 with a population of 1,312,990. 47.6% of the total province population lives in the central urban districts of Atakum, Ilkadim and Canik. The average household size in the province is 3.4. About 49.4% of the population is male and 50.6% is female.[19]

The urban population of Samsun province has increased especially due to migration for the last two decades. Urbanization has changed in the lifestyles and nutritional habits of the urban population. Urbanization is one of the most effective factors in the rising prevalence of overweight and obesity worldwide. Therefore, the urban center of Samsun province was thought to be a good case study to investigate the prevalence of obesity and overweight in adults and effective factors.

Sampling and data collection

The non-grouped one stage random likelihood sampling procedure of Cochran was applied to determine the sample size (Formula 1).[20]

$$n=(t)^2*(p)(q)/(d)^2 \qquad (1)$$

Where n denotes the required sample size, t means the level of significance which is defined as 95% (1.96). The p denotes the probability of attributes to be estimated which was defined 50% for the current study. Similarly, q describes the probability of attributes not to be estimated which was calculated as 1-p (that was also 50%). The final parameter is d which shows the desired level of precision (assumed to be 5%). At last, the final

required number of sample size (n) calculated as 384 adults as representatives of the accessible population of the study area.

The next step was to develop a comprehensive questionnaire. The questionnaire was divided into various sections. The first section was about the social-demographic personal characteristics of the adult respondent such as his age, gender, education, marital status, occupation etc. The second section was about the height and weight of the adults to determine the Body Mass Index (BMI). The third section was composed of genetic and physiological factors such as BMI of respondent's parents, their behavior (active, aggressive), use of medicine etc. Moreover, the questions about the adults' physical activities and nutritional behavior were also asked.

Method

At first, BMI was calculated by Formula 2 to classify overweight and obesity among adults. Based on the resulted BMI values, the adults were classified into "weak or normal weight", "overweight" and "obese" according to the WHO defined criteria. In this way, the adult with BMI less than 24.9 was classified as weak and normal weight (Y=0). If the BMI was in the range of 25 to 29.9 (Y=1), then the adult was supposed as overweight. Similarly, adults with BMI equal to or greater than 30, were considered obese (Y=2). This index was used all over the world to identify overweight and obesity among adults or children. [11, 17, 21]

$$BMI = Body\ Weight\ /\ Height^2 \qquad (2)$$

As the dependent variable has three categories such as normal weight, overweight and obese adults based on the BMI, the dependent variable takes a discrete value, and also inherent ordinal ranking. It satisfies the application of the ordered probit model.[22-23] Subsequently, the ordered probit model was used to determine the effective factors of overweight and obesity. In the ordered probit model, the probability of being in one of weak or normal, overweight, and obese BMI categories was a function of sociodemographic, genetic, psychological, nutritional, and physical factors. The general functional form was described below (Formula 3).

$$y_i^* = \beta' x_i + \varepsilon_i, \varepsilon_i\ F\left((\varepsilon_i|\theta)\right), E(\varepsilon_i|x_i) = 0, and\ Var(\varepsilon_i|x_i) = 1\ (3)$$

Where, y^* is the unobserved "latent" dependent variable, and presently it is 0 for "normal weight adults", 1 "overweight adults" and 2 "obese adults". β is a vector of coefficients to be estimated. *x is a*

vector of explanatory variables and ε a vector of error terms. The above observation mechanism results from a complete censoring of the latent limited dependent variable as follows (Formula 4):

$$
\begin{aligned}
y_i &= 0\ \ if\ y_i\ \le\ \mu_0, \\
y_i &= 1\ \ if\ \mu_0, < y_i\ \le\ \mu_1, \\
y_i &= 2\ \ if\ \mu_1, < y_i\ \le\ \mu_2,
\end{aligned}
\qquad (4)
$$

Where, y is the observed counterpart to y^*, while μ_j represents the threshold values or the cut of points.[24]

Marginal effects were calculated below Formula 5 to determine a unitary effect of each exogenous variable on each of the three categories of the dependent variable.[24]

$$
\begin{aligned}
\frac{\partial Prob(y_i = 0)}{\partial x_k} &= -\emptyset(\hat{\beta}' x_i)\hat{\beta}_k, \qquad (5) \\
\frac{\partial Prob(y_i = 1)}{\partial x_k} &= [\emptyset(-\hat{\beta}' x_i) - \emptyset(\hat{\mu}_1 - \hat{\beta}' x_i)]\hat{\beta}_k, \\
\frac{\partial Prob(y_i = 2)}{\partial x_k} &= [\emptyset(\hat{\mu}_1 - \hat{\beta}' x_i)]\hat{\beta}_k
\end{aligned}
$$

Where $\emptyset$ is the normal probability density function. Marginal effects for a dummy variable can be calculated as the difference between $\emptyset$ of the corresponding probability with and without the presence of the variable in question (Formula 6).

$$\frac{\partial Prob(y_i=0)}{\partial x_m} = \Phi(\widehat{-\beta}' x_i | x_m - 1) - \Phi(\widehat{-\beta}' x_i | x_m - 0) \qquad (6)$$

Where the $\partial\ Prob/\partial x_k$ is partial derivative of probability with respect to independent variable x_k. The sum of marginal effects should be zero by canceling out one another across the response categories. The standard errors of these marginal effects can be obtained by utilizing the delta method. Descriptions of the variables in the ordered probit model have given in Table 1. In the study, f test was used for parametric tests, and chi-square test was used for nonparametric tests.

However, the expected effects of variables on obesity and overweight (the hypothesis) are given in Table 1. It was expected that the variables of AGE, GENDER, NSIBLING, INCOME, MARSTA, EDUC, OBESFM, BMIMUM, BMIDAD, CROILL, PSYPRB, CONMED, SLEEPDUR, DURBREA, PORSIZE and ALCOH have positive impacts on dependent variable (BMI). However, it was expected that the variables of EMPLO, ACTIVE, EMOTION, REGSLEEP, REGEXER, BREAK, LUNCH, DINNER, SNACK, FASUSA and SMOKI have negative impacts on a dependent variable (BMI).

Table 1. Descriptions and expected effect of the variables used ordered probit model

Variables	Variable definition	Expected effect
Dependent Variable (BMI)		
Weak and normal weight (if BMI is <= 24.9 =0)		
Overweight (if BMI is 25-29.9=1)		
Obese (if BMI is >30=2)		
Independent Variables		
Socio-demographic characteristics		
AGE	Age (year)	(+)
GENDER	Gender (1=male, 0=female)	(+)
MARSTA	Marital status (1=married, 0=other)	(+)
NSIBLING	The number of siblings in the family (person)	(+)
EDUC	Education (1=university and above, 0=other)	(+)
EMPLO	Employment (1=employed, 0=unemployed)	(-)
INCOME	Monthly family income (₺)	(+)
Genetic and psychological factors		
ACTIVE	Personal characteristics (1=very active and active, 0=other)	(-)
EMOTION	Emotional characteristics (1=anxious, aggressive, depressive, lonely; 0=Calm, happy, relaxed, safe)	(-)
OBESFM	Number of obese in the family (person)	(+)
BMIMUM	Body mass index of mother	(+)
BMIDAD	Body mass index of father	(+)
CROILL	Chronic illness (1=Yes, 0=No)	(+)
PSYPRB	Psychological problems (1=Yes, 0=No)	(+)
CONMED	Consume medicine (1=Yes, 0=No)	(+)
Nutrition behaviors		
DURBREA	Duration of breastfeeding (month)	(+)
BREAK	Have regular breakfast (1=Yes, 0=No)	(-)
LUNCH	Have regular lunch (1=Yes, 0=No)	(-)
DINNER	Have regular dinner (1=Yes, 0 = No)	(-)
SNACK	Have regular snack (1=Yes, 0=No)	(-)
PORSIZE	Portion size (1= too much, 0=less or normal)	(+)
FASUSA	Pay attention on fat, sugar and salt (1=Yes, 0=No)	(-)
SMOKI	Smoking (1=Yes, 0=No)	(-)
ALCOH	Drinking alcohol (1=Yes, 0=No)	(+)
Physical and sleeping behaviors		
SLEEPDUR	Daily sleep duration (hours)	(+)
REGSLEEP	Regular sleep (1=Yes, 0=No)	(-)
REGEXER	Regular physical exercise (1=Yes, 0=No)	(-)

RESULTS AND DISCUSSION

The descriptive research results in Table 2 show that the average BMI were 22.21 for weak and normal-weight adults, 27.27 for overweight adults and 33.88 for the obese adults, while the prevalence of weak and normal weight, overweight and obesity among the urban adults were 47.14%, 32.29%, and 20.57%, respectively. The independent variables were categorized into four groups. The first group consisted of socio-economic factors such as age, gender, marital status, income, etc. The average age of the weak or normal, overweight, and obese adults were about 35, 41, and 45, respectively. The rate of males was 44% in weak or normal adults, 52% in overweight adults, 47% in obese adults, and 47% in general. However, the rate of males in

Samsun province was 49.4%.[19] The rate of married was 67% in weak or normal adults, 85% in overweight, 89% in obese adults, and 78% in general. The rate of married adults in the province population was 64.9%.[19] The number of siblings in the family was 3 in weak or normal adults, while it was 4 in overweight and obese adults. About one-third of the adults had university or higher education levels. Whereas, the share of university or higher graduates was less (15.4%) in the population.[19] The employment rate among the adults was 78% weak or normal adults, 83% in overweight adults, 68% in obese adults, and 78% in general. The average monthly income of households decreased from weak and normal adults

(₺ 4,572) to obese adults (₺ 4,006).[1] There was statistically difference among the BMI groups in terms of age, the number of siblings, marital status (p<0.001), employment (p<0.05), and education level (p<0.10).

The second group independent variables explain the stated genetic and psychological factors such as the number of obese in the family, BMI of parents, any chronic illness, personal and emotional characteristics. About eighty percent of adults stated themselves as an active or very active person and aggressive, depressive, and lonely behavior. While the obesity prevalence in the family was 19% in weak and normal adults, this rate increased 28% in overweight adults and 56% in obese adults. The mothers (BMI = 27.17) and fathers (BMI = 30.17) of adults were overweight on average. The rate of chronic diseases in families increased from weak or normal adults (14%) to obese adults (39%). The rate of physical handicapped in the family members also increased from weak or normal adults (17%) to obese adults (27%). However, the rate of chronic patients consuming medicine was 7% in weak or normal adults, 16% in overweight adults, and 20% in obese adults. There was statistically difference among the BMI groups in terms of chronic illness and consuming medicine (p<0.001).

The third group of independent variables was about the nutrition behavior of adults such as having meals regularly, drinking alcohol, smoking, and avoiding fat, sugar, and salt in meals. The breastfeeding period increased from 12 months in weak or normal adults to 15 months in obese adults. About two-thirds of the adult groups had regularly their breakfast, lunch, and dinner, while one-third of them had regularly snack. Furthermore, 87-89% of the adults had a large meal portion. The rate of adults who are sensitive not to use salt in their meals was 39% in overweight adults, 36% in weak or normal adults, and 22% in obese adults. While 32 % of adults were smoking, 10-18% of them were drinking alcohol.

The last group variables emphasize the factors regarding the adults' physical exercises and sleeping behaviors such as sleeping hours, regularity in sleep, and physical activities. Whereas the adults slept daily 7.33 hours, and 63% of them had a regular sleep. Thirty-nine percent of the adults worked physically, while 37% of them did regular physical exercises.

---

[1] Average US Dollar rate was ₺ 3.02 in 2016.

Table 2. Description and summary statistics of the variables

	Weak - normal weight (%47.14)		Overweight (%32.29)		Obese (%20.57)		General	
	Mean or %	Std. Deviation	Mean or %	Std. Deviation	Mean or %	Std. Deviation	Mean or %	Std. Deviation
Dependent variable								
BMI***	22.21	1.87	27.27	1.48	33.88	3.64	26.23	5.01
Independent Variables								
Socio-demographic characteristics								
AGE***	34.54	11117.00	41.23	10255.00	45.00	11471.00	38.85	11.71
GENDER	0.44	-	0.52	-	0.47	-	0.47	-
MARSTA***	0.67	-	0.85	-	0.89	-	0.78	-
NSIBLING***	3.10	1.43	4.14	1952.00	4.35	2375.00	3.70	1.91
EDUC*	0.31	-	0.34	-	0.35	-	0.34	-
EMPLO**	0.78	-	0.83	-	0.67	-	0.78	-
INCOME	4571.82	2.35	4217.58	2.55	4006.13	2.65	4341.05	2482.46
Genetic and psychological factors								
ACTIVE	0.80	-	0.80	-	0.76	-	0.79	-
EMOTION	0.78	-	0.76	-	0.77	-	0.77	-
OBESFM	0.19	-	0.28	-	0.56	-	0.29	-
BMIMUM	29.71	4751.00	30.32	4741.00	31.00	5616.00	30.17	4.95
BMIDAD	26.77	3220.00	27.50	5563.00	27.58	5759.00	27.17	4.66
CROILL***	0.14	-	0.28	-	0.39	-	0.24	-
PSYPRB	0.17	-	0.23	-	0.27	-	0.21	-
CONMED***	0.07	-	0.16	-	0.20	-	0.13	-
Nutrition behaviors								
DURBREA**	12.22	8142.00	12.97	8646.00	15.20	9553.00	13.08	8.66
BREAK	0.57	-	0.62	-	0.70	-	0.61	-
LUNCH	0.60	-	0.65	-	0.65	-	0.62	-
DINNER	0.76	-	0.82	-	0.75	-	0.78	-
SNACK	0.30	-	0.35	-	0.35	-	0.33	-
PORSIZE	0.87	-	0.89	-	0.91	-	0.88	-
FASUSA**	0.36	-	0.39	-	0.22	-	0.34	-
SMOKI	0.30	-	0.36	-	0.30	-	0.32	-
ALCOH	0.18	-	0.10	-	0.15	-	0.15	-
Physical and sleeping behaviors								
SLEEPDUR	7.32	1478.00	7.22	1446.00	7.51	1608.00	7.33	1.50
REGSLEEP	0.67	-	0.60	-	0.61	-	0.63	-
REGEXER	0.36	-	0.38	-	0.37	-	0.37	-

***, **, and * indicate the coefficient are statistically significant at the level of 1, 5, and 10%, respectively.

Ordered probit model results

The chi-square value for the factors influencing overweight and obesity (125.69 with 26 degrees of freedom) was statistically significant at the 0.01 level of probability (Table 3). Twenty-seven independent variables were included in the model, and the estimated coefficients of these variables were tested using *t*-test statistics. The model results revealed that eight variables have a significant effect on overweight and obesity. Most of them were related to the socio-economic characteristics of urban adults. First variable was an age which describes that higher the age, higher the probability of belonging to the overweight and obesity group. It also described the positive association of increasing age with overweight and obesity. Second, a large number of siblings in the family also increases the probability of being overweight and obese. Moreover, married adults were more likely to gain weight as compared to an unmarried adult. The last socio-economic factor, unemployed adults were tending to have overweight and obesity problems.

From the second category of genetic and psychological factors, only the number of obese family members, and BMI of mother positively and significantly increase the probability of being overweight and obese. This implies that the probability of being overweight or obese increases if the adult belongs to a family with more overweight and obese family members. Similarly, if a mother's BMI is higher, then the adults were more likely to be over-weighted and obese.

The duration of an adult breastfed by their mother in his/her infant time also increases the likelihood of overweight and obesity among adults. The second variable form nutrition behavior such

as giving attention to fat, salt, and sugar decreases the probability of overweight and obesity among adults. Although, the other factors were not significant.

The marginal effect for the age indicates that when the age increases one year, the likelihood of an adult being over-weighted and obese increased by 0.4% and 0.7%, respectively. Numerous studies also found similar results.[1, 16] When the number of siblings in the family increase, the likelihood of overweight and obesity increases by 2% and 3%, respectively. The likelihood of overweight and obesity in married respondent as compared to single counterparts were higher 6% and 8%, respectively. Sen *at al.*[1] had reached

similar results in his study. If the number of obese in the family increases, the likelihood of overweight and obesity increases by 8% and 12%, respectively. If a mother's BMI increases, the likelihood of overweight and obesity increases by 0.4% and 0.5%, respectively. If people had a longer duration of breastfeeding, the likelihood of having overweight and obesity increase by 0.3% and 0.5%, respectively. If people are employed, the likelihood of overweight and obesity decreased by 5% and 8%, respectively. Slack *et al.*[25] also supported our results. If people pay attention to fat, salt, and sugar contents of foods, the likelihood of having underweight and obesity decreased by 5% and 7%, respectively.

Table 3. Factors affecting overweight and obesity among adults

Variables	Coefficient	Marginal effects		
		Y=0	Y=1	Y=2
CUT1	3.292	-	-	-
CUT2	4.411	-	-	-
AGE	0.028***	-0.011***	0.004***	0.007***
GENDER	0.134	-0.053	0.021	0.032
MARSTA	0.352*	-0.140*	0.056*	0.084*
NSIBLING	0.114***	-0.045***	0.018***	0.027***
EDUC	0.288	-0.114	0.045	0.069
EMPLO	-0.369**	0.146**	-0.058*	-0.088*
INCOME	0.000	0.000	0.000	0.000
ACTIVE	-0.021	0.008	-0.003	-0.005
EMOTION	-0.055	0.022	-0.009	-0.013
OBESFM	0.513***	-0.204***	0.081***	0.122***
BMIMUM	0.022*	-0.009*	0.004	0.005*
BMIDAD	0.016	-0.006	0.003	0.004
CROILL	0.257	-0.102	0.041	0.061
PSYPRB	-0.013	0.005	-0.002	-0.003
CONMED	0.050	-0.020	0.008	0.012
DURBREA	0.022***	-0.009***	0.004***	0.005***
BREAK	-0.025	0.010	-0.004	-0.006
LUNCH	0.076	-0.030	0.012	0.018
DINNER	-0.252	0.100	-0.040	-0.060
SNACK	0.123	-0.049	0.019	0.029
PORSIZE	0.249	-0.099	0.039	0.059
FASUSA	-0.296**	0.117**	-0.047**	-0.071**
SMOKI	-0.045	0.018	-0.007	-0.011
ALCOH	-0.111	0.044	-0.018	-0.026
SLEEPDUR	0.020	-0.008	0.003	0.005
REGSLEEP	-0.092	0.037	-0.015	-0.022
REGEXER	0.046	-0.018	0.007	0.011
Log- likelihood	-339.181			
χ^2	124.07***			
Psuade R^2	0.1546			
N	384			

Ordered probit model was used.
***, ** and * indicate the coefficient are statistically significant at the level of 1, 5 and 10%, respectively.

The main limitation of this study is that this study was conducted in the only urban center of Samsun province and these results did not generalized to the other urban areas of the country and the urban areas. Similar researches should be conducted in the other regions and/or countrywide using larger sample sizes and different methodologies with

high-risk groups such as children and the elderly population.

CONCLUSIONS

The prevalence of overweight and obesity showed and upward trend mainly as a result of urbanization rise, better nutrition, socio-economic development, etc. This study concluded that about half of the urban adults were overweight and obese in Samsun province. Majority of the adults were characterized by aggressive, depressive and lonely personality. About one-third of the adults had a habit of junk food feeding and not a regular habit of breakfast, lunch and dinner. Majority of the adults had large portion of meal and only few of them took care of fat, sugar and salt. Similarly, few adults smoked and drank alcohol. Moreover, only one third of adults did regularly physical activities. These socio-demographic, genetic and psychological, nutritional and physical factors related with the prevalence rates of overweight and obesity show important health risk factors and problems. Therefore, the results of this study are important to develop a successful health program for combating with overweight and obesity problems.

This study has contributed to further insights into how selected factors affect overweight and obesity. Thus, the ordered probit model analysis revealed that some selected factors had significant positive effects on overweight and obesity among urban adults: specifically, age, number of siblings, marital status, and employment among the socio-economic factors; obese mother and number of siblings among the genetic factors. However, paying attention to fat, sugar, and salt contents of diet decreases significantly the likelihood of overweight and obesity among the urban adults.

In order to prevent overweight and obesity, policy measures should focus on the effective factors such as age, a number of siblings, marital status, employment status, obesogenic environment (obese mother and the number of siblings), breastfeeding and food content. Thus, urban adults should be informed and encouraged about consumption of healthy foods and physical activities, and this should be a part of their lifestyle forever. The nutritional diet of urban adults should be appropriate with their gender, metabolism, and age. With growing age, the adults should take care of their diets and also enhance their physical activities. The adults belong to the family with more obese members should be aware of the probability of overweight and obesity. They should take precautionary measures in childhood and should do regular activities. Overweight and obese parents should make habitual their children to adopt healthy diet patterns. However, the municipalities also should invest in the necessary infrastructure of recreation and sports facilities.

REFERENCES

1. Sen J, Mondal N, Dutta S. Factors affecting overweight and obesity among urban adults: a cross-sectional study. Epidemiology, Biostatistics and Public Health 2013; 10(1):1-11.
2. Bray GA. Health hazards of obesity. Endocrinology and metabolism clinics of North America 1996; 25: 907-919.
3. WHO. World Health Organization Obesity and Overweight, World Obesity Federation. http://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight Accessed 15 October, 2018.
4. Erem C. Prevalence of overweight and obesity in Turkey. IJC Metabolic & Endocrine 2015; 8: 38-41.
5. MoH. Ministry of Health. Chronic diseases and risk factors survey in Turkey, Ankara. ISBN; 978-975-590-461-0 Publication Number; 909. 2013.
6. WHO. World Health Organization. Obesity: preventing and managing the global epidemic; Report of a WHO Consultation, WHO Technical Report Series 894. 2000.
7. Chou SY, Grossman M, Saffer H. An economic analysis of adult obesity: results from the Behavioral Risk Factor Surveillance System. Journal of health economics 2004; 23(3): 565-587.
8. Tur JA, Serra-Majem L, Romaguera D, Pons A. Profile of overweight and obese people in a Mediterranean region. Obesity Research 2005; 13(3): 527-536.
9. Haslam DW, James WP. Obesity. Lancet 2005; 366: 1197-1209.
10. Laxmaiah A, Nagalla B, Vijayaraghavan K, Nair M. Factors affecting prevalence of overweight among 12-to 17-year-old urban adolescents in Hyderabad, India. Obesity 2007; 15(6): 1384-1390.
11. Caballero B. The Global Epidemic of Obesity: An Overview. Epidemiol Rev 2007; 29:1-5.
12. IHME, Institute for Health Metrics and Evaluation. What causes the most premature death? 2016. http://www.healthdata.org/turkey. Accessed 15 October, 2018.
13. Skinner AC, Perrin EM, Skelton JA. Prevalence of obesity and severe obesity in US children (1999-2014). Obesity 2016; 24(5): 1116-1123.
14. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. Jama 2014; 311(8): 806-814.
15. Goryakin Y, Lobstein T, James WPT, Suhrcke M. The impact of economic, political and social globalization on overweight and obesity

in the 56 low and middle income countries. Social Science & Medicine 2015; 133: 67-76.

16. Banterle A, Cavaliere A. The social and economic determinants of obesity: an empirical study in Italy. In 113th Seminar of the European Association of Agricultural Economists (EAAE) "A resilient European food industry and food chain in a challenging world". Chania, Crete, Greece 2009;1-13.

17. Delibasi T, Karaaslan Y, Ustun I, Koroglu E, Hosgor S. National prevalence of underweight, overweight and obesity in Turkey: cross sectional study of a representative adult population. Open Medicine 2007; 2(3): 294-303.

18. Sahin H, Cicek B, Yılmaz M, Ongan D, Inanç N, Aykut M, Elmali F. Obesity prevalence, waist-to-height ratio and associated factors in adult Turkish males. Obesity research & clinical practice 2011; 5(1): 29-35.

19. TurkStat. Turkish Statistical Institute. https://biruni.tuik.gov.tr/bitkiselapp/bitki sel.zul Accessed 05 October, 2018.

20. Cochran WG. Sampling Techniques. Third Edition, John Wiley&Sons Inc.; 1977. p. 75-76.

21. Panagiotakos DB, Pitsavos C, Chrysohoou C, Risvas G, Kontogianni MD, Zampelas A, Stefanadis C. Epidemiology of overweight and obesity in a Greek adult population: the ATTICA Study. Obesity Research 2004; 12(12): 1914-1920.

22. McLean-Meyinsse PE. Factors influencing early adoption of new food products in Louisiana and Southeast Texas. J. Food Distrib. Res 1997; 28(3): 1–10.

23. Abdel-Aty MA. Using ordered probit modeling to study the effect of ATIS on transit ridership. Transp. Res. Part C 2001; 9:265-267.

24. Chen K, Ali M, Veeman M, Unterschultz J, Le T. Relative importance rankings for pork attributes by Asian-origin consumers in California: Applying an ordered probit model to a choice-based sample. J. Agric. Appl. Econ 2002; 34: 67–79.

25. Slack T, Myers CA, Martin CK, Heymsfield SB. The geographic concentration of US adult obesity prevalence and associated social, economic, and environmental factors. Obesity 2014; 22(3): 868-874.