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Eating Pattern and Some Factors Effective on Body Mass Index in Erzurum Province of Turkey

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ABSTRACT Normal range of Body Mass Index (BMI) is highly important for a healthy and quality life. BMI has shown increase at significant rate worldwide in recent years. Within this context, a survey was administered to 400 individuals in Erzurum province in order to determine the factors affecting BMI. Regression analysis was employed in the evaluation of the data. According to the results, it was determined that BMI increased with age. In addition, the consumption of butter, bread, and chicken was found to have a significant positive affect on BMI. It was concluded that public awareness should be raised using programs in mass media for a healthy lifestyle through encouraging sports activities and clanging eating habits towards keeping BMI within normal ranges.

INTRODUCTION

Nutrition has been among the highly discussed topics today. This is because inadequate and unbalanced eating habits are the most important factors that impair people's health. When a diet does not include adequate and balanced food groups, it can contribute to deteriorating health due to a failing body resistance (Anonymous 2013). Moreover, ignorance on well balanced diets leads to elevated nutritional problems (Pekcan 2008). In this regard, obesity has become a worldwide struggled issue. Obesity is a state when BMI is above desirable levels (Baysal and Bas 2008). BMI is calculated by dividing body weight (kg) by square of body height (m). According to the classification of World Health Organization (WHO), BMI ranges are described as underweight, normal weight, overweight and obese with a BMI value less than 18.5, 18.5 to 25, 26 to 30 and over 30 respectively. Obesity is a serious risk factor for many common chronic diseases (Yancy et al. 2004; Baysal and Bas 2008; Anonymous 2013; Terzioglu 2015; Uzun 2015). It is emphasized based on World Health Organization data that obesity has almost doubled worldwide in the past 35 years (WHO 2013). Even though obesity is considered to be an increasing health problem particularly in the USA and other western countries (Baskin et al. 2005; Flegal et al. 2010). It has also been a threat for the adult population in Turkey, in recent years, only 38.7 percent of men and 26.6 percent of women have normal BMI levels (Flegal et al. 2010). If obesity is not effectively fought, life quality will decline, cost of health life, and death rates will increase (Bolzenius et al. 2015). Therefore, many people both in Turkey and around the world spend lot of efforts and money to lose or at least maintain weight (Baskin et al. 2005). Cost of obesity has reached critical levels due to both programs fighting obesity and health problems (Marra et al. 2016). Taking this issue seriously and maintaining BMI within desirable ranges is highly important in terms of efficient use of resources.

Factors such as outdoor food consumption, unbalanced eating habits, inadequate water consumption, and too little physical activity play a crucial role in the prevalence of obesity to this level (Gumus et al. 2015; Karaduman 2015). It is evident that water consumption is an important factor in fighting against obesity. Increasing the daily water consumption is said to be a good weight lost strategy (DellaValle et al. 2005; Dennis et al. 2010). Adults are expected to consume 2 liters of water a day for a healthy life (Turgay 2015; Marra et al. 2016), because increased water consumption has been found to be correlated to increased weight loss (Stookey et al. 2007).

It is reported as a result that adequate water consumption and well-balanced diet are important for a healthy life and plays an active role in helping body to fulfill its functions, and that it is, associated with weight control (Uzun 2015). Because eating habits have a direct or indirect effect on BMI, it is of vital importance to set a general profile of the population regarding food

consumption to facilitate the efforts to words fighting the obesity. For this reason, eating pattern of the adult population is attempted to describe in this study.

In the study, identification of factors having an effect on BMI is highly important in terms of fight against obesity in the future.

MATERIAL AND METHODS

Material

Primary study data were collected through one-to-one interviews with 400 consumers in Erzurum province between 2015 and 2016. Also, the general information compiled from provincial and district directorates of agriculture, internet sources, local and foreign sources, and related statistical data formed the secondary sources of the study.

Methods

The secondary data of the study were obtained from the Civil Registration and Nationality Offices in Aziziye, Palandoken and Yakutiye Districts of Erzurum Province and Turkey Statistical Institute (TUIK). In addition, published local and foreign studies on body mass index of consumers were reviewed. The sampling method and the methods used in data analysis in this study were described. Ordinary Least Squares (OLS) Method was among the analysis methods employed in the study. NLOGIT statistical software was used for the analyses.

Sampling Method

The data obtained from the Population Registry Office of Erzurum Province were used to determine the sampling frame. Sampling size was determined by Proportional Sampling Method at 95 percent confidence interval with 5 percent margin of error. In calculation of the sample size following equations were used (Newbold 1995; Sahin et al. 2008).

$$n = \frac{N^{*}p^{*}(1\text{-}p)}{(N\text{-}1)\ ^{*}\sigma^{2}_{2} + p^{*}(1\text{-}p)}$$

Where

n: denotes sample size,

N: denotes sampling frame,

σ^{2}_{p}: denotes the margin of error,

r: denotes the margin of error (5%),

$Z_{a/2}$: denotes standard z score at the confidence level considered (1.96),

P: denotes the probability of the state at which BMI > 25 (50%)

$$n = \frac{394684^{*}0.5^{*}0.5}{(394683^{*}\ 0.02552)+(0.5^{*}0.5)} = 384$$

In order to achieve maximum sample size, p was taken to be 0.5 considering the possibility of some irrelevant or inconsistent data, calculated sample size increased by 4 percent and so 400 respondents in Erzurum province were interviewed through face to face interaction technique.

The research area was divided into 3 groups so as to ensure a homogeneous distribution of the respondents to fairly well represent the research area. Sample size was proportionally distributed regarding population census data (Table 1).

Table 1: Total population and proportional distribution of the sample size in central districts of Erzurum

Districts	*Number of total population*	*Proportion (%)*
Palandoken	160	40.1
Aziziye	53	13.3
Yakutiye	187	46.6
Total	400	100.0

$\sigma_p^2 = 0.00065$

0.05
1.96

Table 1 presents the total population in central districts of Erzurum and distribution of the sample size.

Table 2 presents the proportional distribution of questionnaires based on total proportions according to the age distribution of individuals in Turkey as shown by 2013 census.

Table 2: Turkey population by gender (2013)

Age	*Total*	*Male*	*Female*	*(Survey)*
0-15	24.5	25.1	24.0	0.00
15-24	16.6	16.9	16.3	88.0
25-34	16.8	16.9	16.6	88.0
35-44	14.5	14.6	14.4	76.0
45-54	11.7	11.7	11.6	64.0
55-64	8.3	8.1	8.4	44.0
65+	7.7	6.7	8.7	40.0
Total	76 481 847	38 373 573	38 108 274	400.0

Source: TURKSTAT 2016

RESULTS

Descriptive Statistics Results

According to the distribution of gender, age and BMI values of the individuals participating in the study, BMI was found to increase as males advanced in age (Table 3). Males were determined to fall within overweight category with a BMI value of 38, and the maximum BMI was found to range between the ages of 55 and 64. BMI value was observed to decline after the age of 65. The maximum BMI value (27.9) for females was between the ages of 55-64, whereas the second highest BMI value (27.4) was determined to exist at 45-54 age range with very little difference. Women can be said to fall within slightly overweight category with a BMI value of 35.

Table 3: The distribution of gender and BMI values by age groups

Age range	*Males*	*BMI*	*Females*	*BMI*
15-24	46	23.9	42	21.9
25-34	43	25.0	45	23.7
35-44	38	25.2	38	26.1
45-54	31	27.0	33	27.4
55-64	23	27.4	24	27.9
65>	27	25.9	10	26.6
Total	208		192	

Table 4 presents the statistical summary of variables considered in the study. Income and age were taken as continuous variables and found to have average values of 3135.7 and 39.7 respectively. Schooling years of the respondents was found to be 10.2 years on average. The mean score of gender variable and its standard error were calculated to be 0.5 and 0.5 respectively. According to descriptive statistics results it was found that the respondents consume 4.4 g honey, 42.7 g cheese, 29.8 g butter, 0.8 eggs, 49.0 g red meat, 57.3 g chicken, 78.1 g yoghurt, 1.8 liters water, and 1.2 loaf of bread in daily averages.

BMI value of 25.3 in general average suggests that the respondents slightly fall within the overweight category.

Regression Analysis Results

In the study, regression analysis was employed to determine the factors affecting BMI. 13 independent variables were used and the results were presented in Table 5. The age of the

Table 5: The results of regression analysis for factors affecting body mass index

Variables	*Coefficient*	*St. Error*
Constant	19.4622***	1.24225
Income	0.0004	0.00099
Age	0.0985***	0.01512
Education	- 0.0096	0.05260
Gender	- 0.2476	0.43936
Honey consumption	0.0381	0.06290
Cheese consumption	- 0.0012	0.00712
Butter consumption	0.0165**	0.00728
Egg consumption	0.5250	0.52393
Beef and mutton	- 0.0079	0.00764
Chicken consumption	0.0088*	0.00485
Yoghurt consumption	- 0.0031	0.00366
Water consumption	- 0.0165	0.24748
Bread consumption	0.9841***	0.32126

* $p<0.1$ ** $p<0.05$ *** $p<0.01$

Table 4: The definition and statistical summary of the variables

Variables	*Definition*	*Mean*	*St. error*
Income (TRY/month)	Continuous variable	3135.7	2065.9
Age (year)	Continuous variable	39.7	15.4
Education (year)	Continuous variable	10.2	4.7
Gender	Male:1, Female:0	0.5	0.5
Honey consumption (g/day)	Continuous variable	4.4	3.1
Cheese consumption (g/day)	Continuous variable	42.7	30.1
Butter consumption (g/day)	Continuous variable	29.8	29.5
Egg consumption (unit/day)	Continuous variable	0.8	0.4
Read meat consumption (g/day)	Continuous variable	49.0	29.7
Chicken consumption (g/day)	Continuous variable	57.3	45.6
Yoghurt consumption (g/day)	Continuous variable	78.1	54.7
Water consumption (l/day)	Continuous variable	1.8	0.8
Bread consumption (loaf/day)	Continuous variable	1.9	0.6
BMI	Continuous variable	25.3	4.1

Source: Original calculations

participants was found to be an important factor effective on BMI. BMI was observed to increase with age. Slowing metabolism and less activity may bring about such an outcome. Bread, butter and chicken were determined to have positive significant effects ($p<0.01$; $p<0.05$; $p<0.1$ respectively). On the other hand, chicken consumption was found to be significant at 10 percent significance level and also increase BMI. The high consumption of chicken in the research area (Topcu et al. 2015) can be said to be effective in creating such an outcome. Daily bread consumption was also observed to increase BMI and be statistically significant at 1 percent significance level. Water consumption, particularly emphasized in the study, was determined to have a negative but insignificant.

DISCUSSION

Nutrition is among the leading discussed topics given particular emphasis nowadays. Inadequate and unbalanced eating habit is one of the most important factors that impair human health (Terzioglu 2015). Overweight and obesity, which mean BMI is over reasonable limits, are the risk factors for many common chronic diseases (Karaduman 2015). The prevalence of obesity is increasing in both developed and developing countries day by (Terzioglu 2015; Wang et al. 2015). Changing the eating habits of people is a fundamental issue to fight obesity (Wang et al. 2015). Many people around the world spend efforts and money to maintain BMI at 25.0 – 29.9 range to achieve and sustain a healthy and comfortable life.

In this respect, knowledge on the factors affecting BMI is of significant importance. Analysis of the data revealed that the age of the individuals was the most important factor increasing BMI. The BMI of the individuals with on average age of 38.2 was determined to be 28.2 (Wang et al. 2015). Age factor was already stated to account for increase in obesity (Cawley et al. 2015).

Another finding of the study drawing attention was that BMI increased with increased butter consumption. The relatively high energy content of butter can be responsible for such an outcome. On the other hand, chicken consumption was also found to be a factor increasing BMI. The amount of chicken consumption is quiet high in the research area. Even though its energy content is low when compared to beef and mutton, form of consumption may cause an increase in BMI. The common form of chicken consumption in the area is frying, which can be an important factor affecting obesity (Topcu et al. 2015). Since bread consumption is another a high-ranking factor increasing BMI due to its high carbohydrate content, it should be restricted in nutrition programs (Olmez and Aydin 2015).

CONCLUSION

As it has been an increasingly recognized fact BMI should be within normal ranges for a healthy and quality life. Parallel to the previous study reports BMI increased as the age of individuals increased. Though the young consume more energy foods, their higher metabolism may prevent them to gain more BMI. The next notable issue was that the consumption of bread, butter and chicken was among the factors contributing to BMI increase as well. Water consumption, on the other hand, was found to affect BMI negatively, but a statistically insignificant factor.

RECOMMENDATIONS

According to the findings obtained from the study, it is necessary that public awareness should be raised to maintain BMI within normal ranges as the age increases and diet programs feasible for age groups should be created. In addition, sports activities should be promoted to increase the rate of metabolism at higher age. Awareness raising activities should be organized through mass media diet programs feasible for all age groups to reduce the consumption of bread, butter and chicken. They should be properly planned and promoted.

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