Original Article

Universıty Employees' Healthy Lifestyle Behaviors And Fastıng Blood Glucose

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Abstract

Background: *Adopting healthy lifestyle behaviors is an important step in preventing diseases.* ***Objective:*** This study aims to determine healthy lifestyle behaviors, fasting blood glucose (FBG) levels, and waist circumference of employees in a public university in Turkiye. ***Methods:*** This descriptive study was conducted. A total of 191 academic and administrative staff were recruited for this study.We used sociodemographic data form and the Health-Promoting Lifestyle Profile II (HPLP II) for data collection. We measured and recorded each participant's FBG (at least 8 hours), height, weight, and waist circumference in the data sheet. ***Results:*** Of the participants, 77% were aged under 40; 74.9% were male; 71.2% were administrative staff; 48.2% had FBG between 100-125 mg/dl.; 49.2% were within the normal BMI (Body Mass Index) range; 29.2% of women had a waist circumference greater than 90 cm, 25.2% of men had a waist circumference greater than 100 cm. The average HPLP II score of the participants was 128.67±18.51. ***Conclusion:***It was determined that healthy lifestyle behaviors did not change according to age, that 48.2% of the participants had FBG between 100-125 mg/dl and were not aware of their blood glucose levels, that half of the participants were overweight and obese, and that waist circumference and FBG increased as BMI increased. The incidence of diabetes might be higher than predicted in guidelines in near future.

Keywords: Diabetes incidence, fasting blood glucose, healthy lifestyle behaviors, Turkiye

International Journal of Human and Health Sciences Vol. 06 No. 04 October'22 Page : 383-392
DOI: http://dx.doi.org/10.31344/ijhhs.v6i4.477

Introductıon

Today, a significant part of the world is struggling with hunger and thirst, on the other hand, the rest is struggling with serious health problems such as diabetes, heart diseases, and some types of cancer due to excess weight or obesity.[1]

In the developing world, the biggest challenge against health is considered poverty. Approximately 1.2 billion people have to live on less than a dollar a day. This does not allow people to fulfill even their physiological needs and also leads to malnutrition and unhealthy living conditions, making it difficult to remain healthy. On the other hand, the World Health Organization (WHO) announced that 39.0% of individuals aged over 18 were overweight and that 13.0% were obese in 2016.[1] Annually, more than four million people die from diseases caused by excess weight and obesity.[1] The sustainability of healthy life is under multifactorial risks causes the preparation of action plans on a global scale. The world is facing problems that are completely opposite in origin but widely make the masses unhealthy as a result. Identifying and fighting against these problems will lead to better health. Although actions that can be taken for unhealthy lifestyle behaviors due to out-of-control reasons such as poverty are

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limited, it is necessary to determine the situations caused by overnutrition or malnutrition and plan the fighting options.

Unhealthy living conditions are not limited to poverty and obesity. Conditions such as smoking, a sedentary lifestyle, and excessive use of alcohol are also among the causes.[2,3] The relationship between lifestyle and diseases has been scientifically evidenced.[4] It is known that smoking frequently causes cardiovascular diseases, especially respiratory diseases; lack of exercise/sedentary lifestyle and carbohydrate-rich diet cause obesity; obesity causes many systemic diseases, especially endocrine and cardiovascular diseases.[1,3] The reasons can be listed, even more, and make the fight against unhealthy living behaviors important. The WHO has recently shared the best health checks under 11 headings.[5] These are blood pressure monitoring, blood glucose test, body mass index, bone density screening, breast cancer early detection, colon cancer early detection, dental check-up, lipid profile check, screening for cervical cancer, skin examination, visual and hearing impairment check. The WHO presented these topics for improving women's health, but, except a few, it is possible to generalize these health checks to all genders.

A very large share of the main budget of countries is allocated for health expenditures. A significant part of this share is used in secondary healthcare services. Protecting health and raising awareness of society is much less costly than the treatment of a disease. For this reason, early diagnosis of diseases will facilitate the fight against an unhealthy life. Currently, countries are facing difficulties due to the COVID-19 virus, which is now declared a pandemic. This pandemic demonstrates once again the importance of protective measures. Briefly, adopting healthy lifestyle behaviors is an important step in preventing diseases.

This study aimed to create social awareness by determining the lifestyle behaviors of individuals, and provide early diagnosis.

Methods

This study was conducted as a descriptive study to determine healthy lifestyle behaviors, FBG levels, and waist circumference of academic and administrative staff working at a state university in Turkiye. The universe of the research is consisted of 625 people. The total number of academic and administirative was 625. The sample size was calculated by using the G Power Software (version 3.1.7). In this calculation, the sample size was determined as 235 individuals under α-value of 0.05 and β-value of 0.20 analysis conditions. However, the country-wide lockdown and flexible working hours due to the COVİD-19 pandemic prevented us from reaching the participants. Therefore, we decided to perform power analysis with the obtained data. 196 people were reached in the study. However, since 5 participants filled in the questionnaires incompletely, the data of 191 people were evaluated. Effect size was defined as 0.65 and study power was defined as 98% in post hoc power analysis by using the G Power Software (version 3.1.7). The data collection process was ended due to reaching sufficent power. Participants were included in the study by simple random sampling method.

Inclusion criteria:

1) Being fasting for eight hours;
2) Participate in the study voluntarily;
3) Not to have hearing, understanding, and speaking problems; and
4) Allowing standing height, weight and waist circumference measurement.

Exclusion criteria:

1) Participant who are known diabetic patients; and
2) Having any disease that might affect blood sugar level.

We used sociodemographic data form and The HPLP II for data collection. Data collection continued from September 2019 to September 2020.The participant information form is consisted of 12 statements exploring the participant' sociodemographic characteristics (age, sex, staff), use cigarette, fasting blood glucose, measurement of weight-height and waist circumferences and about the symptoms of diabetes.The HPLP II was developed in 1996 by Walker and Hill-Polerecky[6]. The validity and reliability study of the HPLP II scale was conducted by Pinar, Celik, &Bahcecik[7]. The HPLP II scale, is a 4-point Likert-type scale with 52 items and includes 'never', 'sometimes', 'often' and 'regularly'. The scale consists of six sub-dimension under the headings of 'health responsibility (9 item)', 'physical activity (8 item)', 'nutrition (9 item)', 'spiritual development (9 item)', 'interpersonal relationships (9 item)' and

'stress management (8 item)'. Cronbach's α value of HPLP II was found to be 0.91 in this study.

Peripheral (excluding thumb and index finger) blood glucose was measured to determine FBG. At least 8 hours of fasting (before eating the first meal of the day) was stipulated for blood glucose measurement.[8] Practice days were notified to all units within our university via the electronic information system. The day before practice, all directorates were reminded as written and verbal. Three-person teams (at least one nurse or doctor in each group was be a team leader) were sent to at 8 am the units where the practice would be performed. These teams measured and recorded each participant's height, weight, waist circumference and FBG during the application. In order to avoid any difference in the measurements, the same brand scale, tape measure and blood glucose meter were used. The blood glucose meters were calibrated. Capillary blood sample was used to determine fasting blood glucose. The waist circumference of the participants was measured at the level of the superior iliac crystals.[9]

The International Diabetes Federation (IDF) recommended the use of population-specific waist circumference cut-off points in the definition of central obesity.[10] Therefore, in our study, values of "<90" for women and "<100" for men were used as the cut-off point for waist circumference.[11] Body Mass Index was calculated by division of the height value to square of weight value (kg/m^2) using standardised protocols.[1] Fasting blood glucose results were evaluated according to cut-off points of 100-125 mg/dl, and ≥126 mg/dl.[8] Fasting wasdefined as no caloric intake for at least 8 hours.

The IBM SPSS 22.0 statistics package program (IBM Corporation, Armonk, New York) was used for data evaluation. Descriptive statistics (sociodemographic characteristics) were presented as frequency and percentage. Chi-square test was used to evaluate the difference in terms of descriptive variables. Normal distribution of the data was tested by Shapiro-Wilk test. The independent-samples t-test and analysis of variancewere used to compare the two groups. A *p*-value of <0.05 was accepted as statistically significant in this study.

Results

Of the participants, 77% were aged under 40; 74.9% were male; 71.2% were administrative staff; 48.2% were pre-diabetic; 49.2% were within the normal BMI range; 4% were diagnosed with any chronic disease; 55% were smokers; 48.2% had a family history of diabetes mellitus (Table 1).

The HPLPII scale overall and subscales score means of the participants was found as following overall the HPLP II 128.67±18.51, health responsibility 19.56±3.66, spiritual growth 26.69±4.34, physical activity 17.67±4.10, interpersonal relations 25.47±4.03, nutrition 20.64±3.79, stress management 18.61±3.52. Participants' responses to the HPLPII subscales resulted in the highest mean score on spiritual growth and the lowest mean score on physical activity.

Table 2 presents the comparison of participants' characteristics with the total HPLP II score and subscale scores. A statistically significant difference was found between gender and total HPLP-II score, physical activity, and nutrition subscale scores. The score averages of female participants were higher than male participants (Table 2).There was a statistically significant difference between the staff position in the institution and total HPLP-II score average and health responsibility, physical activity, interpersonal relationships, spiritual growth, and stress management subscales. The average score of the participants working in the academic staff was higher than the participants working in the administrative staff (Table 2).

A statistically significant difference was found between BMI and total HPLP-II score average and physical activity, spiritual growth, and interpersonal relationships subscales. The average score of the participants in the normal BMI range was higher than the obese participants (Table 2).

There was a statistically significant difference between the waist circumference of the female participants and the total HPLP-II score average and health responsibility, physical activity, spiritual growth, and interpersonal relationships subscales. Participants with a waist circumference of less than 90 cm had a higher average score than participants with a waist circumference greater than 90 cm (Table 2).

A statistically significant difference was found between the waist circumference of male participants and the nutrition subscale. Participants with a waist circumference greater than 100 cm had a higher average score than participants with a waist circumference of less than 100 cm (Table 2).

There was a statistically significant difference

between the diagnosis of chronic disease and total HPLP-II score average and health responsibility, physical activity, nutrition, and stress management subscales. The average score of those diagnosed with chronic disease was found to be higher than those who did not (Table 2).

The distribution of BMI and waist circumference values of the participants according to fasting capillary blood glucose levels is presented in Table 3. It was determined that the FBG value increased as the BMI and waist circumference of the participants increased and there was a statistically significant difference between them.

Discussion

In this study, 48.2% of the participants had FBG between 100-125 mg/dl; 5.2% had FBG above 126 mg/dl; 29.2% of women had a waist circumference greater than 90 cm; 25.2% of men had a waist circumference greater than 100 cm. The average HPLP II score of the participants was 128.67 ± 18.51.

Currently, there is no effective and reliable method to prevent Type I diabetes according to evidence-based medical data. However, this is not valid for Type II diabetes. In Type II diabetes, the blood glucose level can be altered and managed with good control. However, it is more important to prevent healthy individuals and prediabetics from being diagnosed with type 2 diabetes. The most realistic intervention for this is the adoption of healthy lifestyle behaviors.

Approximately 422 million people worldwide are diabetic. It was reported that 6,592,400 adults in Türkiye have diabetes and that this represents approximately 12.0% of the adult population. In our study, 48.2% of the participants had FBG between 100-125 mg/dl. They were not aware be high of their blood glucose levels. Those who have high FBG were referred to the hospital for definitive testing, using venous plasma glucose. This group was a small group, but blood glucose levels were in this range in nearly half of the participants. This result was surprising for our. This suggests that the prevalence of diabetes will be much higher than those predicted in the guidelines for the coming years.[3,8]

There is a close relationship between obesity and diabetes, which are involved in the etiology of the majority of chronic diseases.[12]Obesity increases blood glucose levels, worsens diabetes by increasing insulin resistance. In this study, 49.2% of the participants had BMI within the normal range whereas 40.8% were overweight and 9.9% were obese. According to WHO, a waist circumference of 88 cm or above in women and 102 cm or above in men indicates the presence of central obesity.[1]The IDF, on the other hand, recommends using population-specific waist circumference cut-off points for central obesity.[10]The recommendation is ≥ 94 cm in men and ≥ 80 cm in non-pregnant women in Türkiye and European countries. However, The Society of Endocrinology and Metabolism of Türkiye suggests the use of cut-off points, ≥100 cm in men and ≥90 cm in women, for central obesity for the Turkish population based on the results of large-scale studies conducted in the Turkish population.[3]Therefore, in this study, the waist circumference cut-off valuesrecommended byThe Society of Endocrinology and Metabolism of Türkiyewere used and its relationship with the variables was examined. In the study, those with a waist circumference <90 (in women) and <100 (in men) had BMI and FBG levels in the normal range and FBG levels increased as BMI and waist circumference increased.

The closest partner of diabetes and obesity is doubtlessly cardiovascular diseases. Today, cardiovascular diseases are the most important cause of morbidity and mortality in diabetic individuals.[13,14]However, this is not limited to cardiovascular diseases. Many major diseases such as cancers and kidney diseases develop due to these reasons.[15,16]The most effective and comprehensive way to fight against these macro-level problems is through healthy lifestyle behaviors. Previous studies reported that the prevalence of Type 2 diabetes can be reduced by approximately 50.0% by adopting healthy lifestyle behaviors in individuals in the prediabetic stage.[17,18]Behaviors such as physical activity, healthy nutrition, regular sleep, not using excessive alcohol, and nonsmoking are among the healthy lifestyle behaviors.

In this study, the HPLP II, which questions healthy life behaviors, was applied to the participants. The total average score of the HPLP II was 128.67 ± 18.51 and the highest scores were recorded in spiritual growth (26.69 ± 4.34) and the lowest scores were in recorded physical activity (17.67 ± 4.10).When the average the HPLP II subscale scores were examined, it was found that the

subscale with the highest score changes whereas the physical activity subscale was the one with the lowest average in almost all studies.[19,20] Likewise, in this study, the lowest average was determined in the physical activity subscale. In a study examining the relationship between a healthy lifestyle and chronic disease-free life expectancy, participants were monitored for long-term in terms of physical activity, nutrition, alcohol use, and smoking.[21] As a result of the study, it was determined that those who adopted a healthy lifestyle in their mid-life (30-35 years old) lived longer and free from chronic diseases in the coming years. However, it was reported that the difference widens and the setting worsens in obese smokers and those who continue to be inactive.[22] A multicohort study conducted with adults from 21 European countries reported that physical activity (5 days a week) was the most preventative health behavior and reduced the probability of obesity by 42%.[23] Physical activity requires energy expenditure above the basal level. Even activities at this level repair the body, exercise, which is defined as planned structured movements performed at a certain intensity, facilitates coping with obesity.[24] In this study, it was determined that the waist circumference and body mass index of those who performed insufficient physical activity were higher and that there was a statistically significant relationship between them. It is seen that this result is consistent with the literature.

Getting a high score on the HPLP II is considered to have good healthy lifestyle behaviors. However, according to the studies conducted using this scale, it is not possible to generalize the average scale score as good or bad according to variables such as the presence of chronic disease, age, and employment. In some studies conducted with healthy individuals, the HPLP II score average was lower than those with chronic diseases and in some studies, it was higher.[25,26] Besides, in some studies, the score was higher in young people whereas, in others, it was higher in elderly individuals.[20,27] In this study, the average scale score was moderate and it was found that the scale score and almost all subscale scores of those with chronic disease and were lower and there was a significant relationship between them. In addition, young people have insufficient healthy lifestyle behaviors, as well. This indicates that the setting of chronic diseases will get worse in the future. In this study, no significant relationship was found between age and total scale-subscale scores. This result supports the above studies, indicating that young individuals adopt unhealthy lifestyle behaviors.

Studies clearly reveal the problem and its treatment. Modern life causes less activity, a carbohydrate-rich diet, and consumption of unhealthy products and these should be avoided.[2,28] Adopting a healthy life will be the key to combating obesity and the related diseases.[29] In an article about the healthy lifestyle, it was stated that a healthy lifestyle is a preference rather than destiny and that it can be a mandatory destination depending on the effects of factors such as genetics, experiences, and nutrition.[30] The author argued that the statement, "The bigger the supermarkets, the bigger the waist circumference will be and we have organized ourselves for extremism" does not match the perception of both staying healthy and being involved in the shopping outbreak. Do you think the author is wrong? In our opinion, this criticism, which is a brief summary of the chaotic condition we are in, is an important reason for the inadequacy of the fight against diabetes, which has become a pandemic. While a part of the world is struggling with hunger, healthy lifestyle behaviors must be adopted before our bodies turn into an organic waste bin by accumulating excess food.

Limitations

In this study, which was conducted to determine healthy lifestyle behaviors, fasting blood glucose levels, and waist circumference of employees in a public university,at least 8 hours of fasting of person and include only academic and administrative staff are the limitations of the research.

Conclusıon

In conclusion, in this study, it was determined that healthy lifestyle behaviors did not change according to age, that 48.2% of the participants were prediabetic based on their fasting blood glucose, that 5.2% were in the obvious diabetes range and were not aware of their blood glucose levels, that half of the participants were overweight and obese, and that waist circumference and incidence of prediabetes and diabetes increased as BMI increased.

Conflict of ınterest: The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding statement: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Ethical Clearance: For the research, the ethics permission numbered 2019/5-3 was obtained from the Ethics Committee of Batman University in Türkiye, and written permissions were obtained from the institution where the study was done (decision numbered: 22.05.2019-9978). Additionally, verbal and written consent of all the participating were also obtained. Authors declare that the procedures were followed according to the regulations established by the research.

Authors' contribution:NEE: Conceptualization, methodology, data collection, data analysis, supervision, literature review, writing - original draft, writing - review & editing; SA, SE,SC, EC, ZAD, RI:

Table 1: Sociodemographic characteristics of the participants (N=191)

Characteristics	n	%
Age		
< 40 age	147	77.0
40 age and over	44	23.0
Sex		
Female	48	25.1
Male	143	74.9
Staff status		
Academic	55	28.8
Administrative	136	71.2
FBG (≥8 hours fasting)		
<100- 60 mg/dl	89	46.6
100-125 mg/dl	92	48.2
126 mg/dl and over	10	5.2
BMI		
Low (under 18.49)	0	0.0
Normal (18.50-24.99)	94	49.2
High (25.00-29.99)	78	40.8
Obese (over 30.00)	19	9.9
Waist circumference		
Female		
< 90 cm	34	70.8
90 cm and over	14	29.2
Male		
<100 cm	107	74.8
100 cm and over	36	25.2
Chronic disease diagnosis receiving status		
Yes	4	2.1
No	187	97.9
Cigarette smoking status		
Yes	86	45.0
No	105	55.0
How many years have you been smoking?		
0-5 year	11	12.8
6-10 year	11	12.8
11-15 year	31	36.0
16-20 year	15	17.5
21 year and over	16	20.9
Family history of diabetes		
Yes	92	48.2
No	99	51.8

Characteristics	n	%
Who has a family history of diabetes mellitus		
Mother	38	42.2
Father	24	26.7
Sibling	4	5.6
Kin	23	25.6
State of frequent urinary		
Yes	15	7.9
No	176	92.1
State of frequent drinking of water		
Yes	45	23.6
No	146	76.4
State of frequent hunger		
Yes	16	8.4
No	175	91.6

Table 2: Comparison of participants' characteristics and the HPLP-II score averages (N=191)

Characteristics	Health responsibility (M ± SD)	Physical activity (M ± SD)	Nutrition (M ± SD)	Interpersonal relations (M ± SD)	Spiritual development (M ± SD)	Stress management (M ± SD)	Total (M ± SD)
Age							
under age 40	19.67 ± 3.77	17.89 ± 4.13	20.72 ± 4.09	25. 64 ± 4.09	26.95 ± 4.49	18.57 ± 3.66	129.46 ±19.75
over age 41	19.19 ± 3.25	16.95 ± 3.94	20.38 ± 2.56	24.09 ± 3.81	25.84 ± 3.68	18.77 ± 3.05	126.04 ±13.44
p*	t= 0.76 p= 0.41	t= 1.13 p= 0.18	t= 0.56 p= 0.62	t= 1.06 p= 0.28	t= 1.66 p= 0.10	t= 0.34 p= 0.72	t= 1.37 p= 0.19
Sex							
Female	20.08 ± 3.48	18.68 ± 3.64	21.91 ± 3.35	25.85 ± 4.23	27.52 ± 4.92	19.25 ± 3.89	133.31 ± 19.01
Male	19.38 ± 3.71	17.33 ± 4.20	20.22 ± 3.84	25.34 ± 4.23	26.41 ± 4.10	18.40 ± 3.37	127.11 ± 18.95
p*	t= 1.12 p= 0.25	**t= 1.93 p= 0.03**	**t= 2.71 p=0.01**	t= 0.74 p= 0.45	t= 1.52 p= 0.12	t= 1.34 p= 0.15	**t= 2.02 p= 0.04**
Staff status							
Academic	20.96 ± 3.94	19.52 ± 4.47	21.30 ± 3.58	26. 49 ± 4.30	29. 20 ± 3.80	19.49 ± 3.12	136.98 ±17.51
Administrative	18.99 ± 3.39	16.92 ± 3.70	20.38 ± 3.85	25.06 ± 3.85	25.68 ± 4.13	18.26 ± 3.62	125.31 ± 17.89
p*	**t= 3.46 p= 0.01**	**t= 4.13 p= 0.01**	t= 1.46 p= 0.12	**t= 2.23 p= 0.02**	**t= 5.43 p= 0.01**	**t= 2.34 p= 0.02**	**t= 4.17 p= 0.01**
FBG (≥8 hours fasting)							
Normal (<100- 60 mg/dl)	19.20 ± 3.37	17.50 ± 3.86	20.06 ± 3.53	25.23 ± 4.02	26.04 ± 4.05	18.20 ± 3.59	126.61 ± 17.95
Pre-diabetic (100-125 mg/dl)	19.81 ± 3.86	19.89 ± 4.47	21.19 ± 4.11	25.63 ± 4.12	27.05 ± 4.72	18.95 ± 3.57	130.54 ±19.45
Diabetes (126 mg/dl and over)	20.40 ± 4.19	17.20 ± 2.44	20.80 ± 1.54	26.20 ± 3.35	26.00 ± 2.82	19.20 ± 1.81	129.80 ± 13.38
p	F= 0.91 p= 0.40	F= 0.26 p= 0.76	F= 2.03 p=0.13	F= 0.38 p= 0.68	F= 0.64 p= 0.52	F= 1.18 p= 0.30	F= 1.03 p= 0.35
BMI							
Normal (18.50-24.99)	19.88 ± 3.58	18.36 ± 3.70	20.69 ± 3.86	26.44 ± 4.27	27.51 ± 4.35	18.93 ± 3.62	104.31 ± 15.10
High (25.00-29.99)	19.57 ± 3.67	17.47 ± 4.45	20.43 ± 4.01	24.62 ± 3.47	26.14 ± 4.28	18.50 ± 3.54	100.61 ± 15.40
Obese(over 30.00)	17.89 ± 3.72	15.10 ± 3.44	21.31 ± 2.26	25.47 ± 4.03	24.94 ± 3.77	18.61 ± 3.52	96.00 ± 11.64

Characteristics	**Health responsibility** (M ± SD)	**Physical activity** (M ± SD)	**Nutrition** (M ± SD)	**Interpersonal relations** (M ± SD)	**Spiritual development** (M ± SD)	**Stress management** (M ± SD)	**Total** (M ± SD)
p**	F= 2.36 p= 0.09	**F= 5.37 p= 0.05**	F= .42 p= 0.65	**F= 5.73 p= 0.04**	**F= 3.95 p= 0.02**	F= 1.34 p= 0.26	**F= 3.01 p= 0.05**
Waist circumference female under 90 cm 90 cm and over	 20.94± 3.67 18.00 ± 1.75	 19.85 ± 3.54 15.85 ± 2.03	 22.82 ± 3.27 19.91 ± 2.46	 26.97 ± 4.41 23.14± 2.03	 28.26 ± 4.91 25.71± 4.59	 19.97 ± 3.97 18.00 ± 3.50	 138.61 ± 19.76 120.41± 9.34
p*	**t= 2.85 p= 0.01**	**t= 4.96 p= 0.01**	**t= 3.59 p=0.01**	**t= 4.01 p= 0.01**	**t= 1.71 p= 0.09**	t= 1.52 p= 0.13	**t= 4.33 p= 0.01**
Waist circumference male < 100 cm 100 cm and over	 19.30 ± 3.53 19.61 ± 4.23	 17.57 ± 4.27 16.63 ± 3.95	 19.74 ± 3.61 21.63 ± 4.61	 25.46 ± 3.82 25.00± 4.39	 26.28 ± 4.19 26.80 ± 2.88	 18.23 ± 3.37 18.91 ± 3.32	 126.61 ± 17.79 128.61± 19.21
p*	t= .422 p= 0.64	t= 1.15 p= 0.23	**t= 2.41 p=0.01**	t= .57 p= 0.50	t= 0.65 p= 0.51	t= 1.05 p= 0.29	t= .57 p= 0.68
Chronic disease diagnosis receiving status Yes No	 17.50 ± 0.57 19.60 ± 3.68	 13.52 ± 1.73 17.76 ± 4.09	 21.50 ± 0.58 20.63 ± 3.83	 24. 00 ± 2.30 25.50 ± 4.05	 22. 50 ± 0.50 26.78 ± 4.34	 15.50 ± 0.57 18.26 ± 3.53	 114.50 ± 0.57 128.97 ± 18.59
p*	**t= -5.32 p= 0.01**	**t= -4.65 p= 0.01**	**t= 2.16 p=0.05**	t= 1.23 p= 0.28	**t= 1.96 p= 0.05**	**t= 8.22 p= 0.01**	**t= 10.17 p=0.01**
Cigarette smoking status Yes No	 18.90 ± 3.77 20.09 ± 3.49	 17.03 ± 3.98 18.20 ± 4.14	 20.82 ± 4.14 20.50 ± 3.50	 25. 50 ± 3.74 25.50 ± 4.26	 26. 44 ± 3.74 26.90 ± 4.78	 18.11 ± 3.37 19.02 ± 3.65	 126.76 ± 17.47 130.23 ± 19.26
p*	**t= 2.32 p= 0.02**	**t= 1.97 p= 0.05**	t= 0.57 p=0.91	t= 1.73 p= 0.98	t= 0.73 p= 0.46	t= 1.82 p= 0.07	t= 1.30 p= 0.19
Family history of diabetes Yes No	 19.49 ± 3.83 19.62 ± 3.50	 17.12 ± 4.09 18.19 ± 4.06	 20.68 ± 3.86 20.61 ± 3.74	 25. 44 ± 4.07 25.51 ± 4.00	 26. 33 ± 4.48 27.04 ± 4.19	 18.29 ± 3.56 18.92 ± 3.47	 127.37 ± 20.12 129.90 ± 16.85
p*	t= 0.242 p= 0.81	t= 1.80 p= 0.07	t= .138 p=0.91	t= 1.73 p= 0.89	t= 1.12 p= 0.26	t= 1.25 p= 0.21	t= 0.83 p= 0.40

* The independent-samples t-test was done.

** Variance analysis was done.

M ± SD, mean plus/minus standard deviation.

Table 3:Distribution of BMI and waist circumference measurements of participants according to FBGlevels (N=191)

FBG (fasting for eight hours)	BMI	Waist circumference (Female)				Waist circumference (Male)			
		Under 90 cm		90 cm and over		Under 100 cm		100 cm and over	
		n	%	n	%	n	%	n	%
Normal (<100-60 mg/dl)	Normal (18.50-24.99)	43	84.3	8	15.7	51	100.0	0	0.0
	High (25.00-29.99)	11	33.3	22	66.7	28	84.8	5	15.2
	Obese (over 30.00)	0	0.0	5	100.0	2	40.0	3	60.0
*p**		**< 0.001**				**< 0.001**			
Pre-diabetic (100-125 mg/dl)	Normal (18.50-24.99)	32	80.0	8	20.0	38	95.0	2	5.0
	High (25.00-29.99)	9	21.4	33	78.6	27	64.3	15	35.7
	Obese (over 30.00)	0	0.0	10	100.0	0	0.0	10	100.0
*p**		**< 0.001**				**< 0.001**			
Diabetes (126 mg/dl and over)	Normal (18.50-24.99)	1	33.3	2	66.7	3	100.0	0	0.0
	High (25.00-29.99)	0	0.0	3	100.0	0	0.0	3	100.0
	Obese (over 30.00)	0	0.0	4	100.0	2	50.0	2	50.0
*p**		> 0.274				>0.279			

* The chi-square test was done.

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