Original Article

Nutritional Health in Premenopausal Women: A Cross-Sectional Study from Turkey

Selin Akturk Esen, İrfan Esen[1], Yusuf Açikgöz

Department of Medical Oncology, Ankara City Hospital, Ankara, Turkey, [1]Department of Internal Medicine, Yıldırım Beyazıt University Yenimahalle Education and Research Hospital, Ankara, Turkey

Abstract

Background: The aim of this study was to evaluate the nutritional habits of premenopausal women using the Food Consumption Frequency Questionnaire (FCFQ) and to evaluate the relationship between anthropometric measurements, lipid parameters, and the presence of anemia with the findings obtained. **Methods:** This study was carried out in the internal medicine outpatient clinics of the Health Sciences University Bursa Yüksek İhtisas Training Research Hospital (located in Yıldırım districts) and Gürsu State Hospital (located in Gürsu districts) of Bursa province between 1 June–31 August 2019. We used clustered sampling in patient selection. One hundred seventy-one premenopausal participants aged between 18 and 55 who were known to be healthy and who came for routine control to the internal medicine outpatient clinics were included in the study. The FCFQ was used to determine how often the participants consumed different food groups in the last 1 month. **Results:** Overweight participants were 29.20% and 17% were obese. 43.90% of the women had anemia and 65.50% of the women had iron deficiency. The milk-dairy products nutrition score of the group with triglycerides (TG) <150 mg/dL was higher than the group with TG ≥150 mg/dL (P = 0.029). The meat-egg-legumes nutrition score (2.11 ± 0.57) of the group with high density lipoprotein (HDL) ≥50 mg/dL was higher than the group with HDL <50 mg/dL (1.91 ± 0.58) (P = 0.04). **Conclusions:** Anemia and obesity are high in premenopausal women. Community-based screening programs are needed to evaluate premenopausal women for anemia and obesity. Scales to assess the nutritional habits of the population are also needed in screening programs.

Keywords: *Anemia, eating habits, lipid profile, obesity, premenopausal women*

Introduction

All over the world and in Turkey, disability and deaths occur due to diet-related diseases.[1] In various studies, mortality rates related to diet-related diseases were found to be 31% for cardiovascular diseases, 13% for cancer, 3% for gastrointestinal system diseases, and 2% for diabetes.[2] Type 2 diabetes, cerebrovascular diseases, cardiovascular diseases, and various types of cancer (breast, colon, endometrium, kidney, esophagus, and pancreatic cancer) are more frequent especially in individuals with high body mass index (BMI).[3] Therefore, it is very important to evaluate the daily eating habits of society. Food Consumption Frequency Questionnaires (FCFQ) are used in epidemiological studies to evaluate the eating habits of individuals.[4]

The prevalence of obesity in women is 20% worldwide.[5] Studies examining the relationship between obesity and nutritional habits show that over-consumption of foods with high-energy density such as confectionery products, beverages, and fast food increased the risk of obesity, and that fiber food intake, increased eating frequency, and consumption of foods with low glycemic index decreased this risk.[6,7] Anemia is another important problem in the world. The World Health Organization describes anemia as a public health problem in countries with an anemia prevalence of more than 40%.[8] Anemia is more common in women than men, and the WHO has reported an anemia prevalence of 21%–80% in women worldwide.[9,10]

The aim of this study was to evaluate the nutritional habits of premenopausal women using the FCFQ and to evaluate the relationship between anthropometric measurements, lipid parameters, and the presence of anemia with the findings obtained.

Address for correspondence:
Dr. Selin Aktürk Esen, Department of Medical Oncology, Ankara City Hospital, Ankara, Turkey.
E-mail:drselin16@hotmail.com

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Methods

This study was carried out in the internal medicine outpatient clinics of the Health Sciences University Bursa Yüksek İhtisas Training Research Hospital (located in Yıldırım districts) and Gürsu State Hospital (located in Gürsu districts) of Bursa province between 1 June and 31 August 2019. We used clustered sampling in patient selection. Population size (for finite population correction factor) (*N*) was 500. Hypothesized % frequency of outcome factor in the population (*P*) was 45% +/−6. Confidence limit as % of 100 (absolute +/−6%) (d) was 6%. Design effect (for cluster surveys-DEFF) was 1. We calculated sample size of the study as in this formula: sample size $n = [DEFF \times Np(1-p)]/[(d^2/Z^2_{1-\alpha/2} \times (N-1) + p \times (1-p)]$. The sample size was determined to be 174 at the end of the calculation. One hundred seventy-one premenopausal participants aged between 18 and 55 who were known to be healthy and who came for routine control to the internal medicine outpatient clinics were included in the study. Patients with a chronic disease (diabetes mellitus, hypertension, cerebrovascular disease, cardiovascular disease, hematological disease), using any drugs, smokers, and those with follow-up in gynecology clinics due to menorrhagia or metrorrhagia were excluded from the study. Written consent was obtained from all participants. Our study was approved by the Health Sciences University Bursa Yüksek İhtisas Training and Research Hospital Ethics Committee with the decision number 2011-KAEK-25 2019/10-07. Bodyweight was measured using an electronic scale and height was measured using a flexible plastic tape measure. BMI was calculated using the equation, body weight (kg)/height^2 (m). BMI: <18.5 kg/m^2 was defined as low weight, BMI: ≥18.5–<24.9 kg/m^2 was defined as normal, BMI: ≥25.0–<29.9 kg/m^2 was defined as overweight and BMI: ≥30.0 kg/m^2 was defined as obese.[11] Waist circumference was measured with a nonstretching tape measure so that it would pass over both iliac crests in the horizontal plane and the data were given in centimeter. A waist circumference of ≥88 cm in women indicates a high cardiovascular risk.[12] Waist circumference ≥80–88 cm is considered an increased cardiovascular risk.[13,14] Hip circumference was measured with a nonstretching tape measure at the widest point of the hips and the data obtained were given in centimeter. Waist-to-hip ratio was calculated as the ratio of waist circumference to hip circumference. A waist-to-hip ratio ≥0.85 indicates an increased risk of metabolic complications.[15] Waist-to-height ratio was calculated as the ratio of waist circumference to height. A waist-to-height ratio ≥0.50 indicates an increased risk of metabolic complications.[16]

The Food Consumption Frequency Questionnaire was used to determine how often the participants consumed different food groups in the last 1 month. The FCFQ was prepared based on the Turkey Nutrition and Health Research-2010.[17] The FCFQ consists of five main headings: milk-dairy products, meat-egg-legumes, vegetables-fruits, bread-cereals, and fat-sugar-sweet-drinks. For each of these foods, "every day," "5–6 times a week," "3–4 times a week," "1–2 times a week," "once in 15 days," "once a month," and "never eat"' states were recorded.[18,19] Results were scored as: "every day = 6 points," "5–6 times a week = 5 points," "3–4 times a week = 4 points," "1–2 times a week = 3 points," "once in 15 days = 2 points," "once a month = 1 point," and "never eat = 0 points."

The World Health Organization (WHO) defines anemia as hemoglobin concentrations below 12 g/dL for women.[20,21] Serum vitamin B12 levels of 200–300 pg/mL is considered as a borderline value (additional tests are needed) and <200 pg/mL is considered as vitamin B12 deficiency.[22] Serum folate level <2 ng/mL is considered as folic acid deficiency.[22] Serum ferritin level <15 ng/mL is considered as iron deficiency.[23-25] Serum folate and serum vitamin B12 levels were determined using chemiluminescence (UniCel DxI 800 Immunoassay System, Beckman Coulter, Inc. Chaska, MN, USA). Hemoglobin was determined using a photometric measurement (UniCel DxH 800 Coulter Cellular Analysis System, Beckman Coulter, Inc. Chaska, MN, USA). Serum ferritin was determined by chemiluminescence (Cobas 8000, module c602, Roche Diagnostics, Manheim, Germany). The levels of serum glucose, triglyceride (TG), total cholesterol (TC), and high-density lipoprotein (HDL) cholesterol were determined using commercially available assay kits (Abbott Diagnostics, Abbott Park, Illinois, USA) with an Architect c16000 auto-analyzer (Abbott Diagnostics, Abbott Park, Illinois, USA). Low-density lipoprotein (LDL) was calculated with the Friedewald formula: LDL (mg/dL) = TC (mg/dL) − HDL (mg/dL) − TG (mg/dL)/5.[26] Non-HDL cholesterol was calculated with the "TK-HDL" formula.

Statistical analysis

The suitability of continuous variables to normal distribution was examined by Shapiro-Wilk test. Independent samples t-test was used when glucose, TC, HDL, LDL, non-HDL, and TG measurements showed normal distribution and two groups were compared. Mann–Whitney U test was used if the data did not conform to normal distribution. In the comparisons between three groups, ANOVA test was used if the data was compatible with normal distribution and then the Tukey test was used for subgroup analysis. In case of nonhomogeneous variance, Welch test was used and subgroup analysis was performed using Games-Howell test. If the data were not suitable for normal distribution, Kruskal–Wallis test was used in the comparisons between three groups, and if significance was obtained after the test, subgroup analyses were performed using Dunn test. Kruskal–Wallis test or Mann–Whitney test was used to compare nutritional scores between milk-dairy products, meat-egg-legumes, vegetables-fruits, bread-cereals, and fat-sugar-sweet-drinks. The relationship between nutrition scores and measurements given in Table 5 was examined by Correlation Analysis and Spearman correlation coefficient was computed. Statistical analyses were performed using SPSS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) and $P < 0.05$ was considered statistically significant.

Results

The mean age of the participants was 34 ± 9.01 years. Participants with normal weight were 42.10%, 29.20% were overweight, and 17% were obese. The ratio of those with increased and high risk waist circumference was 41.50%. The ratio of patients with waist-to-hip ratio ≥ 0.85 was 16.40% and the ratio of patients with waist-to-height ratio ≥0.5 was 37.40%. HDL level was ≥50 mg/dL in 66.70% of the women and TG level was ≥150 mg/dL in 12.90% [Table 1].

Hemoglobin level was <12 g/dL in 43.90% of the participants. 65.50% of the women had iron deficiency and 35.70% had a vitamin B12 deficiency. Only two patients had folic acid deficiency [Table 1].

The mean glucose level was higher in the group with BMI: ≥30 kg/m^2 and BMI: 25–29.9 kg/m^2 compared to the group with BMI: 18.5–24.9 kg/m^2 ($P = 0.016$ and $P = 0.014$, respectively). The median TC level was higher in the group with BMI: ≥30 kg/m^2 compared to the group with BMI: <18.5 kg/m^2 ($P = 0.045$). HDL level in the group with BMI: ≥30 kg/m^2 was lower than the groups with BMI: <18.5 kg/m^2 ($P = 0.008$), BMI: 18.5–24.9 kg/m^2 ($P = 0.004$), and BMI: 25–29.9 kg/m^2 ($P = 0.002$). The median LDL level of the group with BMI: <18.5 kg/m^2 was lower than the group with BMI: 25–29.9 kg/m^2 and BMI: ≥30 kg/m^2 ($P = 0.032$ and $P = 0.011$, respectively). The non-HDL level was higher in the group with BMI: ≥30 kg/m^2 compared with the group with BMI: <18.5 kg/m^2 and BMI: 18.5–24.9 kg/m^2 ($P < 0.001$ and $P = 0.007$, respectively). TG level was higher in the group with BMI: ≥30 kg/m^2 compared with the group with BMI: <18.5 kg/m^2 and BMI: 18.5–24.9 kg/m^2 ($P < 0.001$ and $P = 0.005$, respectively) [Table 2].

Mean glucose level, median TC level, and non-HDL level were higher in the high-risk group of waist circumference compared to the normal risk group ($P = 0.005$, $P = 0.018$, and $P = 0.003$, respectively). TG levels were higher in the high-risk group of waist circumference than in the increased risk group and normal risk group ($P = 0.006$ and $P < 0.001$, respectively). The median HDL level of the normal waist circumference group was higher than the high-risk group of waist circumference ($P = 0.024$). A difference was found between waist circumference groups according to LDL levels. However, this difference could not be detected in subgroup analyses [Table 2].

There was a significant relationship in the same direction between hip circumference measurement and glucose, TC, non-HDL, and TG levels ($P = 0.002$, $P = 0.011$, $P = 0.017$, and $P = 0.002$, respectively). There was no relationship between hip circumference and HDL and LDL measurements ($P = 0.998$ and $P = 0.156$, respectively) [Table 2].

The median HDL level was higher in the waist-hip ratio <0.85 group than in the waist-hip ratio ≥0.85

Table 1: Anthropometric measurements and laboratory evaluations of the premenopausal women

	***n*=171**
Age (years)	34 (18:53)
Height (cm)	162.01±5.59
Weight (kg)	65 (40:100)
BMI (kg/m^2)	
<18.5	20 (11.70%)
18.5-24.9	72 (42.10%)
25-29.9	50 (29.20%)
≥30	29 (17%)
Waist circumference (cm)	
<80 cm (normal)	100 (58.50%)
≥80-<88 cm (increased risk)	35 (20.50%)
≥88 cm (high risk)	36 (21.10%)
Hip circumference (cm)	110 (68:192)
Waist-to-hip ratio	
<0.85	143 (83.60%)
≥0.85	28 (16.40%)
Waist-to-height ratio	
<0.5	107 (62.60%)
≥0.5	64 (37.40%)
Glucose (mg/dL)	
<100	158 (92.40%)
≥100	13 (7.60%)
Total cholesterol (mg/dL)	166 (92:271)
HDL (mg/dL)	
<50	57 (33.30%)
≥50	114 (66.70%)
Non-HDL	110 (0:218)
LDL (mg/dL)	93.40 (43:195)
Triglycerides (mg/dL)	
<150	149 (87.10%)
≥150	22 (12.90%)
Ferritin (ng/mL)	
<15	112 (65.50%)
≥15	59 (34.50%)
Folate (ng/mL)	7.35 (2.81:19.91)
Vitamin B12 (pg/mL)	
<200	61 (35.70%)
200-300	56 (32.70%)
>300	54 (31.60%)
Hemoglobin (g/dL)	
<12	75 (43.90%)
≥12	96 (56.10%)

Data are given as mean±standard deviation, median (minimum: maximum) and *n* (%). BMI: Body Mass Index; HDL: High-Density Lipoprotein; LDL: Low-Density Lipoprotein

Table 2: Relationship between participants' anthropometric measurements and laboratory results

n=171	Glucose	Total cholesterol	HDL	LDL	Non-HDL	Triglycerides
BMI						
<18.5 (*n*=20)	86 (69:98)	149.50 (118:204)	60 (33:87)	82.60±20.43	90.50 (58:1309	56 (7.32:244)
18.5-24.9 (*n*=72)	86 (62:102)	158.50 (115:238)	57 (17.80:84)	91.33±22.83	106.50 (63:171)	74.50 (23.60:250)
25-29.9 (*n*=50)	89.50 (69:111)	174 (92:271)	58 (33:194)	100.86±32.82	110 (0:217)	88 (16:381)
≥30 (*n*=29)	92 (76:104)	174 (123:260)	45 (29:67)	105.03±27.96	124 (85:218)	106 (56:381)
P	0.002[a]	0.023[a]	0.001[a]	0.006[b]	<0.001[a]	<0.001[a]
Waist circumference						
Normal (*n*=100)	85.90±8.39	157.50 (115:251)	58 (17.80:87)	90.82±22.68	103.50 (58:191)	73.50 (7.32:381)
increased risk (*n*=35)	89.54±9.64	180 (92:241)	57 (35:194)	101.18±29.11	121 (0:176)	77 (16:229)
high risk (*n*=36)	91.05±6.98	172.50 (122:271)	49 (29:123:40)	100.58±34.50	121 (62:218)	113.50 (55:381)
P	0.003[c]	0.030[a]	0.026[a]	0.031[c]	0.004[a]	<0.001[a]
Hip circumference						
r_s	0.18	0.19	0.01	0.11	0.18	0.28
P	0.002	0.011	0.998	0.156	0.017	0.002
Waist-to-hip ratio						
<0.85 (*n*=143)	87.45±8.89	165 (92:251)	58 (17.80:194)	93.92±25.29	108 (0:191)	76 (7.32:381)
≥0.85 (*n*=28)	89.17±7.18	169 (122:271)	45 (29:60)	103.06±35.36	116 (62:218)	113.50 (55:381)
P	0.337[g]	0.505[h]	<0.001[h]	0.105[g]	0.018[h]	<0.001[h]
Waist-to-height ratio						
<0.5 (*n*=107)	86.26±8.33	160 (115:251)	59 (17.80:194)	91.70±22.78	107.13±29.88	74 (7.32:381)
≥0.5 (*n*=64)	90.18±8.65	170 (92:271)	53 (29:123.40)	101.63±32.75	125.36±39.85	95 (16:381)
P	0.004[g]	0.053[h]	0.017[h]	0.035[g]	0.002[g]	<0.001[h]
	Pairwise Comparisons ($p_{groupi\ vs.\ groupj}$)					
	Glucose	Total cholesterol	HDL	LDL	Non-HDL	Triglycerides
BMI						
$P_{<18.5\ and\ 18.5-24.9}$	>0.99[d]	0.898[d]	>0.99[d]	0.368[e]	0.262[d]	0.521[d]
$P_{<18.5\ and\ 25-29.9}$	0.240[d]	0.086[d]	>0.99[d]	0.032[e]	0.043[d]	0.018[d]
$P_{<18.5\ and\ \geq 30}$	0.158[d]	0.045[d]	0.008[d]	0.011[e]	<0.001[d]	<0.001[d]
$P_{18.5-24.9\ and\ 25-29.9}$	0.014[d]	0.743[d]	>0.99[d]	0.281[e]	>0.99[d]	0.335[d]
$P_{18.5-24.9\ and\ \geq 30}$	0.016[d]	0.356[d]	0.004[d]	0.104[e]	0.007[d]	0.005[d]
$P_{25-29.9\ and\ \geq 30}$	>0.99[d]	>0.99[d]	0.002[d]	0.931[e]	0.166[d]	0.613[d]
Waist circumference						
$P_{normal\ and\ increased\ risk}$	0.072[f]	0.077[d]	>0.99[d]	0.122[f]	0.398[d]	0.470[d]
$P_{normal\ and\ high\ risk}$	0.005[f]	0.018[d]	0.024[d]	0.066[f]	0.003[d]	<0.001[d]
$P_{increased\ risk\ and\ high\ risk}$	0.732[f]	0.641[d]	0.126[d]	0.974[f]	0.463[d]	0.006[d]

Data are given as mean±standard deviation, median (minimum: maximum) and *n* (%). [a]Kruskal-Wallis Test; [b]Welch Test, [c]ANOVA Test, [d]Dunn Test; [e]Games-Howell Test, [f]Tukey Test, [g]Independent samples *t*-test, [h]Mann-Whitney U Test BMI: Body Mass Index

group ($P < 0.001$). The median non-HDL and TG levels were higher in the waist-to-hip ratio ≥0.85 group than in the waist-hip ratio <0.85 group ($P = 0.018$ and $P < 0.001$, respectively). There was no difference between the groups according to other measurements [Table 2].

The mean glucose level, mean LDL level, mean non-HDL level, and median TG level were higher in the group with waist-to-height ratio ≥0.5 compared to the group with waist-to-height ratio <0.5 ($P = 0.004$, $P = 0.035$, $P = 0.002$, and $P < 0.001$, respectively). The median HDL level was higher in the group with a waist-to-height ratio <0.5 compared to the group with a waist-to-length ratio ≥0.5 ($P = 0.017$). There was no difference between the groups according to TC level ($P = 0.053$) [Table 2].

The monthly food consumption frequency of the participants is shown in Table 3.

Nutritional score (minimum score is 0 and maximum score is 6) of the increased risk group (4.03 ± 0.20) was higher than the normal risk group (3.39 ± 1.11) ($P = 0.023$). The milk-dairy products nutrition score of the group with waist-to-hip ratio < 0.85 was higher than the group with ≥0.85 ($P = 0.006$). The milk-dairy products nutrition score of the group with TG level <150 mg/dL was higher than the group with TG level ≥150 mg/dL ($P = 0.029$) [Table 4].

The meat-egg-legumes nutrition score (2.11 ± 0.57) of the HDL level ≥50 mg/dL group was higher than the HDL level <50 mg/dL group (1.91 ± 0.58) ($P = 0.04$). There was a difference between ferritin level subgroups

Table 3: Monthly food consumption frequency of participants

	Never eat	Once a month	Once in 15 days	1-2 times a week	3-4 times a week	5-6 times a week	Every day
Milk and Dairy products	3 (1.80%)	8 (4.70%)	18 (10.50%)	52 (30.40%)	60 (35.10%)	24 (14%)	6 (3.50%)
Milk	71 (41.50%)	22 (12.90%)	23 (13.50%)	29 (17%)	10 (5.80%)	7 (4.10%)	9 (5.30%)
Yogurt and Ayran and Kefir	10 (5.80%)	8 (4.70%)	7 (4.10%)	34 (19.90%)	39 (22.80%)	26 (15.20%)	47 (27.50%)
Cheese	12 (7%)	2 (1.20%)	3 (1.80%)	12 (7%)	23 (13.50%)	13 (7.60%)	106 (62%)
Meat and Egg and Legumes	0	25 (14.60%)	114 (66.70%)	32 (18.70%)	0	0	0
Chicken and Turkey	17 (9.90%)	19 (11.10%)	35 (20.50%)	73 (42.70%)	17 (9.90%)	6 (3.50%)	4 (2.30%)
Fish	49 (28.70%)	69 (40.40%)	28 (16.40%)	19 (11.10%)	2 (1.20%)	1 (0.60%)	3 (1.80%)
Offal	115 (67.30%)	28 (16.40%)	11 (6.40%)	5 (2.90%)	3 (1.80%)	3 (1.80%)	6 (3.50%)
Frozen meat	79 (46.20%)	36 (21.10%)	28 (16.40%)	18 (10.50%)	8 (4.70%)	2 (1.20%)	0
Fresh meat	25 (14.60%)	33 (19.30%)	23 (13.50%)	54 (31.60%)	20 (11.70%)	10 (5.80%)	6 (3.50%)
Egg	18 (10.50%)	2 (1.20%)	11 (6.40%)	38 (22.20%)	33 (19.30%)	20 (11.70%)	49 (28.70%)
Legumes	12 (7%)	6 (3.50%)	29 (17%)	71 (41.50%)	22 (12.90%)	14 (8.20%)	17 (9.90%)
Oil seed	106 (62%)	13 (7.60%)	7 (4.10%)	23 (13.50%)	12 (7%)	2 (1.20%)	8 (4.70%)
Vegetables and Fruits	1 (0.60%)	1 (1.20%)	28 (16.40%)	75 (43.90%)	51 (29.80%)	13 (7.60%)	1 (0.60%)
Green vegetables	9 (5.30%)	4 (2.30%)	9 (5.30%)	44 (25.70%)	43 (25.10%)	29 (17%)	33 (19.30%)
Potato	7 (4.10%)	2 (1.20%)	14 (8.20%)	63 (36.80%)	45 (26.30%)	23 (13.50%)	17 (9.90%)
Other vegetables	12 (7%)	3 (1.80%)	13 (7.60%)	58 (33.90%)	48 (28.10%)	19 (11.10%)	18 (10.50%)
Citrus	34 (19.90%)	12 (7%)	20 (11.70%)	44 (25.70%)	38 (22.20%)	12 (7%)	11 (6.40%)
Fresh fruit	11 (6.40%)	4 (2.30%)	10 (5.80%)	32 (18.70%)	43 (25.10%)	25 (14.60%)	46 (26.90%)
Dried fruits and vegetables	79 (46.20%)	30 (17.50%)	16 (9.40%)	19 (11.10%)	15 (8.80%)	5 (2.90%)	7 (4.10%)
Bread and Cereals	0	12 (7%)	68 (39.80%)	65 (38%)	23 (13.50%)	3 (1.80%)	0
White bread	19 (11.10%)	3 (1.80%)	4 (2.30%)	12 (7%)	7 (4.10%)	9 (5.30%)	117 (68.40%)
Whole grain bread	89 (52%)	13 (7.60%)	8 (4.70%)	13 (7.60%)	6 (3.50%)	8 (4.70%)	34 (19.90%)
Rice and Bulgur and Pasta	10 (5.80%)	2 (1.20%)	9 (5.30%)	51 (29.80%)	50 (29.20%)	29 (17%)	20 (11.70%)
Crackers	37 (21.60%)	11 (6.40%)	23 (13.50%)	43 (25.10%)	24 (14%)	12 (7%)	21 (12.30%)
Breakfast cereal	109 (63.70%)	7 (4.10%)	7 (4.10%)	13 (7.60%)	13 (7.60%)	3 (1.80%)	19 (11.10%)
Turkish bagel	47 (27.50%)	36 (21.10%)	34 (19.90%)	34 (19.90%)	11 (6.40%)	3 (1.80%)	6 (3.50%)
Fat and sugar and sweet and drinks	0	19 (11.10%)	109 (63.70%)	40 (23.40%)	3 (1.80%)	0	0
Prepared fruit juice	82 (48%)	26 (15.20%)	19 (11.10%)	27 (15.80%)	11 (6.40%)	3 (1.80%)	3 (1.80%)
Carbonated beverage	67 (39.20%)	22 (12.90%)	25 (14.60%)	31 (18.10%)	16 (9.40%)	6 (3.50%)	4 (2.30%)
Mineral water	57 (33.30%)	15 (8.80%)	26 (15.20%)	22 (12.90%)	22 (12.90%)	14 (8.20%)	15 (8.80%)
Coffee	26 (15.20%)	12 (7%)	23 (13.50%)	27 (15.80%)	24 (14%)	8 (4.70%)	51 (29.80%)
Tea (black and green)	11 (6.40%)	1 (0.60%)	1 (0.60%)	9 (5.30%)	3 (1.80%)	14 (8.20%)	132 (77.20%)
Herbal tea	103 (60.20%)	14 (8.20%)	12 (7%)	17 (9.90%)	4 (2.30%)	8 (4.70%)	13 (7.60%)
Alcoholic beverage	166 (97.10%)	2 (1.20%)	0	0	1 (0.60%)	0	2 (1.20%)
Olive oil	54 (31.60%)	4 (2.30%)	14 (8.20%)	16 (9.40%)	15 (8.80%)	9 (5.30%)	59 (34.50%)
Hazelnut oil	157 (91.80%)	3 (1.80%)	1 (0.60%)	2 (1.20%)	1 (0.60%)	0	7 (4.10%)
Sunflower oil	23 (13.50%)	4 (2.30%)	5 (2.90%)	7 (4.10%)	20 (5.80%)	12 (7%)	110 (64.30%)
Corn oil	141 (82.50%)	4 (2.30%)	4 (2.30%)	3 (1.80%)	3 (1.80%)	4 (2.30%)	12 (7%)
Soy oil	167 (97.70%)	1 (0.60%)	0	0	0	1 (0.60%)	2 (1.20%)
Canola oil	165 (96.50%)	2 (1.20%)	0	1 (0.60%)	1 (0.60%)	1 (0.60%)	1 (0.60%)
Margarine	83 (48.50%)	16 (9.40%)	16 (9.40%)	22 (12.90%)	14 (8.20%)	7 (4.10%)	13 (7.60%)
Butter	24 (14%)	5 (2.90%)	8 (4.70%)	20 (11.70%)	26 (15.20%)	21 (12.30%)	67 (39.20%)
Sugar and Honey and Jam	32 (18.70%)	6 (3.50%)	8 (4.70%)	25 (14.60%)	20 (11.70%)	12 (7%)	68 (39.80%)
Chocolate and Delight	47 (27.50%)	8 (4.70%)	24 (14%)	25 (14.60%)	30 (17.50%)	14 (8.20%)	23 (13.50%)
Pastry dessert	16 (9.40%)	25 (14.60%)	58 (33.90%)	38 (22.20%)	17 (9.90%)	8 (4.70%)	9 (5.30%)
Milky Dessert and Ice Cream	12 (7%)	15 (8.80%)	33 (19.30%)	55 (32.20%)	26 (15.20%)	14 (8.20%)	16 (9.40%)

Data are given as *n* (%)

according to meat-egg-legumes nutrition score. The nutritional score (2.17 ± 0.62) of the ferritin level ≥15 ng/mL group was higher than the ferritin level <15 ng/mL group (1.97 ± 0.55) (P = 0.033). There was no difference in the other comparisons between the groups [Table 4].

The increase in milk-dairy products score correlated with increased LDL levels (r = 0.16; P = 0.039). There was

Table 4: Relationship between anthropometric and laboratory measurements with nutrients

Minimum Score: 0 Maximum Score: 6	Milk and Dairy products	Meat and Egg and Legumes	Vegetables and Fruits	Bread and Cereals	Fat and Sugar and Sweet and Drinks
BMI (kg/m^2)					
<18.5 (*n*=20)	3 (1:5)	2 (1:3)	3 (2:6)	3 (2:5)	2 (1:3)
18.5-24.9 (*n*=72)	4 (0:6)	2 (1:3)	3 (1:5)	2.50 (1:4)	2 (1:4)
25-29.9 (*n*=50)	4 (0:6)	2 (1:3)	3 (2:5)	3 (1:5)	2 (1:4)
≥30 (*n*=29)	4 (1:6)	2 (1:3)	3 (0:5)	3 (1:5)	2 (1:4)
P	0.061[a]	0.689[a]	0.414[a]	0.636[a]	0.056[a]
Waist circumference (cm)					
Normal (*n*=100)	3 (0:6)	2 (1:3)	3 (1:6)	3 (1:5)	2 (1:4)
Increased risk (*n*=35)	4 (1:6)	2 (1:3)	3 (0:5)	2 (1:5)	2 (1:4)
High risk (*n*=36)	4 (0:6)	2 (1:3)	3 (2:5)	3 (1:4)	2 (1:3)
P	0.015[a]	0.825[a]	0.770[a]	0.200[a]	0.731[a]
Waist-to-hip ratio					
<0.85 (*n*=143)	4 (0:6)	2 (1:3)	3 (0:6)	3 (1:5)	2 (1:4)
≥0.85 (*n*=28)	3 (0:6)	2 (1:3)	3 (2:5)	3 (1:4)	2 (1:3)
P	0.006[h]	0.452[h]	0.649[h]	0.579$_{g}$	0.099[h]
Waist-to-height ratio					
<0.5 (*n*=107)	3 (0:6)	2 (1:3)	3 (1:6)	3 (1:5)	2 (1:4)
≥0.5 (*n*=64)	4 (0:6)	2 (1:3)	3 (0:5)	3 (1:5)	2 (1:4)
P	0.538[h]	0.347[h]	0.566[h]	0.549[h]	0.598[h]
Glucose (mg/dL)					
<100 (*n*=158)	4 (0:6)	2 (1:3)	3 (0:6)	3 (1:5)	2 (1:4)
≥100 (*n*=13)	4 (1:6)	2 (1:3)	4 (2:5)	3 (1:5)	2 (1:3)
P	0.709[h]	0.828[h]	0.150[h]	0.906[h]	0.679[h]
HDL (mg/dL)					
<50 (*n*=57)	3 (1:6)	2 (1:3)	3 (0:6)	2 (1:4)	2 (1:3)
≥50 (*n*=114)	4 (0:6)	2 (1:3)	3 (1:5)	3 (1:5)	2 (1:4)
P	0.065[h]	0.040[h]	0.972[h]	0.109[h]	0.382[h]
Non-HDL					
<130 (*n*=122)	4 (0:6)	2 (1:3)	3 (1:6)	3 (1:5)	2 (1:4)
131-189 (*n*=43)	4 (0:6)	2 (1:3)	3 (0:5)	2 (1:5)	2 (1:4)
≥189 (*n*=6)	3.50 (1:4)	2 (1:3)	3.50 (2:5)	3 (1:4)	2 (1:3)
P	0.716[a]	0.427[a]	0.508[a]	0.199[a]	0.812[a]
Triglycerides (mg/dL)					
<150 (*n*=149)	4 (0:6)	2 (1:3)	3 (0:6)	3 (1:5)	2 (1:4)
≥150 (*n*=22)	3 (1:6)	2 (1:3)	3 (2:4)	2 (1:4)	2 (1:3)
P	0.029[h]	0.123[h]	0.194[h]	0.203[h]	0.425[h]
Ferritin (ng/mL)					
<15 (*n*=112)	4 (0:6)	2 (1:3)	3 (1:5)	3 (1:5)	2 (1:4)
≥15 (*n*=59)	3 (0:6)	2 (1:3)	3 (0:6)	3 (1:5)	2 (1:4)
P	0.570[h]	0.033[h]	0.334[h]	0.413[h]	0.729[h]
Vitamin B12 (pg/mL)					
<200 (*n*=61)	3 (0:6)	2 (1:3)	3 (2:6)	3 (1:5)	2 (1:4)
200-300 (*n*=56)	4 (1:6)	2 (1:3)	3 (0:5)	3 (1:5)	2 (1:3)
≥300 (*n*=54)	4 (1:6)	2 (1:3)	3 (2:5)	2.50 (1:4)	2 (1:4)
P	0.186[a]	0.205[a]	0.825[a]	0.706[a]	0.272[a]
Hemoglobin (g/dL)					
<12 (*n*=75)	3 (0:6)	2 (1:3)	3 (1:5)	3 (1:5)	2 (1:4)
≥12 (*n*=96)	4 (0:6)	2 (1:3)	3 (0:6)	3 (1:5)	2 (1:4)
P	0.166[h]	0.417[h]	0.620[h]	0.646[h]	0.525[h]

Data are given as median (minimum: maximum). [a]Kruskal-Wallis Test; [h]Mann-Whitney U Test. BMI: Body Mass Index; HDL: High-Density Lipoprotein

a significant relationship between the nutritional score of the vegetable-fruits and glucose levels. The increase in vegetable-fruits nutrition score correlated with an increase in glucose levels (r = 0.17; *P* = 0.027). There

Table 5: Correlation of anthropometric and laboratory measurements with food consumption frequency scores

Group properties	P and r_s values	Milk and dairy products	Meat and egg and legumes	Vegetables and fruits	Bread and cereals	Fat and sugar and sweet and drinks
BMI	r_s	0.03	0.07	0.08	−0.05	0.02
	P	0.658	0.360	0.300	0.558	0.801
Waist circumference	r_s	0.08	0.07	0.03	−0.01	0.01
	P	0.307	0.360	0.732	0.930	0.912
Hip circumference	r_s	0.13	0.11	−0.01	−0.01	0.04
	P	0.093	0.168	0.906	0.943	0.616
Waist-to-hip ratio	r_s	−0.08	−0.01	0.05	0.00	−0.05
	P	0.304	0.886	0.493	0.975	0.536
Waist-to-height ratio	r_s	0.06	0.09	0.04	0.00	−0.02
	P	0.466	0.231	0.624	0.966	0.825
Glucose	r_s	−0.08	0.02	0.17	−0.11	−0.01
	P	0.332	0.780	0.027	0.171	0.932
Total cholesterol	r_s	0.11	0.12	−0.02	−0.06	0.03
	P	0.163	0.122	0.834	0.423	0.732
HDL	r_s	0.12	0.12	−0.05	0.07	0.07
	P	0.135	0.133	0.513	0.376	0.380
LDL	r_s	0.16	0.09	0.04	−0.10	0.01
	P	0.039	0.237	0.610	0.186	0.945
Non-HDL	r_s	0.05	0.10	0.02	−0.16	−0.02
	P	0.528	0.186	0.766	0.037	0.759
Triglycerides	r_s	−0.07	−0.06	−0.13	−0.10	−0.06
	P	0.368	0.469	0.083	0.210	0.444
Ferritin	r_s	−0.02	0.11	0.07	0.08	−0.06
	P	0.850	0.155	0.339	0.291	0.435
Folate	r_s	0.08	−0.08	−0.07	−0.21	−0.03
	P	0.310	0.300	0.341	0.006	0.735
Vitamin B12	r_s	0.09	0.09	0.01	−0.08	0.03
	P	0.252	0.248	0.921	0.303	0.694
	r_s	0.09	0.05	0.08	0.06	−0.10
	P	0.255	0.551	0.276	0.423	0.185

r_s: Spearman correlation coefficient BMI: Body Mass Index; HDL: High-Density Lipoprotein; LDL: Low-Density Lipoprotein

was a negative correlation between bread-cereals nutrition score and non-HDL and folate levels. The increase in bread-cereals score correlated with a decrease in non-HDL and folate levels (r = −0.16, P = 0.037; r = −0.21, P = 0.006, respectively).

Discussion

In this study, 17% of premenopausal women were obese, 41.5% were abdominal obese (waist circumference ≥80), and 16.40% were at high risk according to waist-to-hip ratio. The prevalence of anemia in premenopausal women was 43.90% and the prevalence of iron deficiency was 65.5%. These findings were quite striking.

Obesity and overweight increase all-cause mortality.[27] In one study, males and females with BMI: 22.5–25 kg/m^2 showed a 30% increase in all-cause mortality for every 5 kg/m^2 increase in BMI.[28] Cardiovascular disease, diabetes, hypertension, and cancer are more common in individuals with a waist-to-hip ratio above the risk limit.[29,30] In this study, an increase in BMI or an increase in waist circumference significantly increased glucose, TC, LDL, non-HDL, and TG levels and significantly decreased HDL levels. A similar significance was found between waist-to-height ratio and these parameters except for TC. As waist-to-hip ratio increased, non-HDL and TG levels increased, but as waist-to-hip ratio increased, HDL levels decreased. To assess coronary risk in women, low HDL is considered more predictive than high LDL.[31-33] A recent study conducted in a cohort containing both diabetic and nondiabetic individuals showed that non-HDL cholesterol was a somewhat better predictor of cardiovascular disease than LDL.[34] Furthermore, the Adult Treatment Panel (ATP-III) of the National Cholesterol Education Program has recommended using non-HDL cholesterol in assessing CVD risk in patients with diabetes.[35] TC levels have been associated with coronary heart disease only at very high levels (>265 mg/dL) in premenopausal women.[36,37] TG was found to be associated with coronary risk in older women, especially at high levels (>400 mg/dL).[31,32,38]

According to WHO data, 40%–89% of anemia in women is iron deficiency anemia.[10] When iron deficiency is not treated, severe anemia (hemoglobin ≤7 g/dL) can develop, which significantly affects the physical, mental, and social health of women.[39,40] In this study, the prevalence of anemia in premenopausal women was 43.90% and the prevalence of iron deficiency was 65.5%. In another study in the Southeastern Anatolia region of Turkey, similar to the results of this study, the prevalence of anemia was found to be 40.08% in women aged 19–40.[41] Long menstruation time, the person's definition of excess vaginal bleeding, and nutritional disorders are risk factors for anemia.[42,43] In Turkey, there is no screening program to reduce anemia rates of women in the reproductive age. In our country, where anemia is common, anemia screening should be one of the most common health services.[44]

In this study, ferritin values were higher in the group consuming more of the meat-egg-legumes nutrient group. Iron deficiency anemia, which is the most common type of anemia in premenopausal women, can be reduced by increasing the consumption of meat-egg-legumes. In addition, we found that folate levels decreased with increasing consumption of bread and cereals and this situation was found to be statistically significant. Findings from American research identified two main sources of folate: yeast breads and rolls (16.6%) and ready-to-eat cereals (18.7%).[45] The main contributors of folate in the total diet of US adults ≥51 years old were ready-to-eat cereals (21.0%), and breads and rolls (13.4%).[46] The different results in different countries may be due to the fact that the proportion of cereal and bread fortified with folate is different. In this study, the folate level was found to be less in those who consume more in the bread and cereal group. This may be due to the fact that folate fortified flour is not used in our country.

When the frequency of food consumption was examined, high levels of ferritin as well as high levels of HDL were seen in those who consumed more of the meat-egg-legumes food group. Due to the cardiovascular protective effect of intrinsic estrogen, premenopausal women are considered to have a reduced cardiovascular risk.[47] Iron has been suggested to play an important role in the pathogenesis of atherosclerosis, primarily as a catalyst for atherogenic modification of low-density lipoprotein.[48-53] It has also been reported that atherosclerotic plaque progression can be slowed down by the reduction of iron stores by phlebotomy.[49,54] Although high iron deficiency in premenopausal women is a major health problem, it may provide additional protection against atherosclerotic heart disease.[55]

In a study examining the relationship between fish consumption and cardiovascular disease, it has been shown that the risk of myocardial infarction and cardiovascular disease death decreases as fish consumption increases.[56] In another study, it was shown that the fatty acid pattern of fish was effective in decreasing plasma TG concentration and decreased the risk of cardiovascular disease.[57] In a study examining the relationship between red meat consumption and cancer, it was shown that the risk of colorectal cancer increases as red meat consumption increases.[58] This effect is explained by the carcinogenic effect of N-nitroso compounds in the structure of red meat cooked at high temperature.[59]

Foods with high glycemic index were shown to indirectly increase the development of type 2 diabetes by increasing insulin resistance and leading to weight gain.[60] In this study, it was seen that fasting glucose level was higher with vegetable-fruit food group consumption. The fruit subgroup is thought to contribute to this situation. There was no correlation between lipid parameters or anthropometric measurements and consumption of vegetable and fruit foods. Two studies investigating the effect of fruit and vegetable consumption on cardiovascular disease showed a clear reduction in the risk of cardiovascular disease as fruit and vegetable consumption increased.[61,62] In studies investigating the relationship between fruit and vegetable consumption and cancer, it was emphasized that the risk of gastrointestinal cancer could be reduced by increasing the consumption of fruit and vegetables.[63] It is said that this effect could be due to the activity of antioxidant elements such as vitamin A, vitamin E, flavonoids, and carotenoids, which are present in high amounts in fruits and vegetables.[64]

In our study, we observed that LDL levels increased but TG levels decreased with increasing consumption of milk and dairy products. In studies investigating milk and dairy product consumption and cardiovascular disease, cancer mortality and all-cause mortality, varying results were obtained.[65] Meta-analyses of prospective cohorts showed no association between milk consumption and the risk of all-cause mortality.[66,67] A study in Switzerland showed that high milk consumption carries a high risk of cardiovascular disease, cancer, and all-cause mortality.[68] In a different study conducted in Iran, an inverse relationship was found between consumption of dairy products and cardiovascular disease and all-cause mortality, and in the same study, no association was found between milk consumption and cancer mortality risk.[65] The Whitehall II study[69] showed that the risk of all-cause mortality decreases as the consumption of dairy products increases. In several studies, increased consumption of yoghurt and cheese showed a reduction in the risk of all-cause mortality and death from cardiovascular disease[65] (Whitehall II Study,[69] the Rotterdam Study,[70] the Hoorn Study[71]). The European Prospective Investigation into Cancer and Nutrition–Netherlands (EPIC-NL) cohort study[72] found no association between yoghurt and cheese consumption and the risk of death from cardiovascular disease. In prospective cohort studies, increased consumption of yoghurt and dairy products has been associated with lower weight gain and low waist circumference.[73,74] However, in another study, high dairy consumption was associated with high BMI.[65] In this study, it was observed that increased milk and dairy product consumption caused an increase in waist circumference, but no relation was found with BMI.

There were some limitations to our study. The frequency of food consumption of the patients was evaluated according to the patient declaration with the help of questionnaire forms. Calories were not calculated. Food groups were examined as main headings and food subgroups could not be compared with laboratory and anthropometric measurements. Each community has different eating habits; hence, using a standardized food frequency questionnaire for Turkey was not possible. Therefore, based on the Turkey Nutrition and Health Research-2010,[17] this FCFQ was prepared. Misclassification error may occur with the FCFQ and recall bias may occur in the nature of a cross-sectional study. Our study also had its strengths. Our sample size reflected the premenopausal women who applied to our hospital. Thus, it provided us with very strong data on anemia and obesity rates in healthy premenopausal women in Bursa.

Conclusions

In conclusion, anemia and obesity are high in premenopausal women. Community-based screening programs are needed to evaluate premenopausal women for anemia and obesity. Scales to assess the nutritional habits of the population are also needed in screening programs. In addition, primary protection for diseases that may develop due to wrong eating habits can be provided for premenopausal women and the whole society by evaluating nutritional habits with standardized questionnaires specific to that society.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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