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ZEHRA BÜYÜKTUNCER

BERAT NURSAL TOSUN

AYLİN AYAZ

MAKBULE GEZMEN KARADAĞ

ALEV KOCABAŞ KESER

See next page for additional authors

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Authors
ZEHRA BÜYÜKTUNCER, BERAT NURSAL TOSUN, AYLİN AYAZ, MAKBULE GEZMEN KARADAĞ, ALEV KOCABAŞ KESER, MERAL AKSOY, MİNE YURTTAGÜL, SEVİNÇ YÜCECAN, and HALİT TANJU BESLER

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Implications of socio-economic status on the dietary fatty acid intakes in Turkish women

Zehra BÜYÜKTUNCER, Berat Nursal TOSUN, Aylin AYAZ, Makbule GEZMEN KARADAĞ, Alev KOCABAŞ KESER, Meral AKSOY, Mine YURTTAGÜL, Sevinç YÜCECAN, Halit Tanju BESLER

Aim: To investigate the effects of socio-economic status (SES) on the dietary intakes of fatty acids in a group of Turkish women.

Materials and methods: Five hundred and sixty three women were randomly enrolled into the study. They were classified into 3 SES groups: group 1 high (n = 186), group 2 medium (n = 186), and group 3 low (n = 191). The groups were determined by the SES distribution of Ankara as determined by the 2000 census. Each participant was investigated with a questionnaire consisting of demographic characteristics, physical activity level (24-h record), and dietary intake (24-h recall) by dietetics interns. Body weight, height, waist, and hip measurements were taken.

Results: Dietary protein, fat and carbohydrate intakes and their respective percentages of total energy were significantly different among the SES groups ($P < 0.05$). Based on the detailed dietary fat analysis, saturated and monounsaturated fatty acid intakes were highest in group 1, polyunsaturated fatty acids intake and ω-6:ω-3 ratio was highest in group 3 ($P < 0.05$). Body mass index, waist to hip ratio, and physical activity expenditure differed significantly between groups ($P < 0.05$).

Conclusion: SES seems to be associated with dietary fat, fatty acid intake, and ω-6:ω-3 ratio. Thus, to maintain proper dietary balances, SES should be also verified in conjunction with the dietary modifications.

Key words: Socioeconomic status, women, dietary fatty acids, ω-6:ω-3 ratio

Türk kadınlarının sosyo-ekonomik durumlarının diyetle yağ asidi alımlarına etkileri

Amaç: Sosyo-ekonomik durum (SED) diyetle yağ asidi alımında çeşitliliğe neden olabilmektedir. Bu çalışmanın amacı, SED'nin diyetle yağ asidi alımına ve yağ asitlerinin birbirine oranına etkisini incelemektir.

Yöntem ve gereç: Çalışmaya rastgele alınan kadınlar (n = 563), Ankara'nın sosyoekonomik durum dağılımına (2000 nüfus sayımı) göre, yüksek (n = 186), orta (n:186) ve düşük (n = 191) olmak üzere 3 gruba ayrılmıştır. Kadınların demografik özellikleri, fiziksel aktivite düzeyleri (24 saatlik kayıt yöntemi) ve beslenme durumları (24 saatlik hatırlatma yöntemi) diyetetik öğrencileri tarafından kaydedilmiştir. Antropometrik değerlendirme için, vücut ağırlığı, boy uzunluğu, bel ve kalça çevreleri ölçülmüştür.

Bulgular: Diyetle protein, yağ ve karbonhidrat alımları ve bunların toplam enerjiye karşılık gelen yüzdeleri SED grupları arasında önemli farklılık göstermektedir ($P < 0,05$). Diyetle yağ asidi alımına bakıldığında, doymuş ve tekli doymamış yağ asidi alımlarının yüksek SED grubunda en fazla olduğu; buna karşılık çoklu doymamış yağ asidi alımı ve diyet ω-6:ω-3 oranının düşük SED grubunda en fazla olduğu saptanmıştır ($P < 0,05$). Beden kütle indeksi, bel kalça oranı ve fiziksel aktivite düzeyleri de gruplar arasında farklılık göstermektedir ($P < 0,05$).

Sonuç: SED diyetle yağ ve yağ asidi alımını ve diyet ω-6:ω-3 oranını etkileyebilmektedir. Bu nedenle, dengeli bir diyetin sağlanabilmesi için, diyet düzenlenirken SED göz önünde bulundurulmalıdır.

Anahtar sözcükler: Sosyo-ekonomik durum, kadınlar, diyet yağ asitleri, ω-6:ω-3 oranı

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Department of Nutrition and Dietetics, Faculty of Health Sciences,Hacettepe University, Ankara - TURKEY
Authors Z. Büyüktuncer and B.N. Tosun have contributed equally to this manuscript

Correspondence: *Halit Tanju BESLER, Department of Nutrition and Dietetics, Faculty of Health Sciences,Hacettepe University, Ankara - TURKEY*
E-mail: htbf@hacettepe.edu.tr

Introduction

Dietary fatty acid intakes have been accepted as critical indicators of a healthy diet. The recommendations for total fat consumption is 15%-30% of energy, for saturated fatty acids (SFA) <10%, for monounsaturated fatty acids (MUFA) 10%, for polyunsaturated fatty acids (PUFA) 6%-10% (w-6 PUFA 5%-8% and w-3 PUFA 1%-2%) (1,2). During the last decade there has been a wealth of research dealing with the relationship between diet and w-6:w-3 polyunsaturated fatty acids (PUFAs) ratio (1,3). The optimal range for w-6:w-3 PUFAs ratio varies from 10/1 to 5/1 depending on the prevention and management of chronic diseases. However, Western diet is appeared to have a high ratio (>15/1). This is due to the excessive consumption of w-6 compared to 3 PUFA (3).

It is well recognized that SES might affect maintenances of healthy life-style and food choice including the type and amount of dietary fats, hence fatty acids (2,4). The Dutch National Food Consumption Survey (4) and UK Women's Cohort Study (5) showed that subjects with a higher SES were more likely to be low-fat consumers. However, there are also some contradictory results, as tabulated by a study conducted on/in the Israel population (6). To the best of our knowledge, there is no study in the literature reviewing the relationship between dietary fat intake and SES in the Turkish population. This study will hopefully form a baseline from which further detailed research can be undertaken. The aim of this work was to investigate the impact of SES on the dietary intakes of total fat, SFA, MUFA, PUFA, and w-6:w-3 ratio, and how this affects Turkish women.

Materials and methods

The study was conducted on 563 women, aged between 19 and 80 years, in Ankara, Turkey, between July 2004 and August 2005. Their mean age was 42 ± 13.8 years at the time of evaluation (median 40 years). A systematic random sample of settlements with a probability proportional to size based on the 2000 General Population Census was conducted. The women (n = 563) randomly enrolled in this study were classified into 3 SES groups: high (n = 186), medium (n = 186), and low (n = 191). All participants were interviewed face to face and they completed a questionnaire including information about their demographic characteristics, dietary intake, and physical activity levels. Some key anthropometrical measurements were also taken. All the data were collected by students in the 3rd grade of the Department of Nutrition and Dietetics, Hacettepe University, who were educated in and experienced on nutritional assessment techniques and anthropometric measurements.

Demographic characteristic

Age and marital, educational, and occupational status were obtained as demographic characteristics. Educational and occupational status were used as interrelated indicators of SES. Eighty-two percent of the women had graduated from secondary school or had no educational qualification whereas only 18% of women were high school or university graduates. The mean education periods were 12, 9, and 6 years in high, middle, and low SES groups, respectively ($P < 0.001$). Spearmen's correlation coefficient (r) between education level and SES was 0.60 ($P < 0.001$). Most of the participants were housewives (71%) and the percentages of currently employed women were 22% in the high, 19% in the middle, and 4% in the low SES group. Eighty-one percent of the women were married and the percentage of single women was highest in the high SES group.

Dietary intake

Food consumption data were collected by a 24-h recall survey technique and analyzed using BEBIS software (Nutrition Information System), which is based on several international and national food composition tables, supplemented with local data. Daily energy, carbohydrate, protein, total fat, fatty acids including SFA, MUFA, PUFA, w -9, w -6, and w -3 fibre, and cholesterol intakes were evaluated. In addition to estimation of daily energy and nutrient intakes, daily consumption amounts of dairy products, total meat (the sum of red meat, chicken, fish, meat products and offal, eggs, legumes, nuts, fruits, vegetables, bread, cereals, oil, margarine, butter, and sugar) were estimated by a specialized function of the software.

Physical activity level

A complete 24-h physical activity records was used to define their physical activity levels (PAL).

Anthropometric measurements

The weight, height, waist, and hip circumferences were measured. BMI and waist to hip ratio were calculated.

Statistical analysis

SPSS 11 for Windows (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. The mean, median, percentage, and standard deviation of the parameters were calculated. The normality of the distribution of the data was checked using the Kolmogorov–Smirnov test. The significance of the differences between SES groups was analysed with one-way ANOVA for parametric variables and with Kruskal Wallis test for non-parametric variables. Mann-Whitney *U* test was performed to analyse significance for 2-group comparisons if the nonparametric data were significant. Statistical significance was established at a P value of <0.05.

Results

Total fat (g), SFA (g), MUFA (g) and, PUFA (g) intakes were found to be significantly different among the SES groups (P < 0.001) (Table 1). There was no difference between high and middle SES groups in terms of total fat intake (53 and 54 g, respectively), but it was significantly lower in the low SES group (45 g) (P < 0.001). Total SFA and MUFA intakes increased whereas total PUFA intake decreased as SES decreased (P < 0.001). Oleic acid (18:1, w-9) intake (g), which constitutes the most important part of

Table 1. Dietary fat and fatty acid intakes by SES.*

	High (min-max)	Middle (min-max)	Low (min-max)	P
Total fat (g)	53 [a] (18-205)	54 [a] (6-195)	45 (9-158)	0.000
Total fat (% of total energy)	34 (11-69)	31 (12-71)	27 (10-59)	0.000
Total SFA (g)	18 (5-53)	16 (3-59)	12 (2-56)	0.000
Total MUFA (g)	21 (5-97)	17 (2-76)	14 (2-43)	0.000
ω -9 FA	19 (4-96)	16 (1-72)	13 (2-40)	0.000
Total PUFA (g)	7 (2-86)	13 [a] (1-90)	14 [a] (1-77)	0.000
ω -3 FA (g)	0.9 (0.2-5.7)	0.8 (0.1-4.6)	0.6 (0.1-4.3)	0.000
ω -6 FA (g)	6.0 (1-83)	12 [a] (1-88)	13 [a] (1-75)	0.000
ω -6 : ω 3	7 (2-43)	15 (2-72)	19 (4-77)	0.000

* Values are given as median (minimum – maximum)
[a] Pairs of numbers within the same row are not significantly different (P < 0.05)

MUFA intake, was significantly higher in the high SES group than the other groups (P < 0.001). Total w-3 intake (g) decreased with decreasing SES (P < 0.001). There was no difference between middle and low SES groups in terms of total w-6 intake (g) (P < 0.05) but it was significantly lower in the high SES group (P < 0.001). Hence, the w-6:w-3 ratio decreased as SES increased (P < 0.001) (Table 1). Figure 1 shows the percentages of each fatty acid contribution to daily total energy intake. The contribution of SFA, MUFA, and w-3 to the total energy intake decreased as SES increased, whereas the percentage of energy provided by w-6 increased SES decreased.

Although total energy intake was not significantly different among the groups, total, animal and plant proteins, and total carbohydrate intake (g and %) significantly varied among the groups (P < 0.001) (Table 2). Total and animal protein intakes were highest in the high SES group whereas plant protein intake was highest in the low SES group (P < 0.001). Total carbohydrate intake was negatively correlated with SES; the low SES participants had the highest intake (207 g, 59.0%) and the high SES participants had the lowest carbohydrate intake (165.4 g, 49.0%) (P < 0.001) (Table 2).

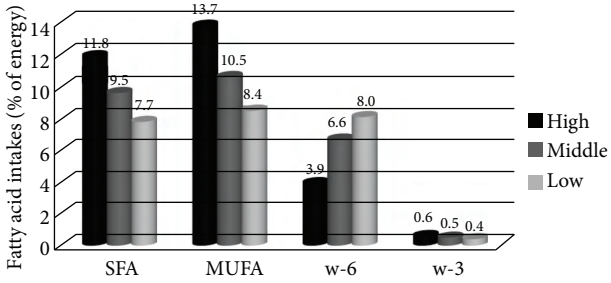

Figure 1. Fatty acid intakes (% of energy) in high, middle, and low SES.

Table 2. Dietary energy and other nutrient intakes by SES.*

	High (min-max)	Middle (min-max)	Low (min-max)	P
Total energy (kcal)	1439 (509-3958)	1504 (410-4017)	1486 (415-3213)	0.334
Total protein (g)	59 (19-152)	51 [a] (14-157)	47 [a] (13-117)	0.001
Protein from plants (g)	22 (6-88)	27 (5-104)	31 (5-72)	0.000
Protein from animals (g)	34 (6-106)	23 (0-144)	14 (0-80)	0.000
Total carbohydrates (g)	165 (53-470)	194 (44-752)	208 (35-490)	0.000
Fibre (g)	18 (4-80)	17 (3-75)	18 (1-53)	0.472
Cholesterol (mg)	130 (18-738)	132 (1-656)	145 (0-653)	0.851
Protein (% of total energy)	16 (9-38)	14 (5-32)	13 (7-25)	0.000
Carbohydrates (% of total energy)	49 (21-71)	55 (21-79)	59 (28-79)	0.000

* Values are given as median (minimum – maximum)
[a] Pairs of numbers within the same row are not significantly different (P < 0.05)

The types of foods consumed are shown in Table 3. Although significant differences in the consumed amounts of dairy products, red meat, chicken, egg, bread, fruit, vegetables, margarine, butter, and sugar were found ($P < 0.05$), there were no significant difference in the consumption of fish, meat products, giblet, legume, nut, cereal, and oil ($P < 0.05$) among the SES groups. The high SES group consumed larger amounts of dairy products, total meat, fruits, and vegetables compared with the other SES groups ($P < 0.05$). On the other hand, low SES group consumed larger amounts bread and sugar than the other groups ($P < 0.05$) (Table 3).

The mean BMI was significantly greater in the low SES groups (27.7 kg/m^2) than the middle (26.7 kg/m^2) and high SES (25.8 kg/m^2) groups ($P < 0.005$). Although W/H and PAL seemed similar in all groups, statistically significant differences between W/H and SES and between PAL and SES were found ($P < 0.05$). Middle and low SES groups had the same W/H, but the high SES group had lower W/H than the others (Table 4).

Table 3. Food consumption according to SES.*

Foods (g)	High	Middle	Low	P
Dairy products	219 (0-903)	90 [a] (0-675)	90 [a] (0-430)	0,000
Meat, total	2 (0-300)	0 (0-459)	0 (0-253)	0,000
Red meat	0 [a] (0-204)	0 [a] (0-150)	0 (0-210)	0,002
Chicken	0 (0-300)	0 [a] (0-459)	0 [a] (0-234)	0,000
Fish	0 (0-250)	0 (0-390)	0 (0-40)	0,136
Meat products	0 (0-84)	0 (0-200)	0 (0-60)	0,758
Giblets	0 (0-0)	0 (0-125)	0 (0-20)	0,168
Egg	0 (0-140)	0 [a] (0-112)	0 [a] (0-89)	0,002
Legumes	0 (0-333)	0 (0-200)	0 (0-100)	0,337
Nuts	0 (0-165)	0 (0-105)	0 (0-100)	0,873
Bread	100 (0-350)	134 (0-660)	200 (0-625)	0,000
Cereals	54 (0-489)	70 (0-529)	60 (0-270)	0,232
Fruits	248 (0-1650)	154 (0-1850)	101 (0-1380)	0,000
Vegetables	418 [a] (0-1514)	352 [a,b] (0-1722)	343 [b] (0-1136)	0,015
Fats and oils, total	20 (0-120)	22 (0-160)	20 (0-125)	0,575
Oils	15 (0-120)	16 (0-158)	16 (0-123)	0,868
Margarine	0 [a] (0-34)	0 [a] (0-49)	0 (0-83)	0,000
Butter	0 [a] (0-31)	0 [a] (0-30)	0 (0-18)	0,000
Sugars	6 (0-103)	15 [a] (0-205)	14 [a] (0-180)	0,003

* Values are given as median (minimum - maximum)
[a, b]Pairs of numbers bearing the same letter within the same row are not significantly different ($P < 0.05$)

Table 4. Anthropometric measurements and physical activity levels of the women by SES.*

	High (n)	Middle (n)	Low (n)	P
BMI (kg/m^2)	25.8 ± 5.6 (180)	26.7 ± 4.7 (185)	27.7 ± 5.7 (189)	0.003
W/H	0.79 ± 0.08 (170)	0.81 ± 0.08 (184)	0.81 ± 0.07 (186)	0.013
Physical Activity Level	1.59 ± 0.21 (180)	1.55 ± 0.17 (184)	1.59 ± 0.19 (191)	0.06

* Values are given as mean ± SD

Discussion

It is known that SES can affect the food choices by structural, material, and economic factors; attitudes and beliefs towards health and food; and, knowledge about food, nutrition, and health (17). It can affect food choices in many ways, such as economic factors, attitudes, knowledge, and beliefs towards health and food. The relationship between SES and dietary intakes has been investigated in recent years (7). Studies show that high SES is associated with decreased risk of dietary inequalities, and individuals with lower SES are expressed as more prone to diet and health disparities (8). The lower SES seems to be the least likely to purchase or consume foods that are known as healthy foods (i.e., consistent with dietary guideline recommendations) (9). As a long-term outcome of this situation, diet related diseases such as obesity has higher mortality and morbidity rates in low SES groups (10).

Socio-economic inequalities in health and diet, regarding food consumption and choices including fat intake, have been reported in various European countries (25-28). A meta-analysis from several European countries showed that fat consumption differed according to SES groups. Those in a lower SES group had a higher fat consumption particularly saturated fat when compared with those in a higher SES group (28). Our results do not support the above finding. Total fat corresponding to energy intake was slightly higher than the upper limit of Turkish recommendations in high and middle SES groups, while in low SES it was just below the upper limit. However, Shahar et al. (6) reported that the quality of the diet in low SES group should be more focused on dietary fat intake. In contrast, Stallone et al. (19) and Lindström et al. (20) found no SES differences for total fat intake.

The inequality between SES groups and the dietary fat intake was also established in Turkish children (21). It has been proposed that early-life dietary habits together with other environmental factors have a great impact on the later-adulthood life quality (22). A high intake of dietary fat can significantly increase the at-risk population in terms of chronic diseases, such as obesity, coronary heart disease, diabetes, and some cancers (2). Nevertheless, the mean total fat corresponding to energy intake (31.7 %) was found slightly higher in our study than the recommended range for all SES groups. This finding was comparable with the results of the studies conducted in different countries. Nordic countries have a fat intake range from 31% to 42%, Western European countries from 31% to 43%, Mediterranean countries 30% to 41%, and Baltic republics 36% to 44% of the dietary energy (23, 24).

The reported daily fatty acid intakes show variations between studies and countries. Our data about the type of fat in the high SES group revealed that SFA and MUFA intakes were over the recommended values, but the PUFA was lower than the recommended range. The achieved ideal w-6:w-3 ratio in this group is explicable with the low w-6 intake in comparison with both the recommendations and the other groups. Our finding regarding the percentage of w-3 and w-6 intakes corresponding to energy is well above the French women (29). The percentages of total energy from SFA, MUFA, PUFA, and w-6 were in the suggested ranges in middle and low SES groups, whereas w-3 intake was lower and w-6:w-3 ratio was higher. The higher w-6 intake resulted in 2- to 3-fold increase in the w-6:w-3 ratio in these groups. A possible explanation for these differences was due to the type of food choices made in each SES group. The way of explaining these differences lay beneath the food choices of these SES groups. Cereal grains are low in w-3 fatty acids, but high in carbohydrates and w-6 fatty acids. Cereals are a good source of w-6, and there was no significant difference in the amounts of consumption among each group. The contribution of w-6 from nuts and legumes was too low to take into consideration. Vegetable and dairy consumption was highest in the high SES group, and these foods had the lowest amount of w-6. This was probably due to the source and amount of oil in these foods. Although the amount of total fats and oils did not show any difference among SES groups, the differences of MUFA and PUFA, especially w-9 and w-6, intakes confirmed the variability of dietary oil type between the groups. There are different ways to obtain the daily recommended balance of w-6:w-3 in the diet. One of the simplest ways is to modify the oil type, which is used in food preparation and salad dressing. Canola oil, with its high w-3 fatty acids content, and olive oil, with its high w-9 fatty acids,

seem to be the most suitable choices. Nuts, especially walnuts, or linseed can be used as w-3 fatty acid sources. However, their effect on energy intake should be considered along with their energy contents. The dark leafy greens have relatively large amounts of w-3 fatty acid compared to other vegetable sources. One interesting finding of this study was the poor intake of fish consumption in all the SES groups. The contribution of fatty fish to the intake of fatty acids has been well documented. It is recommended to have at least 3 portions of oily fish per week. This message needs to be encouraged in our population group.

Many studies show that unhealthy diets are linked to SES. Diets that are low in animal protein and high in carbohydrate tend to be favoured by lower SES groups (4,6). In the present study, although energy intake of the low SES participants was similar with their high SES counterparts, protein intake corresponding to total energy differed substantially between groups. This discrepancy can also be seen in protein quality. Animal and plant protein intakes were predominantly higher in the high SES and lower in low SES. Total carbohydrate intake and the corresponding percent to total energy changed across the groups. This difference was due to the consumption of bread, cereal, and sugar. These staple foods are more popular in lower SES groups. Snacks, such as candy, chocolate or soft drinks, provide dietary energy at a lower cost compared to fresh vegetables and fruits (18). Shahar et al. (6) reported that in the low SES group, the main contributors of energy were bread, oils, and sugar. These results are mostly in accordance with ours, except that the one regarding the consumption of total fat and oils; there was no significant difference in the consumption amount of this food group among SES groups.

SES was associated with body mass index and waist to hip ratio, both of which are indirect determinates of dietary intake (11). In the present study, although the mean BMI values of each SES group was in the range of overweight, there was a significant difference among the mean BMI values, increasing with decreasing SES. This finding is in good agreement with the other studies that evaluated the tendency of high BMI in low SES (6,12). Waist to hip ratio was used as an indicator of the pattern of subcutaneous adipose tissue distribution. Low values are characteristic of women with a W/H of >0.85 for women is associated with an increased risk for obesity and related diseases (13). Accordingly, mean W/H of each SES group in this study was ranked in suggested range although there were small but significant differences among groups. The mean W/H for all participants was similar with the results of a few other studies conducted on Turkish women without any SES distinction (14,15). Physical activity may play a dominant role in the development of weight gain and obesity. In the present study, the participants in each SES group were physically inactive, considering the recommended PAL of <1.7 (16). In spite of the low energy intake among SES groups, higher BMI is a reflection of having more sedentary lifestyle.

In conclusion, this study shows that total fat and fatty acid intakes significantly differed according to SES. Total fat, SFA, MUFA, and w-3 fatty acid (% of energy) intakes were highest in the high SES group and lowest in the low SES group. Our study highlighted that in order to achieve the recommended w-6:w-3 ratio, a major dietary modification is needed within the Turkish population. The consumption of w-3 PUFA foods, such as fish, nuts, and green leafy vegetables, needs to be encouraged.

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