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RESEARCH ARTICLE

NUTRITIONAL STATUS AND PHYSICAL ACTIVITY LEVEL OF WHITE-COLLAR WORKERS: AN ISLAND EXAMPLE

Burcin Karavelioglu [1], Gunsu Soykut [2], Adile Oniz [3]

[1] 1Faculty of Health Sciences, Department of Nutrition and Dietetics, Near East University, Nicosia, Cyprus
[2] Faculty of Health Sciences, Department of Nutrition and Dietetics, Final International University, Kyrenia, Cyprus
[3] Faculty of Health Sciences, Near East University, Nicosia, Cyprus

ORCID: B.K. 0000-0002-6572-0602; G.S. 0000-0002-8479-1457; A.O. 0000-0002-6619-4106

Corresponding author: Burcin Karavelioglu, **E-mail:** burcin.karavelioglu@neu.edu.tr
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ABSTRACT

Purpose: The conducted study aimed to determine the nutritional status and activity level of white-collar workers.
Material and Methods: 211 volunteers' demographic information, anthropometric measurements, and 3-day food recording were determined. The scales “Diet Quality Index-International (DQI-I)”, “Healthy Eating Index-2015 (HEI-2015)”, and “Dietary Approaches to Prevent Hypertension (DASH)” were used to determine the quality of the diets. The International Physical Activity Questionnaire-Short Form (IPAQ) was used to calculate the activity level of the participants.
Results: The average age of participants were 35.70 ± 9.36, while 70.6% were women. The average diet quality scores for DQI-I, HEI-2015, and DASH were 47.8 ± 9.79, 56.40±14.04, and, 2.70 ±1.29 respectively. The IPAQ average score was calculated as 851.44±1065.01 MET. The IPAQ results showed that only 13.3% of participants had sufficient activity levels. The physical activity level of the men was found to be significantly higher than that of the women ($p<0.05$). The activity levels of participants with good healthy eating index scores were also found to be statistically higher ($p<0.001$). In addition, participants with high DQI-I scores had significantly higher healthy eating habits with HEI-2015 ($p<0.001$).
Conclusion: The current study showed that white-collar workers had insufficient physical activity levels, however, sufficient levels of physical activity were correlated with better diet quality.

Keywords: Physical activity, diet quality, white-collar workers, nutrition

INTRODUCTION

White-collar workers are defined as people who work at a desk in an office as a result of focusing on subjects that require intellectual participation and managerial positions (1). White-collar workers are generally at risk of being inactive due to their limited workspace, intense work programs, and long work hours (2).

Insufficient activity at and outside work affects adults and disrupts their energy balance (3). So, weight gain and insufficient physical activity cause white-collar workers to be faced with chronic diseases (4, 5).When precautions are not taken, these health problems can cause serious diseases such as cardiovascular disease (CVD) and type 2 diabetes (6, 7).

“Sedentary Behaviour Research Network” has been defined as those with limited movement and insufficiently active (8). Sufficient opportunities for movement are not provided for white-collar workers in their workplaces (9, 10). It was observed that white-collar workers worked for at least five hours and were

inactive for nearly half (45.6%) of this time (11). It was determined that ensuring energy balance and making changes for sufficient physical activity is effective in behavior change treatment (12, 13).

Nutritional guides that help protect health provide protective warnings against the potential risks by determining the nutrition level of individuals. The most important of these guides include; the Diet Quality Index-International (DQI-I), developed for chronic diseases by the National Heart, Lung and Blood Institute, and the Healthy Eating Index-2015 (HEI-2015) in determining the quality of diet. The Dietary Approaches to Prevent Hypertension (DASH) score was developed to prevent hypertension (14, 15, 16).

Current studies show that good diet quality lowers mortality rate due to all causes by 20%, cardiovascular diseases by 20%, cancer by 14%, and type 2 diabetes by 19% (17). It has been shown that a diet plan is high in vitamins and minerals and high in dietary fibre, such as fruit and vegetables, and plays an effective role in hypertension control, glucose metabolism, and insulin response (18, 19, 20). The plant-based nutrition rich in protein has a higher protective effect against the risk of CVD in comparison to refined carbohydrates and processed meats (21).

It is important to increase the work productivity of white-collar workers who have an important place in society and protect the workforce's health. The main aims of this study include determining the nutritional habits, diet consumption quality, and physical activity of white-collar workers on the island that have a closed life model and raising awareness for them to take precautions for a healthy lifestyle.

MATERIALS AND METHODS

The current research had been designed as a sub-study of a larger study with a specific focus on white-collar workers. The study consists of 211 white-collar workers aged 18-65 with different occupations. The approval for this study was obtained from Near East University Ethics Committee (Decision no: 2020/85-1212 Date: 26.11.2020). Online announcements were made via email and social media, including non-disabled volunteers in the study. The data was collected between the dates of December 2020-May 2021.

The demographic structure, health information, meal plan, nutritional preferences, and places where the food is consumed were obtained from the participants with an online questionnaire. The anthropometric measurements and 24-hour food consumption records were obtained in a one-to-one meeting with the participants.

Anthropometric measurements: The body composition analysis of individuals was conducted with the Tanita device (BF-350). Their height and waist/hip measurements were taken with a tape measure. Additionally, the Body Mass Index (BMI) of individuals was calculated.

24-hour food record: Individuals were asked to record their food consumption for three days, two on weekdays and one on weekends, with a 24-hour retrospective food consumption form. The participants were given relevant training by researchers about filling out the food record form. The forms were analyzed with the BeBiS 7.1 (student) program. The DQI-I and HEI-2015, and DASH scores were calculated according to the 24-hour food consumption form.

DQI-I:It was used to evaluate the diet content of individuals and measure the diet quality which affects chronic diseases. It includes the eight food combinations of; total fat, saturated fat, cholesterol, fruit and vegetables, grains and legumes, protein, sodium, and calcium. The evaluation is conducted by scoring the four categories of variety, adequacy, moderation, and overall balance separately. The total value is calculated and scored between 0-100, a score over 60 shows that the diet quality is "good" (14).

HEI-2015: The updated HEI-2015 is made up of 13 components, including various nutritional groups and nutrients. When calculating the diet quality, the data obtained from the food consumption records were used and were calculated according to the nutrient/nutritional group contained within each 1000 kcal. The highest score that can be obtained from the total of the components is 100, and the lowest is 0. If according to the total HEI-2015 score, the individuals get ≤ 50, then they are defined as having "bad diet quality"', If they have a total score between 51-80, then their diet "must be improved," and if they get a score of >80, then they have "good diet quality" (15).

DASH: The diet score was calculated using nine nutritional components (fat, saturated fat, protein, cholesterol, fiber, magnesium, calcium, sodium, and potassium). It is evaluated by calculating the individual's food consumption of over 1000 calories of energy according to the reference value. If the individuals obtain the DASH diet score for each nutritional component, they obtain one point; if they

Table 1. Distribution of participants according to their demographic characteristics (%)

	Number (n:211)	%		Number (n:211)	%
Age group (year)			**Level of Education**		
18-24	15	7.1	Primary school	1	0.5
25-34	96	45.5	Middle school	2	0.9
35-44	54	25.6	High school	18	8.5
44-58	46	21.8	Undergraduate	93	44.1
Gender			Postgraduate, Doctorate	97	46.0
Female	149	70.6	**Occupation**		
Male	62	29.4	Teacher	49	23.2
Marital Status			Academician	68	32.2
Married	122	57.8	Banker, Insurance Agent	67	31.8
Single	89	42.2	Other	27	12.8

achieve their mid-aim, they get 0.5 points; if they are below their aim, they receive zero points. The total score is nine, and those who obtain 4.5 and above are accepted to have good diet quality (16).

International Physical Activity Questionnaire-Short Form (IPAQ): It is calculated by taking into consideration the physical activity conducted by individuals in the last week, including the duration (in minutes) and frequency (in days) of walking, moderate and intense activities. MET values are used to calculate the physical activity score; the score for walking is 3.3 MET, for moderate activity is 4.0 MET and for intense activity is 8.0 MET. The participants' activity level is calculated using these values (22).

Statistics: The data were evaluated with the SPSS 20 Statistical Package Program. The arithmetic mean (x), standard deviation (S), mean and median levels were calculated for the quantitative data. Descriptive values suited to the quantitative and qualitative variables were defined. Qualitative variables were represented as numbers and percentages (%), and the quantitative variables were represented with mean and standard deviation (±SS). The “Chi-square Test,” “Fisher Exact Test,” “T-test in independent groups” and “Correlation” analysis was applied to the differences between the results obtained from the used questionnaires and scales and the distributions of the observed frequencies related to the anthropometric measurements**.**

RESULTS

This research was conducted with the participation of 149 women (70.6%) and 62 men (29.4%) with a mean age of 35.70±9.36 who live in the northern part of Cyprus. The individuals were mostly in the age group of (45.5%) 25-34 and their level of education is undergraduate or above (90.1%). 57.8% of the participants were married (Table 1). The mean BMI of the participants was 24.51±4.73 kg/m^2 for women and 27.45±5.12 kg/m^2 for men; the body fat percentage was 30.32±7.62 kg for women, 23.04±8.05 kg for men. The results show that the BMI of the white-collar workers was significantly higher than the BMI of the women, ($p<0.002$) whereas the women’s body fat percentages were significantly higher than the men’s ($p<0.000$) (Table 2).The mean IPAQ score was 851.44±1065.01 where men had a statistically significant higher physical activity score than the women ($p<0.05$); for the healthy eating indexes the DASH mean score was 2.70±1.29; The DQI-I mean score was 54.89±10.92; and the HEI-15 mean score was 56.40±14.04. Regarding healthy eating scores, the DQI-I, DASH and HEI-2015 mean scores are compared, a statistically significant difference was

Table 2. Evaluation of the anthropometric measurements of participants according to their gender

	Female (n:149)		Male (n:62)		p
	X±SS	Median	X±SS	Median	
Height (cm)	163.92±6.09	164.00	177.62±7.05	177.00	-
Weight (kg)	64.60±12.59	64.00	85.11±16.83	79.75	-
BMI (kg/m^2)	24.51±4.73	23.20	27.45±5.12	26.85	0.002*
Body fat percentage (%)	30.32±7.67	27.60	23.04±8.05	22.85	0.000**
Waist (cm)	83.23±11.48	82.00	97.20±14.12	95.00	0.032*
Hip (cm)	100.81±10.65	100.00	103.70±10.07	101.50	0.029*

found (p=0.01). When the DASH mean scores are compared to the HEI-2015 and DQI-I although the mean evaluation of there was no statistically significant relationship found (p=0.06). When the awareness between the DASH diet score and activity levels was evaluated, a statistically significant difference was observed between the participants (p=0.00). When the HEI-2015 diet mean scores of participants who had a good DASH diet score were compared with the group who needed to improve their DASH diet scores a significant relationship was found between the DASH diet score and activity (p=0.00). It was also found that the DQI-I score and DASH diet compliance were statistically in the good category (p=0.00) (Table 3).

The activity level of 58.2% of the participants with good DQI-I scores is low, and 41.8% have a sufficient activity level (Table 4). The activity level of 36.8% of the participants with good HEI-2015 scores have an insufficient activity level, and the activity of 63.2% is sufficient. The table shows the comparison of participants' activity and eating index. DQI-I and HEI-2015 diet scores of white-collar workers show a significant difference in the physical activity level of those with good diet scores. The physical activity level of 58.1% of participants with a good DASH score was low, and 41.9% had sufficient physical activity. A significant difference was found between the diet quality of those who were active and inactive (p <0.05).

Table 5 shows white-collar workers' daily mineral consumption according to their three-day, 24-hour food consumption records. When the white-collar workers participating in the study were asked if they had been diagnosed with any diseases, 13.3% stated that they had been diagnosed with CVD, 10% were diagnosed with hyperlipidemia, and 15% were diagnosed with high blood pressure.

When the participants' habits of eating out were asked, it was notified that 94.8% of them eat out. Frequency of eating out is 60%, and 58% of the participants who eat out at least once a week prefer to consume their home-cooked meals both at home and at work.

DISCUSSION

A balanced eating plan must include sufficient nutrients and meet the reference consumption levels (23). When the diet quality mean scores of the white-collar workers working in the island country were examined according to the healthy eating indexes, it was determined that their diet quality was insufficient. It was also determined that the diet index scores of those with a higher level of physical activity were better and that the participants tended to eat healthier as their age increased.

The study showed that the body fat percentage of 82.6% of the participants who had insufficient physical activity was high (24). The waist measurement of 45.7% of the same participants showed that they were either in the category of increased health risk or very high health risk. A study shows that the BMI of those with a sufficient level of activity was <25 kg/m2, that their waist measurements were ideal, and that the level of activity and diet quality increased with age (25). Another study on women showed that as the level of activity and diet quality improved, their waist measurements decreased, and their BMI was normal (26). It is seen that inadequate diet for working

Table 3. The activity level of participants and diet index scores according to their gender

		Female (n:149)		Male (n:62)		Total (n:211)		p
		n	%	n	%	n	%	
DQI-I	**Good**	50	33.6	18	29.0	68	32.2	**0.295***
	Needs to be improved	99	66.4	44	71.0	143	67.8	
	Total	**149**	**70.6**	**62**	**29.4**	**211**	**100**	
HEI-2015	**Good**	52	69.3	23	30.7	75	35.5	**0.270***
	Needs to be improved	88	71.0	36	29.0	124	58.8	
	Insufficient	9	75.0	3	25.0	12	5.7	
	Total	**149**	**70.6**	**62**	**29.4**	**211**	**100**	
DASH	**Good**	22	14.8	9	14.5	31	14.7	**0.229***
	Needs to be improved	127	85.2	53	85.5	180	85.3	
	Total	**149**	**70.6**	**62**	**29.4**	**211**	**100**	
IPAQ	**Low level of PA**	100	67.1	25	40.3	125	59.2	**0.001***
	Moderate level of PA	35	23.5	23	37.1	58	27.3	
	High level of PA	14	9.4	14	22.6	28	13.3	
	Total	**149**	**70.6**	**62**	**29.4**	**211**	**100**	

*= T-test in independent groups

women is reflected in their waist measurements resulting in an increased risk of cardiometabolic diseases and that the activity level was insufficient at a rate of 67.1% for the women workers in our study.

The mean DQI-I score of the white-collar workers that participated in our study is good at 32.4%, and it was seen that 67.7% of the participants have diet quality scores that are at a level that needs to be improved. A study where the relationship between the diet quality and anthropometric measurements of adults was examined showed that the DQI scores of the participants were insufficient and that the men had a higher diet quality score than the women (27). Another study conducted on white-collar workers showed similar results to our study. When compared with other workers, it was found that white-collar workers consume more salt and saturated fat and thus have a higher health risk (28).

A study with the HEI-2015 examined the protective effect of diet quality scores and level of physical activity against cardiovascular diseases. It stated that a balanced diet has potential benefits due to its positive impact on the HEI-2015 scores and risk of diseases (29). When our study is compared with the other, the HEI-2015 scores are higher. However, the activity level is lower than the further study.

Another study investigated the effects of age, education, and activity levels of military personnel who are active due to their position on BMI stated that people who have an active job have a lower health risk (30). Another study conducted with the healthy eating index shows that HEI-2015 has a positive effect on the BMI through the comparison of data from two different student groups where their physical health was evaluated (31). In present study, the activity level and IPAQ score were seen to be at a sufficient level for participants who received good HEI-2015 scores.

Table 4. Participants' activity level and diet quality index scores and standard deviation

DQI-I		Good		Needs to be improved		Total (n:211)		p
		n	%	n	%	n	%	
	Low level of PA	40	58.5	85	59.4	125	59.2	
	Moderate level of PA	19	27.9	39	27.3	58	27.3	0.001*
	High level of PA	9	13.2	19	13.3	28	13.3	
	Total	68	32.2	143	67.8	211	100	
HEI-2015		Good		Needs to be improved		Insufficient		Total		p
		n	%	n	%	n	%	n	%	
	Low level of PA	46	36.8	75	60.5	4	3.2	125	59.2	
	Moderate level of PA	20	34.5	34	58.6	4	6.9	58	27.5	0.001*
	High level of PA	9	32.1	15	53.6	4	14.3	28	13.3	
	Total	75	35.5	124	58.8	12	5.7	211	100	
DASH		Good		Needs to be improved		Total (n:211)		p
		n	%	n	%	n	%	
	Low level of PA	18	58.1	107	59.4	125	59.2	
	Moderate level of PA	7	22.6	51	28.3	58	27.5	0.062*
	High level of PA	6	19.4	22	12.2	28	13.3	
	Total	31	14.7	180	85.3	211	100	

*= T-test in independent groups (Benferroni)

It has been determined that a DASH eating program is effective in treating hypertension (15). The mean DASH score in our study was 2.70±1.29. However, a DASH score of over 4.5 is needed to be classified as recommended (33). So, in general, the DASH diet had not been applied by the participants of this study. When the rates of diseases related to the DASH eating model are examined in this study, the rates were found to be 4.3% for hypertension, 3.8% for CVD, 2.3 % for hyperlipidemia, and 1.9% for diabetes. It was seen that 14.7% of the participants were compatible with the DASH diet and that 85.5% of men and 85.2% of women had diets that were not compatible with the DASH diet. When the age distribution is considered, it was seen that the DASH score of those between the ages of 25-34 and university graduates, those who were married, and academicians were insufficient. A study that examined participants' BMI and blood values showed that BMI and blood parameters were regulated after six months of the DASH diet and exercise treatment (34).

A study conducted by Kahleova et al. (2017) shows that irregular meals result in a fat increase around the waist and an increased BMI (35). A recent study conducted in Tanzania by Zubeyn et al. (2021) shows that 68.9% of white-collar workers, such as bankers, teachers, and health workers, had a weight problem compared to previous studies; the weight of white-collar workers is increasing (36). A similar study, where individuals' diet and activity levels were examined, determined that 68.0% of white-collar workers were inactive (37). The study showed that work environments with insufficient activity opportunities increase the risk of obesity. The study

Table 5. The daily sodium, potassium, magnesium, and calcium consumption according to the three-day food consumption records of white-collar workers, compared to their CVD (cardiovascular disease) has been given.

Mineral	Na (mg)	K (mg)	Ca (mg)	Mg (mg)
Recommended daily consumption (TUBER2022)	2300 mg/d	4.700 mg/d	1000 mg/d	Female 300 mg/d Male 350 mg/d
Participants (n:211; 100%)	2.671	2.231	653.1	263.2
CVD (13.3%)	2.691	2.520	629.5	292.7
Hyperlipidemia (10%)	2.615	2.509	783.8	321.3
Hypertension (15%)	2.701	2.770	659.6	330.9

found that 32% of office workers had a larger waist measurement and carried higher health risks (38). White-collar workers had high blood lipid values, low high-density protein, high blood pressure problems, and metabolic syndrome issues at a rate of 33% (39). Activities that encourage health, such as company exercise and healthy eating training, must be planned to prevent the risk of metabolic syndrome and CVD. The nutrition knowledge level of white-collar workers can be improved through the training given by specialists to achieve healthy body measurements (40, 41).

The amount of sodium (Na) recommended for daily intake is 2300 mg; however, the American Heart Association states that the recommended amount is 1500 mg/day or less for optimal health, especially for those diagnosed with hypertension. In our study, the average daily intake of Na was calculated to be 2671 mg/day, and this rate was 2701.6 mg/day in hypertension patients with a heart problem which is nearly twice the recommended amount. (23, 42).

The average magnesium (Mg) consumption of white-collar workers who participated in our study was 263 mg/day, which was insufficient and below the reference value recommended for both genders. Our study showed that white-collar workers consumed insufficient foods containing magnesium. Magnesium deficiency can cause health risks such as high blood pressure, depression, and inflammation (23, 43).

The DASH diet 2000-calorie eating plan contains 4700 mg/day of potassium (23). In our study, the average daily consumption of potassium was found to be 2231.7 mg. As well as physical activity, consuming potassium-rich foods such as fruit and vegetables are known to prevent hypertension, help regulate blood sugar, and have an antihypertensive effect (40, 44). In our study, the consumption of fruit and vegetables rich in potassium was found to need to be increased. A daily calcium amount of 1000 mg/day is recommended for adults (23). In our study, the general calcium consumption was calculated to be 653.5 mg/day, which is insufficient for the general adult population. Sufficient calcium through recommended diets has been shown to protect against CVD (45).

A study showed that the healthy eating index scores of those who ate homemade food were higher (46). The DQI-I scores that the diet quality was poor in young age gruop (47). The intense working environment affects the eating patterns of the white-collar workers, they prefer readily available foods (48). Another study looked for a link between work experience and eating habits. It is seen that especially younger workers prefer to consume drinks with high sugar content (49). Additionally, skipping meals due to a busy work environment also results in weight gain (50). In our study, the rate of those who ate outside of work was determined as 98.4% and those who made and ate their own food during work hours were 58%. It has been reported that workload affects skipping meals and 15.6% of employees skip lunch due to workload.

CONCLUSION

Our study is an up-to-date study conducted with a sample from an island country. Although the level of activity of white-collar workers with good diet quality was good, this study has generally shown that they are not active enough and that their diet quality is not geared to protect their health. It is seen that adopting a healthy diet habit, encouraging white-collar workers to increase their physical activity, and ensuring a

healthy level of BMI and body fat percentage will positively affect both the protection of their health and their motivation. Providing sufficient time and a suitable environment for physical activity, the opportunity to access a balanced meal and healthy snacks through changes in the workplace will encourage white-collar workers to make healthy lifestyle changes. In addition, making sure healthy snacks such as fruit, yogurt, and water that must be consumed are easily accessible will help healthy eating. As well as changes in the meals consumed within working hours, receiving training support from a dietician/nutritionist will help white-collar workers make the correct choices to meet their daily needs.

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