Nutrition and Physical Activity in Iranian Dyslipidemic Patients

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Abstract- Dyslipidemia is an important cause of cardiovascular diseases with increasing rates among adult populations. Nutrition and physical activity are known to have an impact on degrees of dyslipidemia. In this article, we had a study on nutritional behaviors and physical activities among middle-aged adults with and without dyslipidemia. In this case-control study, 200 middle-aged adults were entered. One hundred adults with dyslipidemia and 100 normal adults were included in this study. Data regarding desirable or undesirable use of fruits, vegetables, dairy, saturated fatty acids, fast foods, carbonated drinks, and extra salt intake with every meal were collected. Intensity and duration of physical activities were also collected from our data bank and analyzed with SPSS software. Our results indicated that people with dyslipidemia had a significantly increased usage of fast foods and saturated fatty acids, while the normal population had increased usage of vegetables and dairy. There were also significantly increased in intensity, duration per day, and weekly days of physical activity in healthy groups. Logistic regression indicated that undesirable consumption of fast foods, dairy, fatty acids, vegetables, and undesirable physical activity increases the risks for dyslipidemia (OR=8.2, OR=16.2, OR=8.2, OR=18.3, and OR=25.3 respectively) (P<0.05). This article emphasizes the role of proper nutritional behaviors and higher physical activities in decreasing the risks of dyslipidemia, and we suggest that further preventive interventions could be made based on the results of our study.

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Introduction

Cardiovascular diseases are still one of the leading causes of death in most developed and developing countries (1). World Health Organization (WHO) reported that almost 12 million people die each year due to cardiovascular diseases, and most of all, middle-aged adults (between 30-59 years) are affected (2,3). Several risk factors and mechanisms have been accounted for cardiovascular diseases. Inappropriate lipid profile could be one of the most important basic risk factors which might cause cardiovascular diseases (4). It should also be noted that one of the main characteristics of metabolic syndrome is hyperlipidemia (5). Lipids play pivotal roles in our body, including maintaining cell integrities, energy resources, synthesis of steroid hormones, and also biliary acids (6). Inappropriate lipid profiles could be caused by abnormal metabolisms of lipoproteins, which lead to lower amounts of high-density lipoprotein (HDL), higher levels of low-density lipoprotein (LDL), and increased levels of triglyceride (TG) (7). Dyslipidemia can also initiate the atherosclerosis process, which later could end up to the coronary artery and also cardiovascular diseases (8). Dyslipidemia is reported by WHO to the cause of 4.5% of all deaths and 2% of all disability-Adjusted Life Years (DALYs) (9). This issue has been one of the most serious concerns of health providers and researchers. STEPS study, which was performed on the Iranian population, indicated that 88.9% of the Isfahan population have improper fruit and vegetable consumption, and 32.1% of them have high cholesterol levels (10).

The lipid profile is affected by several intrinsic and extrinsic factors. As for any other chronic disease, genetics could play a fundamental role in dyslipidemia (11). Other intrinsic factors are age, sex, race, positive family history, and hormones (12). Such factors are unchangeable, and physicians pay much attention to extrinsic factors. Studies indicate that dietary oil intake can influence both profiles and metabolisms of lipids, and different animal or vegetable oils could change lipid profiles in different manners (13). Other factors include

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physical activity, diet, and medications (12). Inappropriate lifestyle habits such as increased consumption of fast food and decreased physical activities are becoming common among populations, and as a result, the prevalence of chronic diseases has risen through past decades (14). Lack of sufficient physical activity and an unhealthy diet are well proven to have influences on dyslipidemia (15). So far, the results have been promising, but there is still much to know about the roles of the amounts and kinds of physical activity and nutritional diet and their correlations to dyslipidemia. Lifestyle is the most important affecting factor in many diseases, which is also consisted of many units. Here, we had a study on physical examinations and nutritional factors such as fruits, vegetables, dairy, fatty acids, fast foods, carbonated drinks, and extra salt intake with every meal.

In this study, we aimed to have a study on the middle-aged population of Isfahan, to collect data on their nutritional behaviors and physical activity and compare these data among adults with or without dyslipidemia in the population which are under our healthcare surveillance.

Materials and Methods

This case-control study was performed in 2018 in Isfahan. Our study population consisted of 200 middle-aged (30-59 years) adults. Inclusion criteria were being middle-aged and under health care surveillance in one of the 12 health care units in Isfahan in 2015- 2016 and also having complete documents. The exclusion criterion was having document completed less than 20% of expected information. All of our study population had been previously under health care services, and their lipid profile has been measured by health care workers themselves or valid laboratories. Questionnaires of physical activity and nutritional behavior had been previously filled by health care workers via interviewing each case.

The study population was divided into two groups: group 1: people who had dyslipidemia (n= 100). Group 2: healthy control adults (n=100). Dyslipidemia was defined based on ATP III guideline as following: Total cholesterol (Chol)> 200 mg/dl, TG> 150 mg/dl, LDL> 130 mg/dl, HDL< 40 mg/dl in male patients and HDL< 50 mg/dl in females. It should also be mentioned that we chose new cases of dyslipidemia or those with uncontrolled dyslipidemia. After filling nutritional and physical activity questionnaires, desirable or undesirable categories were ascertained by health care workers through the following method:

Desirable nutritional habits were accounted for daily usage of 2-3 units of dairy, 3-5 units of fruits, and 5 or more units of vegetables. Also, rarely or never usage of fast food and carbonated drinks considered to be desirable. Avoiding consumption of saturated fatty acids and no intake of extra salt with every meal were desirable habits, too. Undesirable nutritional habits were eating dairy less than two units, vegetables less than five units, and fruitless than three units a day. Weekly usage of fast food and carbonated drinks, extra salt intake with every meal, and consumption of saturated fatty acids were undesirable. Desirable physical activity was accounted for 3-5 days a week for at least 30 minutes with moderate to high intensity. These data were also included nutritional habits and physical activity of their past single month for each case. Our research team collected these data from data banks in 2015-2016 from health care units. It should also be noted that no ethical issues were mentioned because data were collected anonymously from the data bank. In the end, data were collected and analyzed by SPSS software version 24 using descriptive statistics, T-test, chi-square, and logistic regression analysis ("enter" method). Variables included were: education, fast foods, dairy, fatty acids, vegetables, physical activity, job, and marital status.

Results

A total of 100 adults with dyslipidemia and 100 healthy adults were entered into this case-control study. There were no significant differences between the two groups regarding age and sex (P>0.05). Other information about the two groups is summarized in table 1.

Table 1. Demographic variables in patients with dyslipidemia and normal subjects

Variables		Normal population	Patients with dyslipidemia	*P*
Age		45.5±11.2	45.1±10.5	0.93
Gender	**Male**	54 (54%)	50 (50%)	0.67
	Female	46 (46%)	50 (50%)	
Education	**End of elementary education**	12 (12%)	7 (7%)	<0.05 *
	First middle school term	35 (35%)	23 (23%)	
	Diploma	40 (40%)	38 (38%)	
	End of college education	13 (13%)	32 (32%)	
Job	**Housewife**	0 (0%)	23 (23%)	<0.001 *
	Manual worker	30 (30%)	12 (12%)	
	Sedative job	49 (49%)	58 (58%)	
	Unemployed	21 (21%)	7 (7%)	
Marital status	**Single**	13 (13%)	0 (0%)	<0.001 *
	Married	71 (71%)	31 (31%)	
	Widow /Divorced	16 (16%)	69 (69%)	

*: Significant at 0.05 (chi-square)

Our results also indicated that patients with dyslipidemia had an improper usage of fast foods, saturated fatty acids, dairy, vegetables, and had lower physical activity (P<0.001). Lower intensity for physical activities was found in patients with dyslipidemia, while healthy adults had medium to high-intensity physical activities for a longer period of time per day (P<0.001). All this information is shown in table 2. Healthy adults had also higher intensity, duration per day, and weekly days of physical activity (P<0.001).

Table 2. Lifestyle behaviors of patients with dyslipidemia and healthy subjects

Behavior nutrition and physical activity		Undesirable	Desirable	*P*
Fast food	**Healthy control**	24 (24%)	76 (76%)	<0.001 *
	Patients with dyslipidemia	57 (57%)	43 (43%)	
Fruits	**Healthy control**	41 (41%)	59 (59%)	0.10
	Patients with dyslipidemia	51 (51%)	49 (49%)	
Carbonated drink	**Healthy control**	75 (75%)	25 (25%)	0.26
	Patients with dyslipidemia	70 (70%)	30 (30%)	
Dairy	**Healthy control**	33 (33%)	67 (67%)	<0.001 *
	Patients with dyslipidemia	86 (86%)	14 (14%)	
Saturated fatty acids	**Healthy control**	24 (24%)	76 (76%)	<0.001 *
	Patients with dyslipidemia	76 (76%)	24 (24%)	
Vegetables	**Healthy control**	10 (10%)	90 (90%)	<0.001 *
	Patients with dyslipidemia	61 (61%)	39 (39%)	
Extra salt intake with every meal	**Healthy control**	67 (67%)	33 (33%)	0.04
	Patients with dyslipidemia	65(65%)	35 (35%)	
Physical activity	**Healthy control**	22 (22%)	78 (78%)	<0.001 *
	Patients with dyslipidemia	79 (79%)	21 (21%)	

*: Significant at 0.05 (chi-square)

Based on multiple logistic regression of demographic variables and nutritional behavior and physical activity, a significant difference was observed between education and dyslipidemia in the way that higher educational levels, *i.e.*, diploma and end of a college education, could increase the risks for dyslipidemia (OR=2.3, $P<0.05$). Undesirable consumption of fast foods, dairy, saturated fatty acids, vegetables, and undesirable physical activity increased the risks for dyslipidemia (OR=8.2, OR=16.2, OR=8.2, OR=18.3, and OR=25.3 respectively) ($P<0.05$). These data are summarized in table 3.

Table 3. Logistic regression of different variable and dyslipidemia

Variable		OR	95% CI	*P***
Education		2.3	1.32-4.29	0.004
Fast food	**Desirable ***	8.2	2.38-28.5	0.001
	Undesirable			
Dairy	**Desirable ***	16.2	4.50-58.44	<0.001
	Undesirable			
Fatty acids use	**Desirable ***	8.2	2.51-27.29	0.001
	Undesirable			
Vegetables	**Desirable ***	18.37	4.68-72.00	<0.001
	Undesirable			
Physical activity	**Desirable ***	25.37	7.10-90.59	<0.001
	Undesirable			

*: Reference category
**: Significant at 0.05

Discussion

Here, we indicated that patients with dyslipidemia had improper nutritional habits and lowered physical activity compared to healthy controls. Furthermore, our results showed that the intensity and duration of physical activity were higher in healthy populations. Our analysis also showed that undesirable consumption of fast foods, dairy, saturated fatty acids, vegetables, and undesirable physical activity could increase the risks for dyslipidemia. In a study performed by Abdel Wahed and colleagues, they had a study on 384 university students and indicated a high prevalence of dyslipidemia among them. They also indicated that frequent fast-food consumption and low fruit and vegetable consumption were associated with increased risks for dyslipidemia (16). These results are in line with the results of our study. Furthermore, we indicated that undesirable physical activity, along with undesirable nutritional habits, play important and pivotal roles in developing dyslipidemia. On the other hand, we performed logistic regression for different variables and indicated different odds ratios for variables, which are another point of the importance of our study. Devaraj *et al*. also showed that nutritional factors, including high-fat, energy-dense, and fast foods play pivotal roles in increasing the risks of oxidative stress in metabolic syndrome (17), but no OR was reported for such risks. These data could be a clue in relation to fast food consumption and inappropriate nutritional behavior and increased risks of cardiovascular diseases. Takahashi and colleagues also had a study on 979 subjects and indicated that a healthy nutritional diet, including higher vegetable consumption, would protect against dyslipidemia (OR=0.36) (18). Such information is in line with our study, which declared the importance of nutritional factors in dyslipidemia. We showed that undesirable vegetable intake increases the risks for dyslipidemia (OR=18.37). As we showed, proper nutritional habits that could affect dyslipidemia are: increased dairy and vegetable consumption and decreased usage of saturated fatty acids and fast food.

We also showed that undesirable physical activity increases the risks of dyslipidemia. Erem and colleagues had a study on 4809 subjects and declared that the prevalence of dyslipidemia was lower in people with higher educational levels and higher physical activities. They also indicated that dyslipidemia was significantly associated with male gender, education level, cigarette smoking, alcohol consumption, occupation, especially in housewives and marital status of widows and widowers (19). The results of their study are somehow in line with our study, as we indicated that physical activity plays protective roles against dyslipidemia. On the other hand, we indicated that higher educational levels are associated

with higher chances of dyslipidemia. This difference could be due to cultural and population differences and also differences in a number of studied cases. Regional studies indicate that Iranian people with higher educational levels have lower physical activity, and this cultural difference is the most important cause of such differences between studies (20). LeBlanc and colleagues also indicated that higher physical activity is associated with lower chances of developing dyslipidemia. Another study by Delavar *et al*., reported no significant association between dyslipidemia and carbohydrate, fat intake, or physical activity among middle-aged women (21). They had a study on 809 middle-aged Iranian women and declared no association between dyslipidemia and carbohydrate, fat intake, or physical activity. These results are not in line with our study, while we indicated that undesirable usage of saturated fatty acids, fast food, dairy and vegetables, and undesirable physical activity increase the risks for dyslipidemia. These differences in the results of our study and the study by Delavar and colleagues could be due to differences in our methods. Their study was a cross-sectional study which was performed only on women while we performed a case-control on both men and women.

As a result, we declare that proper nutritional behavior and higher physical activities play an important role in decreasing the risks of dyslipidemia. We also showed that the consumption of fast foods and fatty acids increased the chance of dyslipidemia, and consumption of fruits, vegetables, and higher physical activity decreased its chance. Preventive interventions could be made based on this data.

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