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Association among lifestyle status and dyslipidemia in Yasuj

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Abstract

Introduction: Diabetes care involves more than glycemic control and it is important to manage other cardiovascular risk factors. Along with dietary and pharmacological interventions, exercise is a key element of diabetes management. The aim of this study was to determine the effects of short term lifestyle activity modification (LAM) on lipid profiles obese and overweight middle aged men with type 2 diabetes.

Introduction: Dyslipidemia is caused by genetic and environmental factors that lead to problems with enzyme deficiencies, apolipoproteins, or lipoprotein particles. There

are a number of factors that contribute to dyslipidemia; however these factors are not well known. Thus the aim of this study was to determine the association among lifestyle status and dyslipidemia.

Material & Methods: One hundred eighty three male (n=102; mean±SD: 34.9±11.8 years old) and female (n=81; mean±SD: 32.4±11.2 years old) participated in this study. Each subject's lifestyle status was assessed by a self-administered questionnaire based on Breslow's lifestyle index and a composite dietary behavior score obtained from self-reported responses to a 24-item food-frequency.

Results: The results demonstrated a positive relationship between age and BMI with dyslipidemia ($P<0.05$). On the other hand, the results showed that there is a positive relationship between less healthy foods with total cholesterol, triglyceride and LDL-c and a positive relationship between healthy foods and HDL-c levels. General linear regression demonstrated that fast food consumption was independently associated with blood lipid profile in male and female.

Conclusions: In conclusion, unhealthy lifestyle, especially having bad food consumption pattern may cause dyslipidemia.

Key words: Breslow's lifestyle index, Physical activity, Food consumption pattern, Dyslipidemia

1. Introduction

Chronic diseases, often referred to as noncommunicable diseases (NCDs), usually emerge in middle age after long exposure to an unhealthy lifestyle involving tobacco use, a lack of regular physical activity, and consumption of diets rich in highly saturated fats, sugars, and salt, typified by "fast foods." This lifestyle results in higher levels of risk factors, such as hypertension, dyslipidemia, diabetes and obesity that act independently and synergistically (1). Adult-Treatment Panel III (ATP-III) of the National Cholesterol Education Program adopted the Low-

density lipoprotein cholesterol (LDL-c) ≥ 160 mg/dL, high-density lipoprotein cholesterol (HDL-c) < 40 mg/dL, triglyceride ≥ 200 mg/dL or total cholesterol ≥ 240 mg/dl as a major component of the clinical diagnostic criteria of the dyslipidemia (2). Dyslipidemia is one of the top 5 major risk factors leading to cardiovascular disease (3). In the Islamic Republic of Iran, cardiovascular diseases account for 38% of deaths (4). Previously we showed that 24.6% of men had high cholesterol and 36.1% had high triglyceride and the prevalence of high LDL-c was 6.6% for men and 6.1% for women and that of low HDL-c was 47.6% and 53.1% respectively (5). These results showed that lipid disorders in Tehran were more prevalent than in Turkey (6), Canada (7) and England (8). Several studies have indicated that vascular diseases have multifactorial etiology. Many factors, both known and unknown, contribute to the risk of cardiovascular diseases (9). Therefore, to be fully effective, a preventive strategy must deal with multiple elements. Among the environmental factors influencing the occurrence and degree of risk factors, nutrition and lifestyle are of particular importance (10). Although the general food pattern of the Iranian population falls within the accepted ranges, the trend in the past 30 years reveals a twofold increase in fat intake (4). Recent increases in fat intake accompanied by changes in lifestyle warrant concern, and the relationship between lifestyle factors and serum lipid and lipoprotein levels is therefore of considerable interest. Although effective pharmacological treatments for hyperlipidemia have been developed, long-term use of cholesterol-lowering drugs carries both costs and risks (11). It is currently recommended that individuals with dyslipidemia be targeted for therapeutic lifestyle changes, which consist mainly of increases in physical activity and improvements in diet (3,12). Therefore, the main emphasis in population-based preventive strategies should be on changes in lifestyle such as dietary and physical activity habits. The aim of present study was to investigate the association among lifestyle status, food consumption pattern and dyslipidemia in Yasuj.

2. Materials and methods

One hundred eighty three male (n=102) and female (n=81) aged 14 to

74 years (mean ± SD: 33.8 ± 11.6 years) living in Yasuj, the capital of kohgiluyeh and boyer-ahmad in the southwestern of the Islamic Republic of Iran, participated in this study. Written informed consent was signed by all participants. The Islamic Azad University of kohgiluyeh and boyer-ahmad Ethics Committee approved the protocols, which were fully explained to all subjects.

The lifestyle status of each subject was assessed by self-administered questioners based on Breslow's lifestyle index (13). Each subject answered "yes" or "no" to seven questions regarding breakfast, exercise, sleeping, control of body weight, drinking, snacks between meals, and smoking. The answers of "yes" or "no" indicated "proper" and "improper" as to each lifestyle, respectively. The answer of "yes" was assigned 1 point, whereas "no" was 0 point. The sum of the assigned points was designated as the total score of the index for each subject. Diet was assessed using a 22-item food-frequency questionnaire (14). A composite dietary behavior score was obtained and respondents were categorized into 2 groups indicating less and more healthy eaters respectively. Participants were asked how often they ate specific foods (e.g. red meat, milk, fish) known to be frequently consumed by Iranian households in their daily diets. All 22 food items were scored on a scale of 1 to 5 according to their health-giving properties and how often they were eaten, with a higher score indicating a healthier diet. Thus, foods with high fats scored 1 for most days and 5 for rarely or never, whereas foods with high fiber scored 5 for most days and 1 for rarely or never. Height and body weight were measured, and body mass index (BMI; kg/m^2) was calculated from height and weight of each subject. All subjects fasted at least for 12 hours and a fasting blood sample was obtained by venipuncture. Serum cholesterol, triglycerides and HDL-c were measured using enzymatic kits. LDL-c was calculated using the Friedewald formula.

Statistical analyses were performed with SPSS program (version 13, SPSS, Inc., Chicago, IL). Values were expressed as mean ± standard deviation (SD). General linear regression analysis and spearman's correlation were performed to calculate a correlation between food consumption pattern, lifestyle status and dyslipidemia parameters. P-values less than 0.05 were considered statistically significant.

3. Results

The mean ± SD of anthropometric characteristics and blood lipid profile of the subjects are presented in Table 1. Results showed that a higher proportion of male were obese (7.8% *vs.* 2.4%) and overweight (49% *vs.* 39.2%) than female. A further 56.9% of female and only 42.1% of male had the normal weight. By according Table 1, low level of HDL-c is the main parameter in dyslipidemia among all of the participants. The results showed that high level of LDL-c has the lowest prevalence in our population.

Table 1. Anthropometric and metabolic characteristics of the subjects (mean ± SD)

	Male		Female	
Height (cm)	170.7 ± 8.1		161.4 ± 8.5	
Body weight (kg)	73.9 ± 11.5		62.9 ± 8.6	
BMI (kg/m^2)	25.3 ± 3.4		24.2 ± 3.0	
	n	%	n	%
Underweight	1	1	1	1.2
Normal weight	43	42.1	45	56.9
Overweight	50	49	31	39.2
Obese	8	7.8	2	2.4
Cholesterol (mg/dl)	181.5 ± 53.1		164.9 ± 61.7	
	n	%	n	%
Normal	81	81.8	75	92.5
Abnormal	18	18.2	6	7.5
Triglyceride (mg/dl)	188.7 ± 74.6		164.6 ± 71.5	
	n	%	n	%
Normal	69	69.7	69	85
Abnormal	30	30.3	12	15
HDL-c (mg/dl)	42.3 ± 10.6		40.1 ± 9.2	
	n	%	n	%
Normal	49	49.5	37	45.6
Abnormal	50	50.5	44	54.5
LDL-c (mg/dl)	104.0 ± 31.7		96.3 ± 31.1	
	n	%	n	%
Normal	93	93.4	78	96.3
Abnormal	6	6.6	3	3.7

The frequency of consumption of the main food items are presented in Table 2. Many participants consumed foods known to be less healthy few days a week. For example, cream, sausages and solid fat were rarely or never consumed by a large proportion of respondents. On the other hand, a substantial proportion of people consumed healthier foods (e.g. bread, rice, Peas/beans and Tea/coffee) many days a week. However many participants did not consume fish several days a week.

Table 2. Frequency of consumption of main food groups by the subjects

Food group	Most days		2-3 times/week	
	Male n (%)	Female n (%)	Male n (%)	Female n (%)
Less healthy foods				
Red meat*	18 (17.6)	3 (3.7)	54 (52.9)	33 (40.7)
Soft drinks*	22 (21.6)	11 (13.3)	30 (29.4)	5 (6.2)
Cakes/pastries*	6 (5.9)	4 (4.9)	24 (23.5)	32 (39.5)
Butter	18 (17.6)	19 (23.5)	22 (21.6)	22 (27.2)
Chocolates	5 (4.9)	6 (7.4)	22 (21.6)	26 (32.1)
Ice cream	4 (3.9)	3 (3.7)	15 (14.7)	20 (24.7)
Cream	12 (11.8)	19 (23.5)	28 (27.5)	18 (22.2)
Sausages	10 (9.8)	11 (13.6)	16 (15.7)	6 (7.4)
Solid fat	12 (11.8)	19 (23.5)	28 (27.5)	18 (22.2)
More healthy foods				
Bread	96 (94.1)	74 (91.4)	4 (3.9)	5 (6.2)
Tea/coffee*	72 (70.6)	40 (49.4)	18 (17.6)	24 (29.6)
Vegetables	30 (29.4)	36 (44.3)	42 (41.2)	23 (28.4)
Fruits*	31 (30.4)	40 (49.4)	51 (50)	22 (27.2)
Rice*	95 (93.1)	62 (76.5)	5 (4.9)	1 (1)
Cheese	29 (28.4)	30 (37)	47 (46.1)	34 (42)
Yoghurt	29 (28.4)	37 (45.7)	51 (50)	27 (33.3)
Eggs	25 (24.5)	9 (11.1)	54 (52.9)	53 (65.4)
Peas/beans*	63 (61.8)	32 (39.5)	26 (25.5)	33 (40.7)
Chicken*	43 (42.2)	9 (11.1)	46 (45.1)	46 (56.8)
Milk	18 (17.6)	27 (33.3)	20 (18.6)	18 (22.2)
Fish	6 (5.9)	1 (1.2)	26 (25.5)	24 (29.6)
Fruit juice*	18 (17.6)	8 (9.9)	31 (30.4)	19 (23.5)

* Significant differences between male and female ($P<0.05$)

Table 2. (*Cont.*) Frequency of consumption of main food groups by the subjects.

Food group	Once/week		1-2 times month		Rarely or never	
	Male n (%)	Female n (%)	Male n (%)	Female n (%)	Male n (%)	Female n (%)
Less healthy foods						
Red meat*	21 (20.6)	33 (40.7)	8 (7.8)	12 (14.8)	0 (0)	0 (0)
Soft drinks*	19 (18.6)	31 (38.3)	12 (11.8)	13 (16)	17 (16.7)	21 (25.9)
Cakes/pastries*	18 (17.6)	20 (24.7)	24 (23.5)	10 (12.3)	29 (28.4)	14 (17.3)
Butter	34 (33.3)	22 (27.2)	12 (11.8)	6 (7.4)	15 (14.7)	11 (13.6)
Chocolates	26 (25.5)	17 (21)	22 (21.6)	17 (21)	26 (25.5)	15 (18.5)
Ice cream	27 (26.5)	23 (28.4)	33 (32.4)	28 (34.6)	22 (21.6)	6 (7.4)
Cream	33 (32.4)	19 (23.5)	9 (8.8)	9 (11.1)	18 (17.6)	15 (18.5)
Sausages	23 (22.5)	25 (30.9)	22 (21.6)	9 (11.1)	30 (29.4)	30 (37)
Solid fat	33 (32.4)	19 (23.5)	9 (8.8)	9 (11.1)	18 (17.6)	15 (18.5)
More healthy foods						
Bread	0 (0)	0 (0)	1 (1)	1 (1.2)	0 (0)	1 (1.2)
Tea/coffee*	3 (2.9)	10 (12.3)	2 (2)	5 (6.2)	6 (5.9)	2 (2.5)
Vegetables	24 (23.5)	19 (23.5)	3 (2.9)	1 (1.2)	2 (2)	2 (2.5)
Fruits*	18 (17.6)	18 (22.2)	0 (0)	0 (0)	1 (1)	1 (1.2)
Rice*	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cheese	19 (18.6)	13 (16)	5 (4.9)	2 (2.5)	1 (1)	2 (2.5)
Yoghurt	17 (16.6)	12 (14.8)	2 (2.2)	1 (1.2)	1 (1)	2 (2.5)
Eggs	18 (17.6)	12 (14.8)	3 (2.9)	6 (7.4)	1 (1)	1 (1.2)
Peas/beans*	7 (6.9)	10 (12.3)	0 (0)	2 (2.5)	5 (4.9)	1 (1.2)
Chicken*	8 (7.8)	23 (28.4)	4 (3.9)	3 (3.7)	0 (0)	0 (0)
Milk	35 (34.3)	17 (21)	21 (20.6)	12 (14.8)	5 (4.9)	5 (6.2)
Fish	27 (26.5)	33 (40.7)	32 (31.4)	18 (22.2)	8 (7.8)	5 (6.2)
Fruit juice*	33 (32.4)	26 (32.1)	10 (9.8)	22 (27.2)	9 (8.8)	6 (7.4)

* Significant differences between male and female ($P<0.05$)

Table 3 shows the exercise frequency of the subjects. Results showed that most of the participants have a sedentary lifestyle and few male (12.7%) and female (2.5%) more than 4 hour per week participate in regulate exercise programs.

Table 3. Frequency of exercise of the participants

	Sedentary n (%)	< 1h/week n (%)	1-2 h/week n (%)	2-4 h/week n (%)	> 4h/week n (%)
Male*	54 (52.9)	23 (22.5)	4 (3.9)	8 (7.8)	13 (12.7)
Female	50 (61.7)	24 (29.6)	3 (3.7)	2 (2.5)	2 (2.5)

* Significant differences between male and female (P<0.05)

The correlation coefficients of dyslipidemia component and food consumption pattern in the participants are shown in Table 4. The results indicated that there is a positive relationship between less healthy foods with total cholesterol, triglyceride and LDL-c levels and a positive relationship between healthy foods and HDL-c level.

Table 4. Correlation coefficients of blood lipid profile and food consumption pattern of the subjects

Food group	Cholesterol	Triglyceride	LDL-c	HDL-c
	Total	Total	Total	Total
Less healthy foods				
Red meat	0.17*	0.09	0.08	0.11
Soft drinks	0.15*	0.19*	0.1	- 0.02
Cakes/pastries	- 0.04	0.1	0.07	- 0.08
Butter	0.004	- 0.03	0.04	- 0.13
Chocolates	- 0.03	0.06	-0.009	- 0.11
Ice cream	- 0.07	- 0.09	- 0.06	- 0.07
Cream	- 0.05	- 0.09	- 0.03	- 0.1
Sausages	0.05	0.18*	0.03	- 0.1
Solid fat	- 0.05	- 0.09	- 0.03	- 0.1
More healthy foods				
Bread	0.08	- 0.02	- 0.02	- 0.03
Tea/coffee	0.19*	0.11	0.11	0.06
Vegetables	- 0.04	0.01	- 0.07	0.03
Fruits	- 0.04	0.01	- 0.15*	0.01
Rice	0.1	0.04	0.02	- 0.03
Cheese	- 0.11	- 0.13	- 0.11	- 0.16*
Yoghurt	- 0.17*	- 0.19*	- 0.04	- 0.02
Eggs	0.09	0.15*	0.13	0.13
Peas/beans	0.09	0.04	0.15*	0.15*

Food group	Cholesterol	Triglyceride	LDL-c	HDL-c
	Total	Total	Total	Total
Chicken	0.04	0.002	0.03	0.2*
Milk	- 0.1	- 0.11	- 0.1	- 0.1
Fish	- 0.008	0.05	- 0.04	- 0.05
Fruit juice	- 0.1	- 0.01	- 0.04	0.02

*. Correlation is significant at the 0.05 level.

As showed in table 5, dyslipidemia had tendency to increase as age, BMI and cigarette smoking and fast food consumption increased and dyslipidemia had tendency to decrease as Breslow's lifestyle index and exercise frequency levels increased. General linear regression demonstrated that fast food consumption was independently associated with blood lipid profile in male and fast food consumption and age were independently associated with blood lipid profile in female.

Table 5. Correlation coefficients of blood lipid profile with Age, BMI, Breslow's lifestyle index, exercise frequency and fast food

	Cholesterol		Triglyceride		HDL-c		LDL-c	
	Male	Female	Male	Female	Male	Female	Male	Female
Age	0.17	0.48*	0.11	0.3*	0.09	0.14	0.1	0.46*
BMI	0.3*	0.09	0.27*	0.02	-0.02	-0.03	0.15	-0.07
Breslow's lifestyle index	-0.05	0.02	-0.18	- 0.008	0.06	0.15	0.03	-0.02
Exercise frequency	-0.13	-0.13	-0.21*	- 0.07	0.01	-0.009	- 0.04	-0.02
Cigarette smoking	0.05	0.03	0.003	0.03	-0.05	-0.09	0.08	0.15
Fast Food	0.13	0.16	0.24*	0.12	-0.01	-0.07	0.18	-0.01

*. Correlation is significant at the 0.05 level.

4. Discussion

In this report, based on the available information, lifestyle, blood lipid levels, and food consumption pattern were considered, with special focus on the identification of lifestyle such as dietary and physical activity habits in relation to dyslipidemia component. Our findings indicate that plant foods are the major component of the Yasuj population. These finding are contrary to previous reports showed that a characteristic of

the Iranian diet is the dependence on bread and rice as major energy sources (4,5,15). Epidemiological studies indicate that populations consuming diets rich in plant foods tend to have more limited quantities of animal proteins and fats (16). This dietary evidence parallels the lower rates of cardiovascular disease in such populations (17). Our results demonstrated that food consumption especially fast food consumption was independently associated with dyslipidemia in male and female. There is a positive relationship between less healthy foods with total cholesterol, triglyceride and LDL-c levels and a positive relationship between healthy foods and HDL-c level. There have been great changes in the dietary habits of Middle Eastern populations in the past decades (18). A wide range of epidemiological studies has implicated obesity as a significant predisposing risk factor in a variety of disabling and life-threatening medical conditions (19). The high prevalence of obesity and overweight in this study (especially among women) points to the need for more effective interventions to decrease the problem in this community. Evidence indicates that diets relatively rich in fat appear to be particularly conducive to the development of obesity (20). Therefore, knowledge of prevalence rates of obesity and those most susceptible to become obese are of considerable importance.

The result also demonstrated a trend toward an inverse correlation between the total score of Breslow's index and dyslipidemia. Previous studies have reported that there is an inverse relationship between Breslow's index with cholesterol, LDL-c and triglyceride (5,15,21). This indicates that subjects with unhealthier lifestyles have higher dyslipidemia level. Weight management and physical activity are recommended as first-line lifestyle interventions; treatment or therapy is often needed to avert or delay the progression of symptoms of dyslipidemia (22). Lifestyle interventions such as reduced energy intake and increased physical activity can be effective (22,23). Cortez-Pinto and Machado reported that decrease consumption of hypercaloric food and saturated fat, and weight loss through dieting and increasing energy expenditure through the practice of regular exercise has been effective in improving dyslipidemia (24). Janiszewski et al (2008) suggested that lifestyle modification consisting of exercise and/or caloric restriction are associated with improvement in all components of the dyslipidemia,

although the magnitude of this effect varies according to the specific component studied and additional factors such as baseline values (23). By according Table 5, dyslipidemia had tendency to decrease as exercise frequency increased. The results showed that 52.9% of male and 61.7% of female have a sedentary lifestyle and only 12.7% of male and 2.5% of female more than 4 hour per week participate in regulate exercise programs.

Favorable effects of regular physical activity on increased levels of HDL-c and reduced levels of triglyceride have been observed (25,26). Nikkila et al (1978) have reported that endurance training is associated with an adaptive increase in lipoprotein lipase (LPL) activity not only in skeletal muscle but also in adipose tissue and that the high HDL-c levels of physically active people are probably accounted for, at least partly, by the increase in LPL activity and the concomitant rapid turnover of triglyceride-rich lipoproteins (25). In this study, exercising 1 hour per week or more had a positive association with the HDL-c level, but did not achieve statistical significance. As for cigarette smoking, the results are in agreement with previous reports showing that there is no relationship between cigarette smoking and blood lipid profile (27,28); while Phillips et al (1981) have reported a positive association between the number of cigarettes smoked and beta lipoproteins and posited that this effect is secondary to the higher triglyceride levels in smokers (8). On the other hand, Phillips et al (1981) have reported a negative association between the number of cigarettes smoked and HDL-c levels (8). HDL-c has the anti-atherogenic properties that is one suggested mechanism whereby cigarette smoking increases the risk of coronary arteriosclerosis (8).

5. Conclusion

In conclusion, unhealthy lifestyles are associated with dyslipidemia in Yasuj population. These findings suggested that lifestyle interventions such as increased physical activity and education policy to promote healthier eating and avoid of smoking and fast food consumption can be effective to improve dyslipidemia.

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