



Dietary Quality after Diagnosis of Coronary Heart Disease

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ABSTRACT

Background: Dietary saturated fat and cholesterol are the cause of atherosclerosis and cardiovascular disease.

Objectives: This study aimed to assess diet quality after diagnosis of Coronary Heart Disease (CHD).

Patients and Methods: This descriptive study was performed on 242 patients with diagnosis of acute coronary syndrome admitted to a coronary care unit in a cardiology clinic between December 2005 and December 2006. The study questionnaire, including questions about personal information such as age, sex, and education level, was completed by face-to-face interview. Additionally, Diet Quality Index (DQI) was used to assess the subjects' nutritional status. Then, one-way ANOVA and chi-square tests were used where appropriated to compare the study groups. Besides, linear regression models were used to assess the associations between DQI score and the patients' sociodemographic characteristics and lifestyle factors. P value ≤ 0.05 was considered to be statistically significant.

Results: The patients' ages ranged from 26 to 85 years and 68.5% of the patients were male. Considering DQI scoring, 22.7%, 75.2%, and 2.1% of the patients got "inadequate/low", "average", and "acceptable/high" DQI, respectively. In addition, 28% of the patients consumed 40% of calories from total fat, while 55% consumed 30 - 40% of calories from total fat. Also, nearly 30% of the patients consumed greater than 13% of calories from saturated fat, while 64% consumed 10 - 13% of calories from saturated fat.

Conclusions: In this study, most of the CHD patients got low DQI scores. In general, CHD can be prevented. However, if precautions regarding lifestyle modification are not followed, CHD is expected to progress.

► Implication for health policy/practice/research/medical education:

Dietary factors are important coronary risk factors. However, compliance with dietary recommendations has remained a major problem. Diet quality index is very useful parameter in assessment of dietary pattern in patients with coronary heart disease.

1. Background

Coronary Heart Disease (CHD) is a major cause of morbidity, mortality, and economic burden in both developed and developing countries. The risk factors of Cardiovascular Disease (CVD) include hypertension, genetic factors, smoking, diabetes, obesity, physical inactivity, and dyslipidemia (1). Secondary prevention programs, with a focus on risk factors management, have been shown to play a pivotal role in treatment and

management of the individuals affected by CHD (2). Efforts at secondary prevention of CHD also have substantial public health implications. In addition to effective cardiac medications, lifestyle modifications have been shown to reduce the risk of future cardiac events (3-5).

Studies found that increased serum Low Density Lipoprotein (LDL)-cholesterol level was associated with CHD. These findings led to the diet-heart hypothesis. Diet heart hypothesis was based primarily on the observation of a strong, positive association between saturated fat consumption (essentially animal products) and CHD mortality and morbidity. Saturated fat and cholesterol intake,

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known to increase blood cholesterol, was also positively correlated to the incidence of CHD. It was, therefore, hypothesized that reduction of blood cholesterol level by dietary (or non-dietary, i.e. pharmacological) means might reduce the frequency of cardiac relapses after a first coronary event. Historically, research on the relationship between diet and CVD or mortality focused on single food items or nutrients. More recently, however, the focus has shifted toward markers of overall diet quality and dietary patterns to reflect the multidimensional nature of diets consumed in the population. Diet quality is a major modifiable risk factor well established in prevention of CVD and mortality. Therefore, the relationship between diet and CHD has been studied intensively. Studies on diet quality and CHD have focused largely on determining the dietary risk factors of CHD (6-12). Accordingly, dietary risk factors for CVD are diets high in saturated and trans fat and low in polyunsaturated fatty acids, vegetables, fruits, and fiber (13-20).

2. Objectives

The present study aims to assess diet quality after diagnosis of CHD.

3. Patients and Methods

3.1. Subjects

This descriptive study was conducted on 242 consecutive patients (166 males and 76 females) admitted to coronary care unit of a cardiology clinic between December 2005 and December 2006 with diagnosis of acute coronary syndrome, defined as (1) Creatine Kinase (CK) \geq 210 IU/L and CK-MB \geq 20 IU/L, or Troponin T $>$ 0.01 ng/mL, (2) electrocardiographic evidence of ischemia (ST segment deviation \geq 0.05 mV, ST depression $>$ 1mm, or T-wave inversion \geq 0.3 mV), or (3) typical chest pain. The inclusion criteria of the study were aging 18 years and above and suffering from CHD. The study protocol was approved by

the Ethics Committee of our department. Besides, written informed consents were obtained from all the patients.

3.2. Assessment of the Patients' Characteristics

The data regarding the patients' characteristics were collected by a self-administered questionnaire at the baseline clinical visit after diagnosis of CHD. The patients' characteristics have been summarized in Table 1. Smoking status and physical activity status were collected at 1 year using "yes/no" questions. Smoking status was asked using the following question: "In the last 1 year, have you smoked any cigarettes, cigars, pipes, or other tobacco products". Also, the following question was used to determine the participants' physical activity status: "In the last 1 year, have you exercised for at least 20 minutes on one occasion without stopping".

3.3. Assessment of Body Weight

Body weight and height were measured using standard methodology (21). Relative mass was expressed as Body Mass Index (BMI) calculated as kg/m².

3.4. Diet Quality Assessment

Dietary data were collected by Diet Quality Index (DQI), a self-administered food frequency questionnaire, administered by interviewers in the hospital. The DQI reflects 10 dietary characteristics (22, 23) and each of the 10 components contributes 10 points to the total DQI score. In this study, the scores were limited to a range of 0 to 10 points. To improve interpretability, scale scoring was changed to reflect a total possible 100 point score, with lower scores reflecting poorer achievement of dietary recommendations and higher scores reflecting better diet quality.

The first 3 components of the DQI reflect macronutrient distribution recommendations; for example, to restrict relative dietary fat to less than or equal to 30% of energy, to

Table 1. Baseline Characteristics of the Patients with Coronary Heart Disease

Baseline Characteristics	Male (n = 166)		Female (n = 76)		Total (n = 242)	
	Number	%	Number	%		
Age (years) (mean \pm SD)	57 \pm 11		67 \pm 10		60 \pm 12	
Marital status						
Married	165	99.4	68	89.5	233	96
Widowed	1	0.6	8	10.5	9	4
Education level						
Illiterate	32	19.3	63	82.9	95	39
Literate	11	6.6	5	6.6	16	7
Primary school	71	42.8	6	7.9	77	32
Middle school	34	20.5	0	0.0	34	14
High school	12	7.2	1	1.3	13	5
Academic	6	3.6	1	1.3	7	3
BMI (kg/ m²) category						
Normal (< 25)	76	46.0	18	24.0	94	39
Overweight (25 - 29.9)	73	44.0	34	45.0	107	44
Obese (\geq 30)	17	10.0	24	31.0	41	17
Physical activity						
No	111	66.9	73	96.0	184	76
Yes	55	33.1	3	4.0	58	24
Smoking in the last 1 year	85	51	2	2.0	87	35

Abbreviations: BMI, body mass index

restrict saturated fat to less than or equal to 10% of energy, and to consume less than 300 mg dietary cholesterol daily. The next 3 DQI components measure relative differences in consumption of servings of fruits, vegetables, and grains. DQI measures of grain, vegetable, and fruit intake adequacy are adjusted to reflect intake as a proportion of the number of servings recommended for the appropriate energy intake level. The next 2 DQI indicators reflect relative intakes of calcium and iron. The final 2 components of the DQI are 2 new scores designed to measure the constructs of diversity and moderation. The dietary diversity score reflects a weighted average of scores for each of the 4 primary food groups. Each of the 4 broad food categories receives a maximum diversity score of 2.5 out of the 10 possible points. Each component of the dietary moderation score also provides 2.5 of the 10 possible points of the total moderation score.

3.5. Statistical Analysis

All data analyses were performed by the SPSS statistical software (version 11.0; Chicago, IL, USA). DQI groups were created to represent inadequate/low (0 - 50 points), average (51 - 80 points), and acceptable/high DQI (81 - 100 points). The participants' characteristics and nutritional variables were summarized using mean and standard deviation for continuous variables and number and percent for categorical ones. In addition, one-way ANOVA and chi-square tests were used where appropriated to compare the study groups. Linear regression models were also used to assess the associations between DQI score and the patients' sociodemographic characteristics and lifestyle factors. Statistical power was 0.85 and $P \leq 0.05$ was considered to be statistically significant.

4. Results

In this study, the patients were between 26 and 85 years old, with the mean age of 60 ± 12 years. Besides, 68.5% of the patients were male, while 31.5% were female. Only 2.9% of the patients had education levels beyond high school. Moreover, 17% of the patients were obese with the mean BMI of 33.9 ± 3.6 kg/m². Additionally, nearly 35% of the patients reported smoking and 23% reported having

performed at least one 20-minute session of continued exercise in the past one year (Table 1).

According to the results, 28% of the patients consumed 40% of calories from total fat, while 55% consumed 30 - 40% of calories from total fat. Besides, about 30% of the patients consumed greater than 13% of calories from saturated fat, while 64% consumed 10 - 13% of calories from saturated fat. Moreover, 33% of the patients consumed lower than 300 mg/day dietary cholesterol. Also, 72% of the patients consumed adequate fruits and vegetables daily, and 85% consumed 2400 - 3400 mg/day of salt. This daily salt intake was a little higher and correction was required.

Considering DQI, the results showed that 22.7%, 75.2%, and 2.1% of the patients had inadequate/low (0 - 50 points), average (51 - 80 points), and acceptable/high DQI (81 - 100 points), respectively (Table 2, one-way ANOVA). The mean DQI score of the patients was 59.8 ± 11.7 . The results of multivariate linear regression model for DQI have been presented in Table 3. Accordingly, low diet quality was associated with smoking in the previous one year, lower education level, and obesity.

5. Discussion

To date, dietary research and guidance have been focused on dietary patterns rather than on single nutrients or food groups, because dietary components are consumed in combination and are correlated to one another (24). Previous studies showed that lower intakes of saturated and trans fatty acids and higher intakes of unsaturated fatty acids, dietary fiber, and vegetable proteins could reduce the risk of some types of CVD, particularly CHD (25-28). Consumption of three or more servings of fruits and vegetables per day compared to less than once per day was also associated with a 27% reduction in the risk of CVD (29). This was consistent with the results of other studies, indicating a graded risk reduction associated with higher intakes of fruits and vegetables (25, 27). It was suggested that dietary intake of green leafy vegetables and foods rich in carotenoids and vitamin C particularly contributed to this relationship. In most of the above mentioned researches, consumption of vegetables and fruits more than once a week was compared to not eating vegetables and fruits in

Table 2. Diet Quality Index Scores in the Patients with Coronary Heart Disease

Gender	DQI Score					
	0 - 50 Points (Inadequate/Low)		51 - 80 Points (Average)		81 - 100 Points (Acceptable/High)	
	Number	%	Number	%	Number	%
Male	33	19.9	129	77.7	4	2.4
Female	22	28.9	53	69.7	1	1.3
Total	55	22.7	182	75.2	5	2.1

Abbreviations: DQI, diet quality index
 $\chi^2 = 2.629$, $P > 0.05$

Table 3. Multivariate Linear Regression Model for the Diet Quality Index

Independent Variables	Coefficient	Standard Error	P value
Smoking for least 3 months in the last 1 year	- 4.566	1.587	< 0.05
Education levels higher than high school	3.203	1.48	< 0.05
Obesity (BMI ≥ 30 kg/m ²)	- 3.354	0.756	< 0.05

Abbreviations: BMI, body mass index

a week (25).

DQI is a composite measure of diet quality created to evaluate healthfulness of diets. The major finding of our study was the poor quality of diet among the patients diagnosed with CHD. Our study also showed that diet was associated with CHD, which is consistent with the findings of the previously published reports in the literature (30, 31).

In the present study, overall low quality of diet, as determined by a low DQI score, was associated with current smoking, higher BMI, and lower education level. Consistently, a recent population-based study in Brazil (32) found that dietary quality, measured by the healthy eating index, was inversely associated with smoking and BMI. Using the data from the Behavioral Risk Factor Surveillance System, Rafferty and colleagues (33) also found that dietary quality was related to education level. Other studies found similar results, as well. Shea et al. (31) demonstrated that saturated fat and cholesterol intakes, as expressed in the cholesterol-saturated fat index, were inversely related to educational attainment. This might be due to the fact that participants with low education levels might require specific interventional tools to improve dietary quality. Thus, it is particularly important to consider the issues related to health literacy (34, 35) and make sure patients can understand the provided materials.

In the current study, the mean score of DQI (59.8 ± 11.7) was low in the study population. This highlighted the low quality of the patients' current diet and the need for increasing surveillance and lifestyle recommendations by physicians and health professionals to decrease the risk of future CHD events for patients with established CHD. It should also be noted that only a quarter of our patients had acceptable physical activity in the last one year before their coronary events.

The Lyon Diet Heart Study was the first clinical trial supporting the Mediterranean diet, which includes high intake of fruits, vegetables, nuts, legumes, and grains (36). Other recent studies have also supported the Mediterranean diet's protective effects on prevention of CHD (37-39). These studies showed that vegetable and fruit consumption was inversely associated with the risk of ischemic heart disease. Overall, daily consumption of vegetables and fruits is recommended, reflecting the current dietary guidelines.

Dietary recommendations are designed to promote good overall health and reduce the risk of major chronic diseases in the general population. Up to now, most studies on diet and CVD have focused on dietary lipids. Metabolic studies have revealed the detrimental effects of trans fat on the inflammatory factors associated with CHD (1). Until as recently as the 1990s, the focus of public health recommendations, including the USDA food guide pyramid, was on restricting the intake of total (and particularly saturated) dietary fat to reduce the risk of CVD (40). Based on the most recent evidence, the 2006 American Heart Association (AHA) diet and lifestyle recommendations for CVD risk reduction relaxed guidelines for total fat intake and, rather, made recommendations for each type of fat. Specifically, the AHA now recommends limiting intake of saturated fat to < 7% and trans fat to < 1% of energy (27).

5.1. Conclusion

In conclusion, the present study results revealed that the quality of diets was poor among the patients with a recent CHD event. CHD can be prevented, but compliance with dietary recommendations remains a major problem. In our view, diet assessment is best done with food records and the most effective way to change dietary intake is to alter the food supply by providing specific foods or supplements or to provide consumers with prepared meals.

5.2. Study Limitations

One of the limitations of the present study was the broad classification of smokers. Any amount of smoking in the past 3 months was considered to be smoking, which included both social and occasional smokers. A similar limitation also applies to physical activity measures.

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Authors' Contribution

Ozturk U, Ozturk U, and Toksoz P were responsible for 1- study concept and design, 2- acquisition of data, 3- analysis and interpretation of data, 4- drafting of the manuscript, 5- critical revision of the manuscript for important intellectual content, 6- statistical analysis, 7- administrative, technical, and material support, and 8- study supervision

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