Original Article

DIET, HYPERTENSION, HYPERCHOLESTEROLEMIA AND DIABETES IN ISCHEMIC HEART DISEASES

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ABSTRACT

Objective: Ischemic Heart Diseases (IHD) have the highest cause of mortality in the Islamic Republic of Iran. Unhealthy dietary habits as a major threat make our country prone to an epidemic of non-communicable diseases in the next two decades. The aim of this study was to determine the association of diet, hypertension, hypercholesterolemia and diabetes with risk of developing IHD in Tehran.

Methodology: This case – control study was conducted during 2003 and 2004 in Tehran Heart Center and Tehran Shahid Rajaii Hospital. A sample of 100 IHD patients (cases) and 100 individuals free of cardiovascular symptoms (controls) were entered into the study; the Controls were matched to the IHD patients by age (± 5 years) and sex. Information was recorded by Food Frequency Questionnaire (FFQ). All data were analyzed with the SPSS for windows, version11.

Results: Multivariate analysis showed a significant and positive association between Hypertension, Hypercholesterolemia and Diabetes and risk of developing IHD. Odds ratios for these three risk factors with 95% confidence interval (CI) were: 3.9, 12 and 8.6 respectively. In the cases consumption of high dairy fat and fried foods were significantly high, that increased the risk of IHD 9.8 and 54.6 times, respectively. Also low intake of fish was directly associated with increase of the IHD risk (95% CI, OR: 13.9). Moreover low consumption of vegetables and fruits independently increased the risk of IHD 19.8 times in cases group.

Conclusions: Hypertension, hypercholesterolemia and diabetes have a significant association with development of IHD. High consumption of fatty food and low consumption of fish, vegetables and fruits also contribute to development of IHD.

KEY WORDS: Ischemic Heart Diseases, Cardiovascular Disease, Diet.

Pak J Med Sci July - September 2007 Vol. 23 No. 4 597-601

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* Received for Publication: March 29, 2007

* Accepted: June 4, 2007

INTRODUCTION

Ischemic Heart Disease (IHD) is the highest in ranking as the cause of mortality in the Islamic Republic of Iran.[1] Moreover during the past years, there has been a significant changing in the prevalence of various life style habits (i.e. unhealthy diet, sedentary life, and smoking).[2] Certain studies estimated that up to 80% of cases of coronary heart disease could be avoided through changing lifestyle habits.[3] A rise in fat intake, excess energy intake coupled with energy-activity mismatch characterizes the nutrition transition that is becoming increasingly well documented in many developing countries.[4] Unhealthy dietary habits as a major threat make our country prone to an

epidemic of non-communicable diseases in the next two decades.[5] To reduce such risks at the individual and community levels, it is important to make people aware of the harm they cause and to increase the desire of individuals to change their behavior. Recent study highlighted the importance of healthy nutrition in prevention of IHD; therefore the aim of the study was to determine the association of diet, hypertension, hypercholesterolemia and diabetes with the risk of developing IHD in Tehran, Islamic Republic of Iran. These findings may have important implications for identifying patients at health risk in primary care practices.

SUBJECTS AND METHODS

This case–control study was conducted between August 2003 and April 2004 in Tehran Heart Center and Tehran Shahid Rajaii Hospital. A sample of 100 IHD patients (cases) and 100 individuals free of cardiovascular symptoms (controls) were entered into the study. The sample size was determined by power analysis (statical power (ã) >0.80, P.V < 0.05).

To put study participants at ease, questionnaires were completed during a private interview held after the second day of hospitalization. The cases were randomly selected from the admission listing of the cardiology clinics. The cases were those who experienced a first event of acute myocardial infarction (diagnosed by typical electrocardiograph changes or cardiac catheterization ("cath").

Controls were matched with the IHD patients by age (± 5 years) and sex. They were also randomly selected by the same procedure from friends or colleagues of the patients. Patients' relatives were excluded to eliminate potentially adverse effects of positive family history of IHD as a confounder. All individuals were examined by a cardiologist who recorded detailed medical histories and carried out physical examinations and necessary laboratory measurements (Fasting Blood Sugar, High-density lipoprotein (HDL), Low-density lipoprotein (LDL), and Total cholesterol).

Participants were classified as hypertensive if their mean systolic blood pressure was ≥140mmHg and/or had a diastolic blood pressure ≥90mmHg, or if they were under specific treatment. Diabetic subjects were defined as those with a mean fasting blood glucose concentration >125mg/dl, or who were under specific treatment and hypercholesterolemic participants were those with mean total cholesterol levels >200mg/dl or who were under specific treatment.[6] Common inclusion criteria for both groups were: negative family history of IHD and Tehran residency.

To account for the potentially confounding effect of patients who adopted a low-fat diet, a detailed nutritional questionnaire was applied. The 24-hour dietary recall described reported intakes from midnight to midnight, meal by meal. The reliability and validity of 24-hour recalls has been proven in several studies.[7] For each of the investigated food items, the frequency of consumption was approximately quantified in terms of the number of times a food item was consumed each week. Level of consumption were categorized according to food pyramid, in terms of high, acceptable and low using the median values of monthly food consumption score as cut-off points.

All data were statistically analyzed using SPSS for Windows version 11. Continuous variables were expressed as mean values ± one standard deviation, while qualitative variables were expressed as absolute and relative frequencies. Estimates of the relative risks of developing IHD were calculated by using the Odds Ratio (OR) and corresponding confidence intervals through Multiple Conditional Logistic Regression Analysis. The qualitative data were analyzed with Chi Square (x^2) or Fisher's exact test. Comparisons between two continuous variables were done using independent sample t-test. To estimate the independent effect of each risk factor on IHD, adjusted odds ratios were calculated by logistic regression analysis. All test were 2-Tailed and P<0.05 was considered significant.

Table-I: Distribution of cardiovascular risk factors in study group

Variables	*Cases (n =100)*	*Controls (n =100)*	*O.R*	*95% CI*	*P-value*
Hypertension	36/100	16/100	2.9	1.5, 5.80	<0.0001
Hypercholesterolemia	33 /100	15 /100	2.8	2.4, 14.80	<0.0001
Diabetes mellitus	26 /100	8 /100	4	2, 13.2	<0.0001

RESULTS

In univariate analysis there was a significant and positive association between hypertension, hypercholesterolemia and diabetes and risk of developing IHD. Odds ratios for these three risk factors with 95% CI were: 2.9, 2.8 & 4 respectively (Table-I). Table-II shows the level of intake of food items such as fish, fried foods, high fat dairy, vegetables and fruits in patients and controls. Results indicated that the cases had high intake of fried foods, high fat dairy in comparison with controls. Moreover fish consumption and vegetables and fruits intake were significantly low in the patients group (Table-II). Multivariate analysis showed that high fat dairy, high fried foods intake and low fish intake increased significantly the risk of developing IHD. Odds ratios with 95% CI were: 9.8, 54.6 and 13.9 respectively. Also low consumption of vegetables and fruits independently increased the risk of IHD 19.8 times in cases group.

In this model, diabetes, hypertension and hypercholesterolemia, remained significant and were positively correlated with the risk of the disease too, the adjusted odds ratios for these three risk factors with 95% CI were: 8.6, 3.9 and 12 respectively (Table-III).

DISCUSSION

In this study multivariate analysis showed that, hypertension, hypercholesterolemia and diabetes were determined as risk factors, these results are in agreement with numerous studies and it has been clear for many years that there is a positive association between hypertension, hypercholesterolemia, diabetes and IHD.[8-10]

Low consumption of vegetables and fruits in the patients increased the risk of developing IHD more than 19 folds in comparison with controls. This is consistent with other studies which have shown an association between vegetables and fruits consumption and a significant reduction in IHD mortality.[11-14] There is increasing evidence that diets high in fruit and vegetables are protective against coronary heart disease.[15-18] Based on the first survey of non communicable disease risk factor surveillance of Iran, fruit and vegetables intake was within the lower limit of recommended level.[19,20] Therefore, it seems that low intake of vegetables and fruits are one of the major risk factor for IHD in Tehran.

This study indicates that fried foods and high fat dairy consumption are significantly high in the patients, resulting in the excessive intake of trans-fatty acids. Moreover results of another national health survey in Iran showed that the

Table-II: Relative frequency of intake of fried foods, high fat dairy, fish, vegetables and fruits in study groups according to their level of consumption.

Variables	*Consumption level*	*Cases (n=100)*	*Controls (n=100)*	*O.R*	*95% CI*	*P-value*
Fried foods	Acceptable	35	86	11.4	5.6, 22.9	<0.001
	High	65	14			
High dairy fat	Acceptable	66	85	2.3	1.4, 5.8	<0.001
	High	34	15			
Fish	Acceptable	20	87	26.8	12.5, 57.3	<0.001
	low	80	13			
Vegetables and fruits	Acceptable	71	96	9.8	3.3, 29.2	<0.001
	low	29	4			

Table-III: Adjusted odds ratios for the effect of diet, hypertension, hypercholesterolemia and diabetes on IHD risk

Variables	*Coef (b)*	*S.E*	*P. value*	*Exp. (b)*	*95% CI*
High fried foods intake	4.00	1.29	0.001	54.6	4.3, 61.9
High fat dairy	2.98	0.46	0.0001	9.8	7.9, 49.2
Low fish intake	2.64	1.10	0.01	13.9	1.6, 11.4
Low vegetables and fruits intake	2.98	0.46	0.0001	19.8	7. 9, 49.2
Diabetes mellitus	2.15	0.64	0.0008	8.6	2.4, 30.3
Hypertension	1.38	0.63	0.02	3.9	1.1, 13.7
Hypercholesterolemia	2.48	1.16	0.03	12	1.2, 18.3
á constancy:	5.91	4.18	0.15		
Goodness- of- fit test:					
Chi-square: 6.30, d.f: 8, Significance: 0.61					

only province with high levels of fat consumption (>25% of total energy) was Tehran.[20] Therefore, the high fat intake of Tehran population may have contributed to the high prevalence of IHD in the Tehran.

As data indicate fish consumption is a protective factor against IHD. At the same time some studies have reported that fish consumption was related with an adjusted 16% reduction in the risk of developing a first event of acute coronary syndromes and confirmed the benefits of fish consumption have been recognized for cardiovascular diseases.[9,10,21,22] Our findings point to low levels of fish intake in the patients group as a major risk factor, in addition, the recent national survey in Iran showed that consumption of fish as a principal source of polyunsaturated fatty acids was within the lower limit of recommended intake.[19] Thus, the low level of fish intake in our country may partially explain the high rates of mortality of IHD.

Limitation of the study: Although we tried to eliminate bias in selecting study participants by setting objective criteria, insignificant misclassification may exist since a small percentage of asymptomatic coronary patients may have been wrongly assigned to controls, even though they were evaluated by a cardiologist. Coronary patients, who died at entry or the day after, were not included into this study. Although this bias could influence our results, the proportion of deaths during the first two days was estimated at only 2–4% by physicians in the study, and therefore excluding these patients probably did not significantly alter the findings. Finally, we also tried to reduce the effects of unknown and uncontrolled confounders by using multivariate analysis and by using the same study base for both patients and controls, but the unmeasured effect of psychosocial and other unknown factors could moderate our findings.

CONCLOUSIONS

This study like others confirms significant association of IHD with hypertension, Hypercholesterolemia and diabetes. The results suggest that more focused diet and lifestyle interventions may be needed to improve risk factors and reduce IHD risk. It seems reasonable to recommend an increased adoption of low fat diet and consumption of fish fruits and vegetables in Iran especially in Tehran.

ACKNOWLEDGMENTS

We thank the research deputy of Tehran University of Medical Sciences for financial support.

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