

**American University of Armenia**

**Public Health Department**

**Assessment of Nutrition Knowledge and Fat, Fruit,  
Grain, Vegetable Consumption in Coronary Heart  
Disease Patients in Yerevan**

**( a case - control study )**

**Written by Liana Hovhannisyan**

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## Abstract

Coronary Heart Disease (CHD) is the leading cause of deaths and disability in most industrialized countries, and its importance as a major public health problem is increasing in developing countries. CHD is the leading contributor to the mortality rates in Armenia as well. It has been increasing since 1994. It was estimated that in 1998 in Armenia among all cardiovascular diseases 40% morbidity was due to CHD. The role of diet as a risk factor for CHD was confirmed by epidemiological studies, clinical trials. Since the diet is a major modifiable risk factor for CHD, it plays an important role in CHD prevention. For that reason this study aimed at assessing the level of nutrition knowledge regarding low-fat diet, frequency of fat consumption, and cholesterol control in CHD patients in Yerevan. It was hospital-based case-control study. Cases defined as patients admitted to the hospital with acute or chronic CHD from August 8 to September 24 in 1999. Controls defined as patients admitted to the hospital with diagnosis other than CHD, who never experienced CHD before, aged > 30 from August 8 to September 24 in 1999. Exclusion and inclusion criteria were stated. Ascertainment of cases and controls were based on medical records, ECG and/or echocardiography. CHD diagnosis were made in accordance with WHO classification. One hundred eligible patients were enrolled in the study : 44 controls and 56 cases. Of these 56 cases 23 were incident and 33 were prevalent cases. Statistical analysis was done using STATA. Odds ratios and confidence intervals were calculated by unconditional logistic regression, statistical significance for differences between cases and controls was assessed by Chi-squared test. Knowledge scores reflected proportion of correct answers to the sixteen knowledge-related questions. The results had shown a low level of knowledge in both groups; proportion of patients identified as knowledgeable was dramatically small in both cases and controls : 33% and 15% respectively. Significant difference was found in the level of knowledge between cases and controls. Cases demonstrated relatively higher level of knowledge than controls, but the mean score in prevalent cases was higher than in incident ones. So, this difference could be accounted for relatively higher level of knowledge of prevalent cases. It was also found that frequency of fat consumption was positively associated with CHD: it increases the odds for CHD. Monthly income was a factor, which also associated with increased risk of CHD : the higher SES the higher odds for CHD. The study showed that 95% of the study population did not check cholesterol. The main mentioned reasons were : it was not important, it had never been advised by a health worker. Taking into consideration epidemiological findings of the study the following recommendations about preventive strategies can be suggested: elaborate education programs to increase awareness of population of the role of the diet in CHD prevention, importance of cholesterol control through the large variety of channels: TV, radio, other mass-distributed print media, and also to increase the role of health workers as a source of information.

## Introduction

### Background

#### *Magnitude of the problem*

Coronary Heart Disease (CHD) is the leading cause of death and disability in developed countries.(1,2,3) According to the WHO every 15 out of 100,000 Americans died from myocardial infarction every year. For Switzerland and Japan these figures were 33 and 15 out of every 100,000 respectively. (1) Developing countries contribute to "a greater share to the global burden of CHD than the developed countries" (2). It was estimated that 8-9 million deaths from CHD occurred in developing countries, whereas the corresponding figure for developed countries was 5,3 million. (2)

In the former socialist countries CHD mortality is increasing. (3) As a former socialist and a developing country, CHD has become a major public health problem in Armenia as well. According to the statistics data of the Ministry of Health (MOH) CHD is the leading contributor to the mortality rates in Armenia. It has been increasing since 1994.(Fig. I ) In 1997 it was 62,52 / 100 000 , in 1998 it became 66,93 / 100 000 of population. (4) CHD mortality rates are not age-adjusted, and for that reason are not comparable with international data.

It was estimated that in 1998 in Armenia among all cardiovascular diseases 40% morbidity was due to CHD, 23% was due to hypertension, and only 37% was due to the other CVD diseases (4) (chart I)

Since 1990 morbidity from CHD as well as incidence rates are decreasing.(Fig. II) In 1997 it was 2197/100 000, in 1998 it was 1904/100 000 The existing inconsistency between mortality and morbidity rates could be explained by low referral of population to health facilities. Recent transitions to the payment system in Public Health results in low accessibility to medical services for the majority: average wages are between 10-15 \$ per month and every sixth Armenian can be identified as "poor".(spending about 10\$ per month on all their needs) (5). Governmental expenditures for CHD per treatment per person for acute myocardial infarction are 100 000 drams. So, CHD also is an economic burden for Armenia .

The role of diet as a risk factor for CHD was confirmed by epidemiological studies, clinical trials. Since the diet is a major modifiable risk factor for CHD, it plays an important role in CHD prevention. When pharmacological treatment of high cholesterol is compared with dietary treatment, the latter has other positive health effects besides its effect on cholesterol level. A low-fat diet usually includes fewer calories and salt, more fiber, and has a higher content of vitamins. Besides, reduction of plasma cholesterol through dietary therapy is not related to serious side effects (3). In Armenia cholesterol-lowering drugs are not accessible for the majority of people (it will cost 300-400\$ per year per

person). So, the more limited the resources are, the more important is the effective control of cholesterol through dietary changes especially taking account the fact that Armenian cuisine is traditionally high in saturated fatty acids and very low in polyunsaturated ones.

### *Pathogenicity of CHD*

The diet-CHD hypothesis states that high intake of saturated fatty acids results in elevated plasma cholesterol levels, promoting atherosclerosis, and, then, myocardial ischemia.(6)

So, the first stage in development of CHD is hypercholesterolemia. When the body is overloaded by cholesterol "in excess of its needs and its capacity to metabolize and excrete" concentrations of cholesterol in plasma rises. (7) The source of excessive cholesterol may be either dietary fat or endogenous synthesis of lipids. If hypercholesterolemia has been maintained for a long time, it may result in manifestation of CHD due to occurrence of fatty streaks, fibrous plaques, which could be complicated with calcification, obstructing...(7)

In early 1900 Anischkov in Russia experimentally induced atherosclerosis in rabbits by cholesterol feeding. This hypothesis was supported later by epidemiological studies, which showed positive correlation between the level of mean plasma cholesterol and the incidence of CHD morbidity and mortality in many populations: Seven Country Study, Framingham Heart Study, Multiple Risk Factor Intervention Trial...(8)

### *Epidemiological studies*

Numerous epidemiological, clinical, experimental investigations revealed risk factors, which contribute to the development of CHD. Major risk factors are dyslipidemia, hypertension, cigarette smoking, while less important risk factors are diabetes, obesity, physical activity, psychological factors, alcohol consumption, sociocultural factors.(8)

*Stanford Five-City Project* designed and conducted by John Farquhar, Stephan Fortmann, June Flora, Barn Taylor, William Haskell, Paul Williams and, Nathan Maccoby tested whether multiple education strategies can reduce CHD risk factors: plasma cholesterol, cigarette use, obesity, sedentary life style. (1) It was a 14-year trial of communitywide CHD risk reduction through health education. Two treatment cities compared with two control cities for changes in knowledge of risk factors, and other mentioned risk factors. After 30 to 64 months of education significant reductions occurred: decrease in mortality risk scores (15%), CHD risk scores (16%). So, such low-cost programs can have an impact on risk factors and contribute to CHD prevention. (1)

Between 1968 and 1976 the age-adjusted mortality rates from CHD in US declined by 20%. More than half of that decline was related to lifestyle changes, particularly reduction of plasma cholesterol level and cigarette smoking. In US declining rates of CHD reflected the growing awareness of population about the diet as a risk factor for CHD. Since 1950 Americans have been eating less saturated fat, red meat, and fewer the dairy products , which are high in saturated fats (8). Between 1977 and 1985 according to the data of Nationwide Food Consumption Survey (US) beef intake decreased by 35%, poultry intake decreased by 22%, whole-milk intake decreased by 25%, and intake of eggs decreased by 26%. At the same time fish intake increased by 50%, low-fat milk intake increased by 50%, and fruit and vegetable intakes increased by 11 and 3% respectively. (6)

*The Coronary Primary Prevention Trial* (9). This randomized trial is supportive for lipid hypothesis. It was conducted in 12 specialized lipid research clinics in North America. About 3100 men were enrolled in the study. The eligibility criteria were the following : no clinical evidence of CHD, serum cholesterol level exceeds 265mg/dl or higher and LDL level was 175 mg/dl or higher even after dietary therapy, no severe hypertension, hyperglyceridemia, or diabetes. The study population were randomized to a placebo or treatment group (treating by cholestyramin:a lipid-lowing drug).The prevalence of smoking was the same in both groups. Treatment was continued for 7,5 years , the endpoint was myocardial infarction. The results of the study demonstrated that 1% reduction of total cholesterol results in a 2% decrease in CHD risk.

*The Oslo study.* (10) It was primary prevention trial. It used diet to lower cholesterol along with smoking cessation program In the intervention group there was 13 per cent reduction in total cholesterol during 5 years of follow-up versus 3 per cent in the control group. Both smoking cessation and low cholesterol level result in 57 per cent reduction in CHD mortality. Continuing followed-up about 102 months showed 19 deaths in the intervention group versus 31 deaths in the control group.

*The multiple Risk Factor Intervention Trial (MRFIT)* (11) explored the effect of a multifactor intervention program on CHD in men who had high blood pressure, high plasma cholesterol level, and who smoked, which put them at an increased risk of death from CHD. Men were randomly assigned to specific intervention (SI) group, who were given dietary advice, encouraged to quit smoking and control hypertension, and to the control group, who utilized their usual sources of medical care. The results of the follow-up showed a significant decrease in CHD mortality in the intervention group over 10,5 years. CHD mortality in SI group was 11% lower than in the other group.

Peoples habitual eating patterns influence their chance of development CHD. Investigating coronary heart disease in Seven Country Keys, Dock, Snapper came up with the following data, which indicated relationships between consumption of certain nutrients (average dietary intakes of various nutrients ) and the mortality from CHD in men.(7, 12)

**Table I** Correlations coefficients between the mortality rates from CHD and the intake of certain nutrients in the diet

<b>Nutrient intake</b>	<b>Positive correlations</b>
cholesterol	0.762
meat	0.697
total fat	0.676
eggs	0.666
sugar	0.638
total calories	0.633
animal fat	0.632

Table 1 shows that some of nutrients correlate positively with the mortality rate. These are dietary cholesterol, animal protein, animal fat, meat and eggs, total calories and sugar.

According to the degree of saturation fats may be classified into three major classes (13):

1. Saturated fatty acids (SFA) They are not essential nutrients and may be synthesized in the body from acetate. This type of fat increases level of low density lipoproteins (LDL), which results in hypercholesterolemia. The main sources of saturated fat are animal fats except fish and shellfish: red meat, fried meat, sausage, whole milk, cheese, butter, ham, cakes, eggs.
2. Monounsaturated fatty acids (MUFA) is present in all animal and vegetable fats. They are essential and may be synthesized in the body. The main source of MUFA is olive oil.
3. Polyunsaturated fatty acids (PUFA) are vital nutritional factor for cellular membranes. They are "essential" fatty acids, because they are only obtainable from dietary sources and can not be synthesized in vivo. They are obtained from all vegetable oils except coconut and palm. PUFA decrease cholesterol and low density lipoproteins (LDL) concentration in blood .

Several carefully studied populations in Mediterranean countries, where diets are rich in vegetables, fruit, and fiber consumption have lower rates of CHD. There is an evidence that high consumption of dairy products rich in saturated fats is likely to increase CHD. So diet high in fruit, vegetable, whole grain and low or moderate intake of fat-containing dairy products in Mediterranean diet contribute to the low rates of CHD in these populations (14) Consumption of beef, pork, and lamb traditionally has been low in these countries. Epidemiologic studies showed a positive association between regular red meat consumption and CHD occurrence. In Mediterranean diet the main source of

dietary fat has been olive oil (MUFA), which compared with saturated fatty acids reduces LDL cholesterol and increases high density lipoproteins (15)

*Seven Country Study*.(12) This study enrolled populations from US, Finland, the Netherlands, Italy, Yugoslavia, Greece, and Japan. There were 15 cohorts of 11579 men aged 40-59, healthy, who are followed for 15 years. It was found that death rates were positively associated with dietary SFA intake, and negatively associated with dietary MUFA. Besides, death rates were lower in cohorts consuming olive oil as a main source of fat.

So, the first step in prevention CHD is dietary therapy aimed to reduce CHD morbidity and mortality. The National Cholesterol Education Program (NCEP) recommends to keep the diet "in a stepwise manners". For the general population for CHD risk reduction has been recommended a diet (step I diet) containing  $\leq 30\%$  of energy from fat,  $< 10\%$  from saturated fat, and  $< 300\text{mg}$  cholesterol/d, while for hypercholesterolemic people the recommended diet is likely to contain (step II diet)  $< 7\%$  of energy from saturated fat and  $< 200\text{ mg}$  cholesterol/d. Such diets have been shown to reduce CHD risk. (16).

In order to achieve optimal concentrations of LDL, high density lipoproteins in plasma it is important to regulate quantities of dietary saturated, monounsaturated and polyunsaturated fatty acids intakes. To investigate this problem (quantity of total fat and type of fatty acids) a randomized double-blind trial was conducted in normal males. 48 males were followed for 3 weeks average American diet (AAD), which is 37% of calories from fat and 16% from SFA. During the next 7 weeks one-third of these males continued AAD, one-third switched to a 30%-fat diet with 9% SFA(step I diet), and one-third shifted to a 30% fat diet with 14% SFA. It was found that only overall reduction of dietary fat to 30% does not results in reduction of plasma cholesterol unless consumption of SFA decreased in the diet. So, the quantity of dietary SFA is more associated with lowering of LDL cholesterol than with quantity of total dietary fat (17)

So, a diet which is expected to prevent CHD is likely to be low in cholesterol, animal and saturated fat, total calories, animal foods like meat, egg yolks; diary products high in saturated fats should be either limited or excluded from the diet for CHD prevention. The alternative diet is a diet high in grains, vegetables, legumes, nuts, skim milk, vegetable margarines and oils, fruits and limited quantities of fish and milk.

Epidemiological studies on obesity, alcohol consumption, and diabetes indicated the effect of these factors on lipid metabolism. The epidemiological association between alcohol intake and CHD has been examined in a variety of case-control studies. They showed the protective effect of mild or moderate alcohol intake on CHD incidence by raising high density lipoproteins level in blood. (18). In order to examine the effect of alcohol on nutrient intakes, *the Quebec Family Study* was conducted. The results

showed that a high alcohol intake was associated with a high - fat diet, which increased daily energy intake and contributed to overfeeding.(19) Epidemiological studies on obesity showed that obesity has been associated with increased risks of CHD. (20)

Diabetes is a well-established risk factor for CHD.(8) There is an evidence in literature that diabetes attributes to abnormal lipids metabolism called dislipidemia.(20)

The relationship between socioeconomic status (SES) and CHD was explored in cohort and case - control studies conducted from 1960 to 1993 [a meta-analysis]. The majority of studies concluded that there was an inverse relationship between SES and CHD. (21)

## **Methods**

### *Research questions*

Taking into consideration the importance of the diet as a major risk factor in CHD prevention and the fact that no epidemiological studies have been done before in Yerevan to assess nutrition knowledge, fat, fruit, grain, vegetable consumption, cholesterol control in CHD patients the following research questions were addressed in this study:

1. What is the level of nutrition knowledge regarding low-fat diet in CHD patients ?
2. Is the level of nutrition knowledge different between CHD and non-CHD patients ?
3. Is the level of nutrition knowledge different in incident versus prevalent CHD patients ?
4. What is the frequency of fat ,fruits, grain, vegetable consumption in CHD patients ?
5. What is the frequency of fat ,fruits, grain, vegetable consumption in non- CHD patients ?
6. Is there any association between frequency of fat consumption in CHD versus non-CHD patients
7. What proportion of people check cholesterol in blood as a routine care in both case and control groups ?

The dependent variable (outcome) was Coronary Heart Disease.

The independent variables (exposure) were diet and knowledge.

### *Potential confounders*

Age, gender, residence, education, marital status, socio-economic status, a family member with a medical background (either nurse or doctor), diabetes, alcohol consumption ,and obesity were considered

as potential confounders. Factors like age, gender, residence, marital status, , a family member with a medical background were not well-elucidated in literature but considered in this study as confounders. It was hypothesized that they may influence people's dietary practices, knowledge.

Body mass index (BMI) was calculated as weight in kg divided by height (in meter) squared. Obesity was defined as BMI > 25 kg/m<sup>2</sup>

### *Study design*

Compared with cross-sectional studies case-control studies allow measurements of past dietary intakes, comparison of findings between different groups, estimation of risks. Besides, case-control studies are relatively more efficient and quick than cohort studies, clinical trials. (22) Taking into account limitation of resources including financial support, manpower, also time limitation ( 1- 1,5 months for data collection) to conduct a study and the above-mentioned research questions a case-control study was the most appropriate study to be performed.

The design of the study was a hospital-based case-control study The study was conducted in the hospital "Nairi". It is located in the center of Yerevan. In the past the hospital served "elite" people (members of the government, other high rank people, academicians, professors... ). Last ten years maintaining the status of the hospital by serving the special cohort of the above-listed people eligible for treatment at the hospital, nowadays the doors of the clinic are open for everyone. There is no restriction for admissions. Variability of patients admitted to the hospital according to their socio-economic status, level of education, residence is large. For this reason study population was selected on the basis of this hospital to ensure to some extent representativeness of the sample. The hospital has the following clinical departments : cardiological, coronary care unit, neurological, therapeutical, surgical, urological, gastroenterological.

Ascertainment of cases and controls was based on medical records, ECG and/or echocardiography. CHD diagnosis were made in accordance with WHO classification. All diagnosis in the cardiological department are confirmed by Adamyan K.G., a visiting doctor of the department, an academician, in the neurological department by professor Bekunts H.H., in the gastroenterological department by professor Bagdasaryan E.G.

#### *Definition of cases*

Patients admitted to the hospital with acute or chronic CHD from August 8 to September 24 in 1999.

#### *Definition of controls*

Patients admitted to the hospital with diagnosis other than CHD, who never experienced CHD before, aged > 30 from August 8 to September 24 in 1999.

#### *Exclusion criteria*

Patients admitted to the hospital with strokes were excluded from the control group. Diet is a risk factor for cerebrovascular diseases (strokes) as well : these patients were an appropriate group for control.

Patients following a diet not allowed to consume fatty products because of

-losing or maintaining weight

- gastrointestinal diseases: colitis, pancreatitis, hepatitis, gall bladder (only prevalence persons)

- renal failure as a complication of a disease

were excluded from both case and control groups.

Patients with no verified diagnosis during the stay in the hospital were not included in the study. Foreigners were also dropped from the study.

Incidence events of gastrointestinal diseases, patients with diabetes not complicated by renal failure were *inclusion criteria*

Within the data collection period (August-September) 191 patients were admitted to the hospital: 103 patients were hospitalized in August, 88 in September. From 191 patients 123 met the eligibility criteria and enrolled in the study. Since CHD mainly affects men ,proportion of women/men in controls was much larger than in cases. For that reason during last two weeks of data collection only men were enrolled in control group. The control subjects may be selected so that their distribution on factors like age and gender reflects the distribution of those factors in the diseased population (22).

The response rate was uniformly high (96%). It was almost similar for cases and controls. There were 3 refusals, 2 incomplete interviews. 18 eligible patients were not interviewed because of severity of their conditions, deaths.

#### *Sample size*

Estimated sample size for detecting 20% difference in the level of knowledge between the two groups at 0,05 level of significance ,  $\beta = 0,8$  was 91 for each group.

So, it was planned to interview 182 patients. Since the number of admissions to the hospital dramatically dropped during the data collection period, only 100 patients were involved in the study : 44 controls, 56 cases . Of these 56 cases 23 were incident, 33 were prevalent cases.

STATA was used to estimate the power of the study taking into account existing sample size. ,because the smaller sample size the lower the power of the study. Estimated power was 0.5352

### *Data collection*

Exposure information was obtained through questionnaire. The first part of the questionnaire is the list of food products more specific for Armenian population. It includes 24 points and consists in its turn of two sections: the first one assesses frequency of fat consumption (15 points) while the other one assesses frequency of vegetable, fruits and grain consumption (9 points).

The questionnaire was a standardized valid food frequency questionnaire. It was taken from another study conducted in Moscow and Petersburg (Russia) to assess nutritional risk of dislipidemia. The questionnaire was compiled based on Dietary Assessment Resource Manual , and for validation of the questionnaire the following biologic markers were tested: total cholesterol, tryglicerides, LDL, HLP. (23)

The second part of the questionnaire includes demographics, knowledge, and behavior related questions. The knowledge questions consist of 16 items. The total rating score was computed from the sum of the 16 items and each item was given 1 point. Every person who scored  $\geq 8$  points was considered as knowledgeable. Nutritional exposure was assessed before the onset of the disease in the recent past (among incidence CHD cases and control subjects), or in the distant or remote past (among prevalence CHD cases).

The patients were interviewed as they were admitted in 1-3 days after hospitalization dependently on their health status. The selected sample was a consecutive sample.

I myself conducted face-to-face interviews in Armenian and Russian. It took about 15-20 minute to complete an interview.

The following steps were performed to conduct an interview:

- check the list of everyday admissions in Admission Room. It includes information about age, gender, employment status of a patient, and admission diagnosis
- double check the same information in appropriate departments of the hospital
- look through medical records
- identify eligible patients

### **Statistical analysis**

Data entry was done by using STATA. Statistical significance for differences between cases and controls was assessed by Chi- squared test for categorical variables. Knowledge scores reflected the proportion of correct answers to the sixteen knowledge-related questions. Within each group, knowledge scores were pooled to estimate the mean level of knowledge.

Odds ratio and their confidence intervals were calculated by 2\*2 tables and unconditional logistic regression. To control possible confounders stratification technique was used.

## **Results**

The analyses based on the data on 44 hospital-based controls and 56 case patients ( 23 incident and 33 prevalent cases )

### *Socio-Demographic characteristics*

Proportion of males to females in both groups are similar : 64/35 in cases and 65/34 in controls.(Table 2)  
The mean age of cases was  $63 \pm 10$  , mean age of controls was  $56 \pm 10$ . About 60% of interviewees in each group had University degree (bachelor). 95% cases and 91% controls were married. By place of residence the majority of cases and controls live in the center of Yerevan. The center includes Arabkir, Kentron, Zeitune districts. Approximately 10% cases and 6% controls are either doctors or nurses. 33% cases and 37% controls had a family member with medical background (either doctor or nurse). SES was distributed unequally. The majority of cases belonged to the medium income level while among controls more than half of participants were represented by the low income level .The proportion of diabetics in cases was 25% against 13% in controls. About 37% controls and 27% of cases were considered as obese. The proportion of people categorized by frequency of alcohol consumption was almost the same between cases and controls : 30% and 34% respectively.

### *Results of knowledge-related questions*

The test of proportion showed statistically significant difference ( $p < 0.05$ ) between cases and controls in the level of knowledge.

The mean score of sixteen- item knowledge test among cases was  $6 \pm 3$ , among controls was  $4 \pm 3$ . Mean knowledge score calculated separately within cases for prevalent CHD cases was  $7 \pm 3$ , while for incident cases it was  $4 \pm 3$ .(table 3)

**Table 3. Mean knowledge score distribution**

Groups	Mean knowledge score $\pm$ SD
Controls	4 $\pm$ 3
Cases	6 $\pm$ 3
Incident cases	4 $\pm$ 3
Prevalent cases	7 $\pm$ 3

The proportion of knowledgeable patients in cases was 33% against 15% in controls.

When the interviewees were asked whether they agree or disagree with the statement that while eating poultry it is important to remove the skin first and why, 51% cases and 38% controls answered correctly by motivating that it was harmful for health because of high fat content. The others considered poultry's skin either useful or tasty.

Responding to the statement that when eating red meat it is important to trim the visible fat and why, correct answers were accounted for 56% cases and 64% controls. The others opinion is that it is either tasty or useful. Controls were more aware than cases.

The question whether regular diet rich in animal fat increases a person's chance of getting heart disease 55% cases and 38% controls answered correctly "Yes". Among incidence cases 48% and among prevalence cases 30% said "I do not know". Overall, the proportion of people in cases and controls, who responded as "I do not know" was 38% and 48% respectively.

When the participants were asked whether regular diet rich in vegetable oil increases, decreases or has no influence on a person's chance of getting heart disease, the most frequent answer was "I do not know" (41% cases and 45% controls). Correct responses were given by 41% cases and 36% controls.

Questioning their opinion about in what proportions were animal fat and vegetable oil desirable to use, 53% of cases and 41% of controls gave correct answers. Approximately half of cases and more than half of controls preferred to use animal fat rather than vegetable oil.

About 71% cases and 68% controls had an idea what the term cholesterol means. From the all cases almost 26% of correct answers accounted for prevalent cases and only 14% correct answers were given by incident ones.

**Table 4. Recognition of foods more associated with the risk of getting heart disease**

List of foods	Proportion of correct answers	
	Cases (incident/ prevalent)*	Controls
Bread	81 ( 79/85 )	93

Butter	81 ( 73/86 )	58
Vegetable oil	90 (93/89 )	96
Eggs	54 ( 33/65 )	55
Fish	90 (93/95 )	82
Sausage	27 ( 20/32 )	31
Vegetables	100 (100/100 )	96
Whole milk, cheese	18 ( 14/20 )	13
Macaroni	67 ( 66/67 )	62
Potatoes	83 ( 78/86 )	89
Poultry	25 (13/31 )	37
Red meat	59 ( 66/56 )	51
Ice cream	31 ( 20/37 )	25
I do not know	13	16

\*incident : proportion of correct answers among all incident cases  
prevalent : proportion of correct answers among all prevalent cases

Table 4 shows that there is a small difference in identification of foods associated with CHD between cases and controls. But within cases more correct answers are given by prevalent rather than incident cases.

Egg yolk as the biggest source of cholesterol was correctly identified by 50% cases and 28% controls. From all the cases 10% of correct answers were given by incident and 15% by prevalent cases. The next most frequent answer to this question were "milk", then "fish".

55% cases and 61% controls correctly marked the desirable recommended number of eggs worth consuming per week. Within case group 80% prevalent and 19% incident cases gave correct answers.

The participants were asked to identify the condition which most increases a person's chance of getting heart disease (all listed conditions except the diet were minor risk factors). The most frequent answer to the question was worry or anxiety ( 50% cases and 38% controls). Only 12% cases and 11% controls gave preferences to the diet high in animal fat. None of incident cases answered correctly, 21% correct answers accounted for prevalent cases.

No association was found between the level of knowledge and SES, age, gender, residence, the level of education, occupation, marital status, having a family member as a health worker, diabetes.

#### *Frequency of fruit, grain, vegetable consumption*

Three categories were identified by fruit, grain, vegetable consumption :low intake (< 20) and moderate intake (20-30), high intake (>30)

**Table 5. Frequency of fruit, grain, vegetable consumption in cases and controls**

	Frequency of fruit, grain, vegetable consumption (%)		
	low	moderate	high
Cases	47	53	0
Controls	52	48	0

52% controls and 47% cases were low and 48% controls and 52% cases were moderate fruit, grain, vegetable consumers. There is a little difference in fruit, grain, vegetable consumption between cases and controls.

*Frequency of fat consumption*

According to the frequency of fat consumption the interviewees were split into three categories : low fat consumers (scored <17), moderate fat consumers (total score was within 18-24 inclusively), and excessive fat consumers (scored  $\geq 25$ ).

**Table 6. Frequency of fat consumption in cases and controls**

	Frequency of fat consumption (%)		
	low	moderate	high
Cases	11	25	64
Controls	30	30	40

64% cases were considered as excessive and 11% as low fat consumers, and among controls only 40% are excessive and 30% are low fat takers. So, among cases proportion of excessive fat consumers was larger than among controls.

No association was found between level of knowledge and frequency of fat consumption ( $p > 0.05$ )

*Frequency of fat consumption and CHD*

Table 7 pointed out that frequency of fat consumption is strongly associated with CHD. Estimated OR for CHD in excessive fat takers versus non- excessive was 2,7. It increases the odds for CHD.

**Table 7.Odds Ratio (OR) and 95% Confidence Interval ( 95% CI) of frequency of fat consumption variable for CHD**

Outcome Exposure	Cases (numbers)	Controls (numbers)	OR	95% CI
Excessive fat takers	33	15	2.7	[1.22 6.25]
Non- excessive fat takers	23	29		

p = 0.0136 Results were statistically significant (p< 0,05).

An association was found between CHD and SES (p < 0.05), In order to control this factor it (SES) was stratified, OR were estimated and compared with crude OR = 2,7

**Table 8. Stratum-specific Odds Ratio of SES**

SES	OR
Low	1.8
Medium	3.8
High	2

Crude OR = 2.7, and across different levels of SES stratified OR differ largely ; SES modifies the effect of fat consumption on CHD.

#### *Cholesterol control*

Only 5% of study population check cholesterol in blood as a routine care.(chart II ) All interviewees asked to explain the reasons for not controlling cholesterol. The most frequent response was : " it was not important for health" (49%). Almost 26% said that they have never been advised by a health care worker. 23% refer to the financial issues : "it is expensive".

The other specified reasons were the following:

- have no time 41%
- cholesterol control was not accepted in Armenian culture 19%
- I heard about it first time 9%
- hate to be injected 3%
- I should cover a long distance to get to a health facility 3%

-I know I am healthy 3%

-I control cholesterol through the diet by using a limited quantity of fat 3%

## Discussion

### *Knowledge*

The test of proportion indicated higher level of nutrition knowledge in cases than in controls. The same tendency was observed according to the obtained scores. The difference in level of knowledge between cases and controls could be accounted for a higher level of knowledge in prevalent cases compared with incident cases, because separate analysis of prevalent CHD cases resulted in the same mean score of knowledge test between incident cases and controls ( $4 \pm 3$ ).

In identifying the main sources of cholesterol like egg yolk, poultry's skin...about 50% of cases and controls had no idea about it. The rate of correct answers regarding the influence of diets rich in animal fat, vegetable oil on the risk of CHD were the lowest. The main response was : "I do not know". About half of cases and more than half of controls prefer to use animal fat rather than vegetable oil.

Identification of foods associated with the risk of CHD , in general, was low, particularly eggs, butter, sausage, poultry, red meat, ice cream . Among the listed conditions, which are minor risk factors for CHD except one response : diet rich in animal fat, none of incident cases answered correctly. The majority in both groups considered worry or anxiety as the main factor in CHD development. Proportion of knowledgeable people was dramatically small in both groups.

So, although there is a difference in knowledge level between cases and controls ,in general, level of nutrition knowledge related to "heart-healthy" diet is low among controls as well as among incident and prevalent cases with regards to the estimated mean scores. Possibly lack of preventive programs in Armenia is a reflection of low nutrition knowledge among our population.

### *Frequency of fat consumption and CHD*

In agreement with numerous epidemiologic studies , positive association between frequency of fat consumption and CHD has been found in this study. The higher fat consumption the higher risk of developing CHD. In accordance with estimated OR the risk of developing CHD in excessive fat consumers was 2,7 times greater compared with non- excessive ones.

The following association was observed between CHD and SES : the higher SES the higher odds for CHD. Literature showed inverse relationship between CHD and SES : " for each educational level risk of CHD was higher at the next level up"(21) But in all reviewed articles SES defined by level of education (not income) . In Armenia education could not determine income level. There is no link between level of education and income status. Possible explanation of the revealed association is that well-off people could afford diverse food products, mainly meat, which are rich in animal fat. It puts them at an increased risk for CHD, especially taking into account low awareness of study population of healthy dietary practices.

Further analysis identified SES as an effect-modifier, which alters exposure-disease odds at different stratum. But no trends were found at different levels of SES. The odds in low SES was the least 1.8, in medium SES was the highest 3.8, and in high SES was equal to 2. Low odds at high SES stratum could be explained by approximate assessment of SES , which is the main concern for data collection in Armenia. SES was defined by monthly average expenditures. There were no valid accurate sources for identification of real incomes.. People usually tend to indicate the lower income than really it is. This introduce information bias in the study. Another explanation is that proportion of peoples presented by high SES in the sample was much smaller than within low and medium strata, which could be explained either by the above-mentioned reason or the small sample size with restricted representativeness of the study population.

#### *Frequency of fruit, grain, vegetable consumption*

It was surprising that none of sample elements was identified as high fruit, grain, vegetable consumer. Low level of nutrition knowledge may account for this fact.

There was no significant association was found between frequency of fruit, grain, vegetable consumption and CHD. It could be explained by the fact that difference in fruit, grain, vegetable consumption was marginal in cases and controls. To detect subtle difference a larger sample size is needed . For the same reason the absence of relationships between CHD and obesity, alcohol consumption, and diabetes could be justified, although literature showed the evidence

In this study not much difference has been revealed between cases and controls in respect to the marital status, gender, level of education, occupation, a family member with a medical background, residence, and no association has been found between these factors and CHD.

#### *Cholesterol control*

Soviet Public Health system paid very little attention to health education and promotion : it was mostly clinically oriented , and did not give emphasis to preventive programs. Possibly for that reason the majority of study population did not give importance to cholesterol control as a routine care. Armenians are reluctant to change to a healthy lifestyle. Even knowledgeable persons may not adhere to the healthy practices.

### **Limitations of the study**

Selection of cases and controls is a major issue in evaluation a case- control study, which reflects to what extent the findings of a study may be generalizable. In this study no random strategies were built to select both case and control groups, which leads to concern about *representativeness* of the study population. The selected sample was a consecutive sample. It was done because of time and resource limitations.

The quality of obtained information is another major point especially in nutritional studies. *Recall bias* may be concern in all case-control studies regarding diet and disease. The difficulty is in identification how valid the reported exposure (diet) was in the distant past. In that sense the use of prevalent CHD cases could affect the accuracy of information : misreporting of previous intake of foods was possible.

Changes in diet over time controlled in the study. Exposure information was collected before the onset of the disease.

During the interviews *presence of household members* influenced respondents' answers in a few cases, although they (household members) were asked not interrupt the interview.

Although food frequency questionnaire was standardized, while designing the project it was planned to test *lipids profile* (as a biologic marker) of study population. But in late July the hospital ran out of testing materials because of absence of financial support since March 1999. That is why the questionnaire was administered without testing the lipids.

Financial issues in Public Health , like absence of petrol, blocked Emergency Services. Number of admissions to hospitals fell. The total number of admissions to the hospital "Nairi" in May was 204, in June was 198, in July was 182, in August was 103, in September was 88. For that reason another general concern occurred : *statistical power* of the study .Sample size was smaller than it was expected to be.

### **Recommendations**

Based on epidemiological findings of the study the following recommendations related to CHD prevention could be made for CHD patients as well as for general population:

*at population level*

- increase knowledge of population about the importance of diet in CHD prevention by health education. Education programs may draw people attention to what healthy diet is, how to follow it, what are the main sources of animal fat, what types of food should prevail in the diet...Such campaigns could be conducted by using a large variety of channels : TV, newspapers, mass-distributed print media, health care system...
- increase awareness of population about importance of cholesterol control as a routine care with the purpose of having every person know his/her own cholesterol level. This may motivate people to start adopting a healthy lifestyle.

*at individual level*

- increase the role of health workers as a source of information : a more active role of physicians in teaching people how to achieve and maintain healthy habits

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# **Annex**

### Trends of CHD Mortality Rates in Armenia, 1988-1998

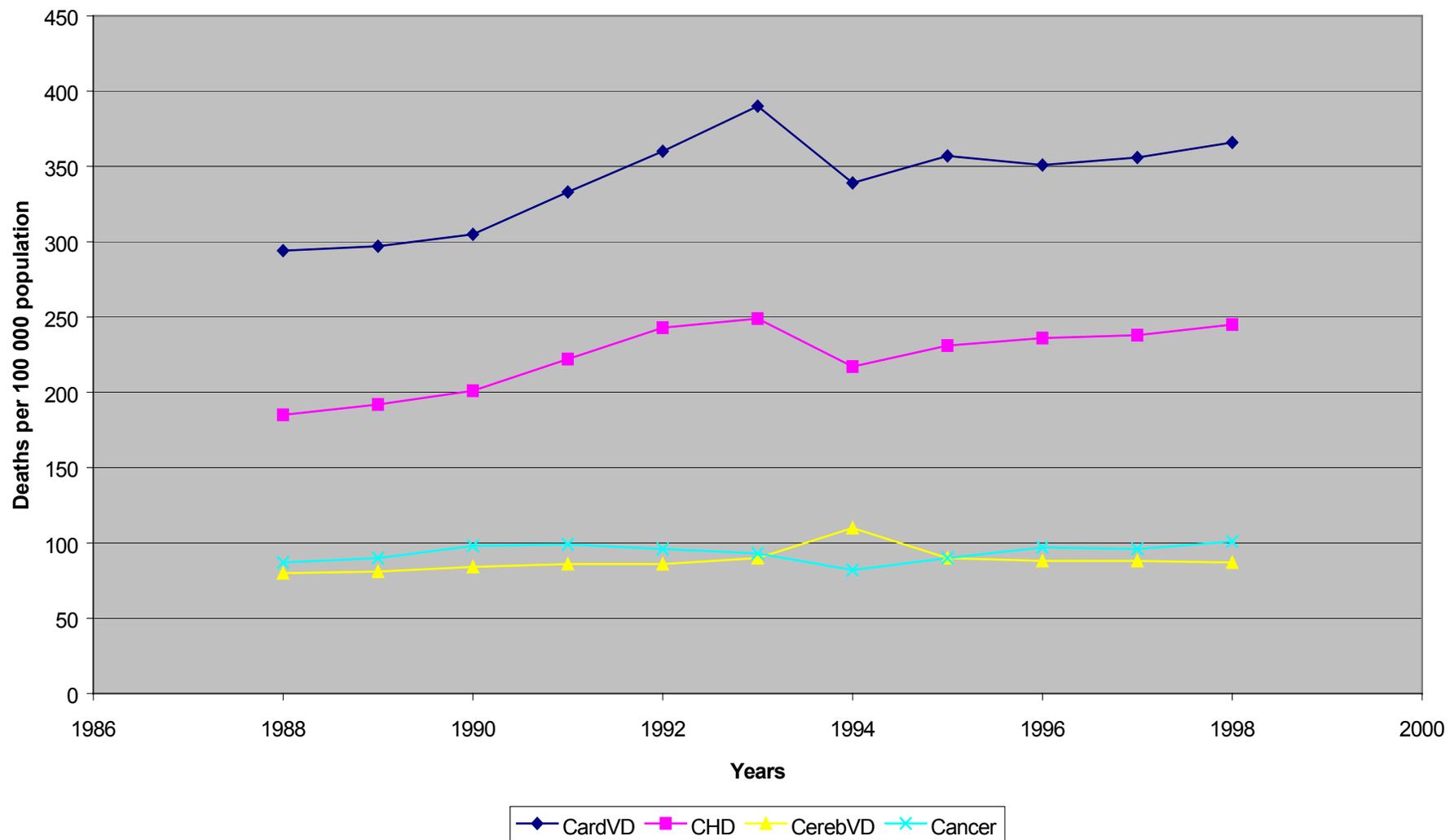
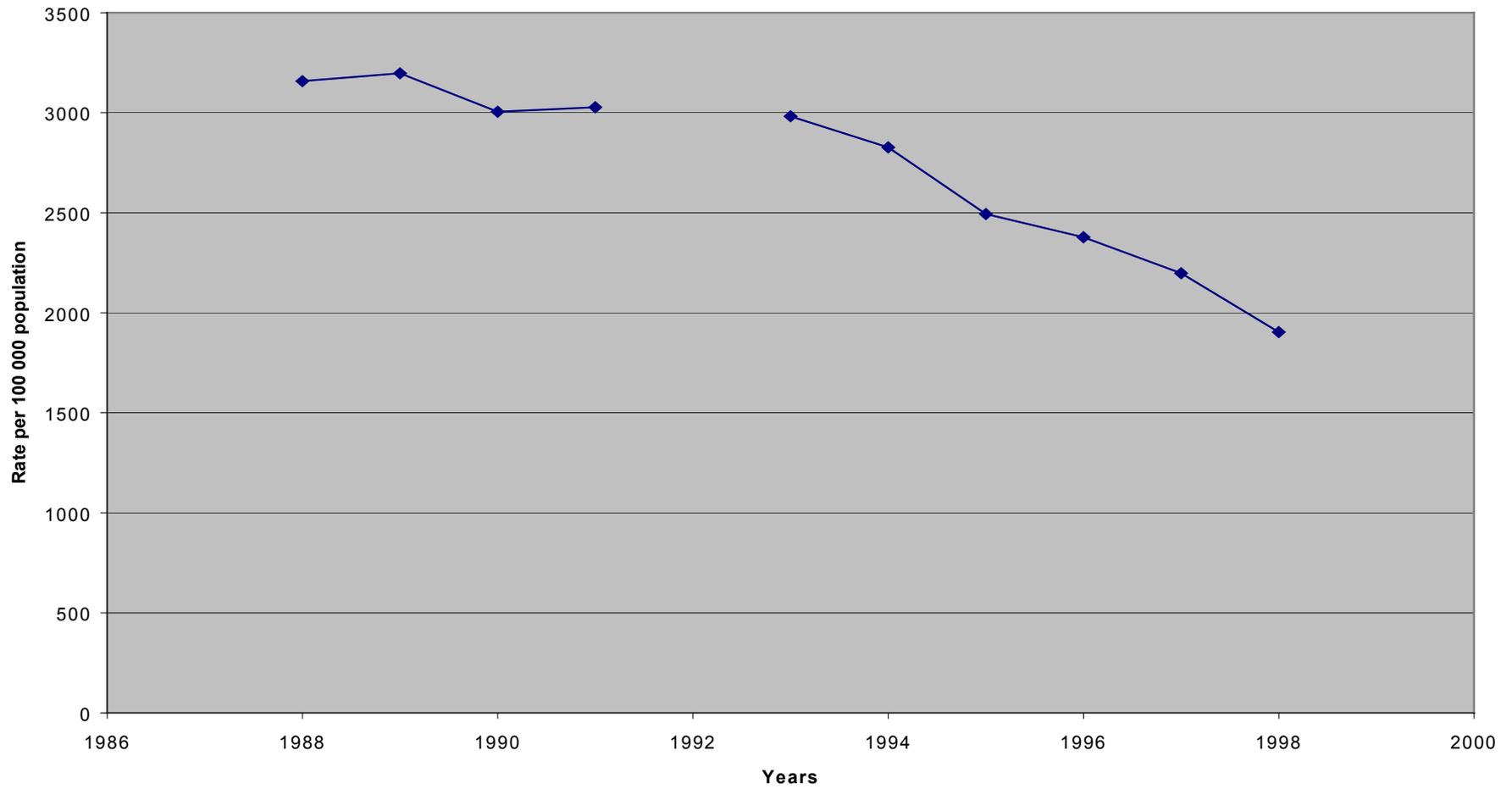


Figure I. Source: Analytic-Information Center of MOH of Armenia

### CHD Morbidity in Armenia, 1988-1998



**Figure II.**

**Source: Analytic-Information Center of MOH of Armenia**  
**Data regarding CHD morbidity in 1992 in Armenia not available**

Chart I

Distribution of Cardiovascular Diseases in Armenia, 1998

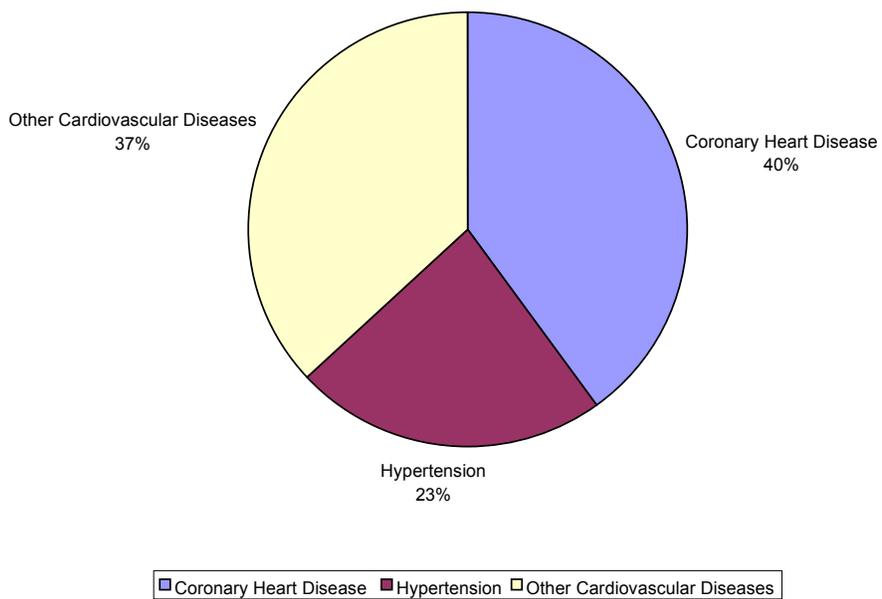
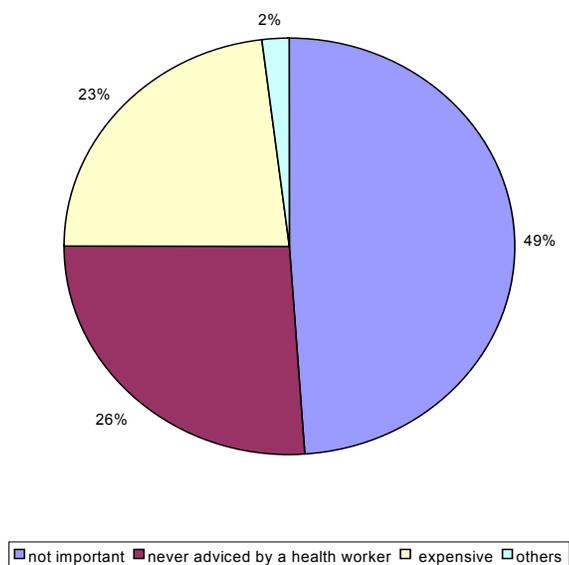


Chart II

Respondents opinion about cholesterol control as a routine care



**Table 2 . Socio- Demographic characteristics of the study population**

<b>Variables</b>	<b>Cases</b>	<b>Controls</b>
<b>Gender :</b> Male Female	64 35	65 34
<b>Age (mean ± SD)</b>	63 ± 10	56 ± 10
<b>Level of education (%)</b> High school, college University	35 60	40 59
<b>Socio-economic status (%)</b> Low Medium High	37 41 21	54 36 9
<b>Marital status (%)</b> Married Single	75 25	79 21
<b>Obesity (%)</b>	27	37
<b>Occupation (%)</b> Medical Non-medical	10 90	6 94
<b>A family member with medical background (%)</b>	33	37
<b>Alcohol consumption(%)</b>	30	34
<b>Residence (%)</b> center periphery	66 63	34 37
<b>Diabetes (%)</b>	25	13

## Questionnaire

### Food frequency questionnaire

*Assessment of frequency of fat consumption*

List of products	1/mont h or less	2-3 times a month	1-2 times a week	3-4 times a week	5+ times a week	Total sum of points
	points					
	0	1	2	3	4	
Butter, margarine, and other animal fat using in cooking (to roast, to bake), on bread						
Beef like steak, roasts, ribs						
Whole milk						
Soured cream, cream, ice-cream						
Liver, brain , kidney						
“boiled” sausage,						
Settled or semisettled sausage						
Cheese, , cheese spread (not low-fat)						
Curds (18%)						
Eggs						
Pork, ham, mutton						
Fried chicken, goose, (with skin)						
Fried potatoes, chips, popcorn						
fat						
Pastries, cakes, chocolates						
Total points						

Total sum of points < 18 implies low animal fat and cholesterol consumption

Total sum of points 18-24 inclusively implies moderate animal fat and cholesterol consumption

Total sum of points ≥ 25 implies excessive animal fat and cholesterol consumption

*Assessment of frequency of fruit, vegetable, and fiber consumption*

List of products	1/month or less	2-3 times a month	1-2 times a week	3-4 times a week	5+ times a week	Total sum of points
	points					
	0	1	2	3	4	
Bread (white)						
Bread (dark) such as whole wheat or rye						
Boiled potatoes						
Carrot, red beet, cabbage, tomatoes, cucumber, vegetable marrow, egg-plants, pepper						
Macaroni, rice, barley, millet, pearl						
Semolina, buck wheat, oat meal						
Leguminous plants (beans, ped, haricot bean, lens)						
Bananas, apple, pear, orange, fruit, juice like orange, apple, grape						
Apricots, grapefruit, water-melon, pineapple, grapes, melon, berries(strawberry, gooseberry...), tangerine, plum, cherry, dried fruits						
Total sum of points						

Total sum of points < 20 implies insufficient consumption of fruit, grain, vegetables

Total sum of points 20-29 implies moderate consumption of fruit, grain, vegetables

Total sum of points > 30 implies moderate consumption of fruit, grain, vegetables

*Socio-Demographic questions*

1. What is your name?
2. What is your age from your last birthday?
3. Your current address:
  - 3.1 How long have you been lived here?
4. What is your weight ?
5. What is your height ?
6. Your education :
  1. High school
  2. College
  3. Bachelor or higher degree
7. What is your profession ?
8. Is anybody in your family has a medical background ?
  1. yes
  2. no
9. What is your marital status
  1. Married
  2. Single
  3. Divorced
  4. Widow/widoer
10. Are you following any diet ?:
  1. yes
  2. no (skip to 12)
  - 10.1 Is it a diet because of :
    1. a disease: gastro/intestinal, heart, renal, diabetes
    2. loosing weight
    3. other(specify)

11. Have you been suffering from diabetes?

1. Yes
2. No

12. How often did you use alcohol during last month ?

1. Every day
2. 1-3 per week
3. 2-3 per week
4. rarely
5. never

13. Was the amount of your drinking within that period during the past 12 months is:

1. typical
2. more
3. less

***Knowledge-related questions***

14. Are you agree or disagree with the following statement : " When eating poultry, it is important to remove the skin first"

1. Agree (skip to 10.1)
2. Disagree (skip to 10.2)

14.1 Why are you agree ?

1. I do not like it
2. it is harmful for health
3. other (specify)

14.2 Why are you disagree ?

1. it is useful for health
2. it is tasty
3. other (specify)

15. In your opinion regular diet rich in vegetable fat (sunflower oil, olive oil):

1. increases the risk of getting heart disease (infarction)
2. has no influence on health
3. decreases the risk of getting heart disease(infarction)
4. I do not know

16. Are you agree or disagree with the following statement: "When eating red meat , it is important to trim the visible fat "

1. Agree (skip to 13.1)

2. Disagree (skip to 13.2)

16.1 Why are you agree ?

4. I do not like it
5. it is harmful for health
6. other (specify)

16.2 Why are you disagree ?

4. it is useful for health
5. it is tasty
6. other (specify)

17. In your opinion in what proportions are animal fat and vegetable oil desirable to use?

1. in equal proportions
2. mainly animal fat
3. mainly vegetable oil
4. I do not know

18. In your opinion regular diet rich in animal fat :

- 1.increases the risk of getting heart disease (infarction)
- 2.has no influence on health
- 3.decreases the risk of getting heart disease(infarction)
- 4.I do not know

19 In your opinion what does the term cholesterol mean?

20. Which of the following foods are more associated with risk of getting heart disease?

1. Bread
2. Butter
3. Vegetable oil
4. Eggs
5. Fish
6. Sausage
7. Vegetables
8. Whole milk, cheese
9. Macaroni
10. Potatoes
11. Poultry
12. Red meat
13. Ice cream
14. All of above
15. None of above

16. I do not know

21. In your opinion which of the following foods is the biggest source of dietary animal fat ?

1. Milk
2. Egg yolks
3. Fish
4. Cheese
5. I do not know

22. In your opinion , how many eggs per week is desirable to eat ?

23. In your opinion, which of the following conditions **most** increases a person's chance of getting heart disease?

1. Coffee drinking
2. Eating a diet high in animal fat
3. Diabetes
4. Worry or anxiety, stress
5. Sedentary life style
6. I do not know

***Cholesterol control***

24. Do you check your lipids level in blood as a routine care?

1. Yes
2. No

24.1 Why no:

1. It is not important
2. Expensive
3. Not advised by a health professional
4. Other reason (specify)

25. What is your family's average monthly expenditures ?

1. < 50 \$
2. 51-100 \$
3. 101-200 \$
4. 201 – 300
5. 301-400

6. 401-500
7. 501-600
8. 601 >
9. refuse answering ,(see attached speech)

Income is important in analyzing the health information I am collecting. This information will help me to learn whether persons in one income group eat differently from the others.

