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# Frequency and Distribution of Risk Factors For Coronary Heart Disease in the Adult Population of Rural District of Elazığ, Turkey

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**Abstract:** Objectives: This study was performed to determine the frequency and distribution of risk factors for coronary heart disease in people living in the Baskil district of Elazığ.

Methods: From a population of 905 individuals aged 35 years and over, 388 were randomly selected. Selection of subjects was done with official records of the Baskil Health Care Center. Although repeated invitations were made, 32 individuals (29 men and 3 women) did not participate. Thus, 356 subjects were enrolled. Blood cholesterol and blood pressure levels, body height and weight were measured in all study subjects. In addition, a questionnaire was applied.

Results: Mean cholesterol levels were found to be 195.8 mg/dL and 197.5 mg/dL in men and women, respectively. Cholesterol levels of men and women were above 240 mg/dL in 9.3% and 17.5% of men and women, respectively. The prevalence of cigarette smoking was higher in men (58.7%) than in women (13.1%). The prevalence of hypertension (systolic blood pressure >140 mmHg and /or diastolic blood pressure >90 mmHg) was found to be 51.9%, being 51.3% in men and 52.4% in women. Prevalence of obesity according to the body mass index criteria (over 30 kg/m2) was 12% in men and 31.6% in women (p=0.0001). Only 9.3% of men and 2.4% of women reported participating in regular physical activity (p<0.005). Animal fat and products were the leading sources of dietary fat intake (46.6%), followed by vegetable oils (28.7%), and margarine (24.7%). Based on the subjects' accounts, the prevalence of diabetes mellitus was 5.6%, being 2.7% in men and 7.7% in women.

Conclusions: This study indicated that the prevalence of major risk factors for coronary heart disease was high in people living in rural areas of Elazig. As there are few population-based studies performed on the prevalence of risk factors for coronary heart disease, this study may be of value in reflecting the situation in rural areas of Turkey.

**Key Words:** Coronary heart disease, risk factors, adult population.

## Introduction

Coronary heart disease (CHD) remains one of the leading public health issues. It is one of the most significant diseases in the United States and many other industrialized countries in respect to both mortality and morbidity (1, 2). In the USA, among one million deaths from cardiovascular disease each year, CHD is the leading cause of deaths in both sexes, accounting for 50% (3). Similarly, in England and Wales, CHD, with 150,000 deaths in 1987 accounted for 31% and 24% of male and female mortality, respectively (4).

There is an intimate relationship between age and sex and the incidence of CHD. Coronary heart disease occurrence below 30 years of age is rare, whereas increased occurrence is observed after age 30. Although the difference in the occurrence rates between sexes diminishes with increasing age, the disease is always more prevalent in men at all ages (1). The incidence of CHD varies in different populations, with age-adjusted mortality being 435/100,000 in Scotland and Finland, and 64/100,000 in Japan (4). Several risk factors have been implicated in the development of CHD. Major risk factors that appear to have an evident role include hypertension, high blood cholesterol, and smoking, all of which are amendable by appropriate interventions. There are also a considerable number of secondary risk factors which include age, sex, obesity, non-insulin dependent diabetes, work-related factors, and some genetic factors (1). The Framingham Study showed that, in eight-year

periods, atherosclerotic heart disease occurred in 2% of individuals presenting no risk factors, whereas the incidence increased to 49% during the same period in those presenting a total of five risk factors (5).

This population-based study was conducted in Baskil, Elazığ, among people aged 35 years or over to detect the prevalence of risk factors for CHD, to determine the need for provision of education and health care services to rural populations, and to provide insight into the evaluation and treatment of those presenting with CHD risk factors.

## Materials and Methods

Among all inhabitants aged 35 or over (n=905) living in Baskil a randomized group of 388 inhabitants were sampled. The selection was made in two stages. First, individuals aged 35 or over were listed from residents' records kept by the Health Care Centre in Baskil. A number was then assigned to each individual and a total of 388 persons were selected with the Table of Randomized Numbers. Those who were selected were invited to the Health Care Centre. Of these, 32 individuals did not show up for various reasons and were eliminated. Thus, 356 individuals were enrolled.

The study design was explained to all participants and their informed consent was obtained. Blood cholesterol and blood pressure levels, body height and weight were measured. In addition, a questionnaire was distributed.

Blood cholesterol was determined with the Reflotron System (Boehringer) from a capillary blood sample obtained from the fingertip. Values between 200-239 mg/dL were regarded as upper normal, and hence >= 240 mg/dL indicated high blood cholesterol (6).

Sitting blood pressure was measured on the right arm with a stethoscope and a standard mercury sphygmomanometer 10 minutes after each individual had shown up at the facility. A second measurement was made 10 minutes after the first, and the average blood pressure was calculated. The presence of hypertension was defined as systolic blood pressure >=140 mmHg and/or diastolic blood pressure >=90 mmHg (7).

Obesity was defined as body mass index (BMI) >=30 kg/m2 (8).

Two questions from the National Health Interview Survey in the USA were asked for classification of smoking status: 'Have you smoked at least 100 cigarettes in your entire life?' and 'Do you smoke now?' Subjects responding 'no' to the first question were classified as

| Age Group | Population | | | | Sample | | | |
|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | Male | | Female | |
| | n | % | n | % | n | % | n | % |
| 35-39 | 91 | 20.2 | 90 | 19.8 | 30 | 20.0 | 53 | 25.7 |
| 40-44 | 94 | 20.8 | 94 | 20.7 | 23 | 15.3 | 32 | 15.5 |
| 45-49 | 60 | 13.3 | 71 | 15.6 | 24 | 16.0 | 32 | 15.5 |
| 50-54 | 73 | 16.2 | 70 | 15.5 | 18 | 12.0 | 34 | 16.5 |
| 55-59 | 43 | 9.5 | 48 | 10.6 | 19 | 12.7 | 21 | 10.2 |
| 60-64 | 47 | 10.4 | 38 | 8.4 | 20 | 13.3 | 22 | 10.7 |
| 65-69 | 16 | 3.6 | 12 | 2.6 | 6 | 4.0 | 4 | 2.0 |
| 70+ | 27 | 6.0 | 31 | 6.8 | 10 | 6.7 | 8 | 3.9 |
| Total | 451 | 49.8 | 454 | 50.2 | 150 | 42.1 | 206 | 57.9 |

Table 1. Distribution By Age And Gender In Baskil Population Aged 35 Years Or Over And In The Sample

All percentages except those in the total row are calculated as column percentages.

Those in the total row are row percentages

| | Male | | Female | | |
|---|---|---|---|---|---|
| | n | Mean (SD) | n | Mean (SD) | P |
| Age | 150 | 51 (12.0) | 206 | 48 (11) | p < 0.05 |
| Cholesterol Level | 150 | 195.8 (42.8) | 206 | 197.5 (42.9) | p > 0.05 |
| Systolic BP | 150 | 134.9 (1.0) | 206 | 137.4 (22.9) | p > 0.05 |
| Diastolic BP | 150 | 85.8 (10.9) | 206 | 85.8 (12.4) | p > 0.05 |
| BMI | 150 | 25.7 (3.9) | 206 | 28.3 (5.1) | p < 0.0001 |

Table 2. Mean of Coronary Heart Disease Risk Factors in People Aged 35 Years or Over In Baskil

Table 3. Mean Plasma Total Cholesterol Concentration by Age and Gender in Baskil ( mg/dl)

| | 35-39 | | 40-49 | | 50-59 | | 60-69 | | 70+ | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | Mean | n | Mean | n | Mean | n | Mean | n | Mean | n | Mean |
| Male | 30 | 195.2(58.5) | 47 | 193.2(33.1) | 37 | 198.9(34.7) | 26 | 190.1(49.5) | 10 | 213.1(40.2) | 150 | 195.8(42.8) |
| Female | 54 | 175(36.2) | 63 | 191.6(43.7) | 55 | 210.8(32.6) | 26 | 223.8(48.8) | 8 | 219.5(42.4) | 206 | 197.5(42.9) |
| Total | 84 | 182.2(46.1) | 110 | 192.3(39.3) | 92 | 206(33.8) | 52 | 206.9(51.6) | 18 | 215.9(40.1) | 356 | 196.8(42.8) |

Analysis of variance: Gender: p=0.269, Age: p=0.002, Gender by age: p=0.006

never smokers, while those answering 'yes' to the first questions and 'no' to the second were classified as former smokers. Those who responded 'yes' to both questions were classified as current smokers (9).

Regular physical activity was defined as moderate aerobic that performed five days a week, with a duration of at least 20 minutes a day (10).

Diagnosis of diabetes mellitus was based upon the individuals' accounts. Those who stated that they had diabetes mellitus were considered diabetics without measurement of blood glucose and confirmation of hyperglicemia (11).

The field study was performed in April and May 1993. Data obtained from the questionnaires were processed on a computer by SPSS. Statistical analyses were done with chi-square, t-test and analysis of variance .

**Results**

Of a total of 451 men and 454 women aged 35 and over, 150 men (33.3%) and 206 women (45.4%) were included in study group (Table 1). Of the 32 nonrespondents, 29 individuals were men.

Of these 356 individuals, 42.1% and 57.9% were men and women, respectively. Average ages for men and women were 51 and 48 years, respectively (Table 2).

Of all the individuals enrolled, 17.3% of the men and 69.6% of the women were illiterate. Of men and women, 5.3% and 27.7% had received education up to high school level; 18.7% and 1.9% were graduated from high school, and 12.6% and 0.5% were university graduates respectively.

Average cholesterol levels in men and women were found to be 195.8 mg/dL and 197.5 mg/dL, (t: >0.05) respectively (Table 2). Table 3 shows the average cholesterol distribution in study subjects by age and gender (for gender p=0.267, for age p=0.002, for gender by age p=0.006). Blood cholesterol levels were equal to or in excess of 240 mg/dL in 14% of all study subjects, the rates being 9.3% in men and 17.5% in women (Table 4). Cholesterol levels by age increased

Table 4.    Prevalence of Coronary Heart Disease Risk Factors Compared to Age Group and Sexuality

| Risk Factors | | Male | | | Female | | | P | |
|---|---|---|---|---|---|---|---|---|---|
| | | No | % | n | No | % | n | | |
| Current smokers | | 88 | 58.7 | 150 | 27 | 13.1 | 206 | p< 0.0001 | |
| Total cholesterol concentrations >240mg/dl | | | | | | | | | |
| | 35-49 | 6 | 7.8 | 77 | 14 | 11.9 | 117 | in male | p>0.05 |
| | 50+ | 8 | 10.9 | 73 | 22 | 24.7 | 89 | in female | p<0.0001 |
| | Total | 14 | 9.3 | 150 | 36 | 17.5 | 206 | | |
| HBP Systolic >140/diastolic>90 mmHg | 35-49 | 31 | 40.3 | 77 | 47 | 40.2 | 117 | in male | p<0.005 |
| | 50+ | 46 | 63.0 | 73 | 61 | 68.5 | 89 | in female | p<0.0001 |
| | Total | 77 | 51.3 | 150 | 108 | 52.4 | 206 | | |
| Body Mass Index >= 30 | | | | | | | | | |
| | 35-49 | 11 | 14.3 | 77 | 40 | 34.2 | 117 | | |
| | 50+ | 7 | 9.6 | 73 | 25 | 28.1 | 89 | p <0.0001 | |
| | Total | 18 | 12.0 | 150 | 65 | 31.6 | 206 | | |
| Regularly physical exercises | | 14 | 9.3 | 150 | 5 | 2.4 | 206 | p<0.005 | |
| Major sources of dietary fat | | | | | | | | | |
| | Animal Products | 62 | 41.3 | 150 | 104 | 50.5 | 206 | | |
| | Margarine | 40 | 26.7 | 150 | 48 | 23.3 | 206 | | |
| | Oil | 48 | 32.0 | 150 | 54 | 26.2 | 206 | | |
| Diabetes Mellitus | | 4 | 2.7 | 150 | 16 | 7.7 | 206 | p<0.0005 | |
| Incidence of mortality from CVD in first-degree relatives under age 60 was reported | | 14 | 9.3 | 150 | 18 | 8.7 | 206 | p > 0.05 | |

almost steadily in females whereas they did not appear to change in males. Cholesterol levels wererelated to gender and age. While cholesterol levels equal to or exceeding 240 mg/dL were found in 7.8% and 10.9% of men in the 35-to-49 year and above-50-year age groups (p>0.05), the rate increased from 11.9% to 24.7% in women in the same age groups (p=0.0001).

Hypertension was detected in 51.9% of the adult population, 51.3% and 52.4% of men and women being hypertensive, respectively (Table 4). A strong relationship between age and hypertension was observed; that is, 40.3% and 63.0% of men (p=0.005) and 40.2% and 68.5% of women (p=0.0001) were hypertensive in the 35-49 and above-50 age groups, respectively. According

to the WHO hypertension criteria with systolic and/or diastolic blood pressure levels > or = 160 and 95 mmHg, the incidence decreased to 37.3% in men and 43.2% in women. Table 2 summarizes the average diastolic and systolic pressures in both sexes.

Mean BMI was found 25.7 kg/m2 in men and 28.3 kg/m2 in women (Table 2) (p=0.0001). Of all the study subjects, 23.3% had a BMI of >= 30 kg/m2. Obesity was detected in 12.0% and 31.6% of men and women, respectively (p=0.0001). The distribution according to sex and age is summarized in Table 4. After age 50 obesity decreased in both sexes.

We observed a low level of regular exercise in both sexes. Only 9.3% of the men and 2.4% of the women reported regular physical activity (p<0.005) (Table 4).

Smoking was found to be a major risk factor in men living in the area, with 58.7% of the men and 13.1% of the women being current smokers (Table 4) (p=0.0001)

Among major sources of the dietary fat, animal products (butter and animal fat) were the leading (46.6%), followed by oils (28.7%) and margarine (24.7%) (Table 4).

The prevalence of diabetes mellitus was 5.6%, with an incidence of 2.7% in men and 7.7% in women (p=0.0005) (Table 4).

Considering three major CHD risk factors (Hypertension, cigarette smoking and high blood cholesterol) of female individuals, 46.1% had only one risk factor, 15.5% had two risk factors and 1.9% had three risk factors. Among males 54.7% had only one risk factor, 29.3% had two risk factors and 2.0% had three risk factors.

## Discussion

### Total Cholesterol Levels

Men and women in this study exhibited relatively low average cholesterol levels (195.8 mg/dL and 197.5 mg/dL, respectively). Although average cholesterol levels in women at the age of 35-39 years were reasonably lower than those of men in the same age group, they underwent a rapid elevation by age, exceeding men's levels in the 50-69 age group. These different patterns of average cholesterol levels according to age in males and females could be the result of the decrease of the oestrogen level in females by age (1). Onat et al. compared cholesterol levels in men living in rural and urban areas of Turkey and reported average values to be 178.5 mg/dL and 192.7 mg/dL, respectively (12).

Corresponding values for women in the same study were 193.4 mg/dL and 200.9 mg/dL, respectively. A similar trend was found with respect to cholesterol levels according to age in women, being 166.9 mg/dL and 174.0 mg/dL in the 30-39-year-old group, 193.2 and 182.0 at the age of 40-49 years, and 200.2 mg/dL and 207.2 mg/dL in the 50-55-year-old group. On the other hand, cholesterol levels in males in that study varied according to age but not regularly (12). Average cholesterol levels obtained from men aged 40 to 59 who participated in the WHO Erica Project were 231 mg/dL in northern Europe, 222 mg/dL in southern Europe, and 220 mg/dL in eastern Europe (13). Another study performed on men from seven countries in the same age group reported an average cholesterol level of 195.3 mg/dL in Italian, Yugoslavian, and Greek populations (14); corresponding figures obtained from 1,000 Japanese, railway personnel in the USA, and men from Holland and Finland were 145 mg/dL, 240 mg/dL, and 215 mg/dL, respectively (14). Thelle et al., in a study of 7735 men from 24 cities in England, aged 40 to 59 years, found an average cholesterol level of 244 mg/dL (15). Differences in cholesterol values are likely to be determined by a variety of factors including dietary habits, environmental and genetic factors, average age of the study group, and diverse evaluation methods.

In this study, 9.3% of the men and 17.5% of the women had total cholesterol levels above 240 mg/dL. These rates are comparable with those of Onat et al., whose respective figures were 6.4% and 7.6% for general population of Turkey (12). Another study by that author reported incidences to be 9.1% and 10% in men and women living in Istanbul, the largest city of Turkey (16). If the fact that total cholesterol levels increase with age is taken into consideration it is probable that discrepancies between these results andour own may arise from the age distributions of the study subjects. The study samples of Onat had individuals aged 20 years or more (12, 16). Data from developed countries on total cholesterol levels are somewhat alarming. Thompson reviewed data from two studies performed in England in 1980s and found that 26% of men and 24% of women aged 25 to 59 years exhibited cholesterol levels exceeding 250 mg/dL (4). A study from Belgium revealed that blood cholesterol levels in 50% of the study population were >=240 mg/dL (17). In a study carried out in the USA, 32% of men and 27% of women were reported to exhibit hypercholesterolemia. (18)

### Blood Pressure

In our study average blood pressures (systolic and

diastolic) were found to be 134.9 / 85.8 mmHg in men and 137.4 / 85.8 mmHg in women. These levels are higher than those reported by Onat et al. for a sample population (126.3/83 mmHg in men and 132.8/84.3 mmHg in women) living in Istanbul (16). Average blood pressure levels obtained by the Monica Study were 132/85 mmHg and 131/82 mmHg, respectively (19).

Taking into consideration >=90/ >=140 mmHg as the limit and the age range >=35 years, we documented high prevalence rates for hypertension, which were 52.4% in women and 51.3% in men. Studies performed in various districts of Turkey have yielded lower values, with the hypertension limit being >=95/ >=160 mmHg and age limit >=20 years (literature usually only available in Turkish). If >=95/ >=160 mmHg limits are applied, our incidence rates will decrease to 43.2% in women and 37.3% in men. A study from Rochester, Minnesota, estimated hypertension prevalence for men and women aged >=35 years to be 25% and 29%, respectively (20). According to the results of Alberta Heart Survey, Canada, 14% of the participants had hypertension (21). The National Health and Nutrition Examination Survey (NHANES III) conducted between 1988 and 1991, documented the overall prevalence as 24% (25% in men and 23% in women) among Americans >=18 years old.

### Body Mass Index

Our study showed that, in this rural population, more women (31.6%) were obese than men (12.0%). Similarly, average BMI was lower in men (25.7 kg/m2 versus 28.3 kg/m2). Average levels of obesity found by Onat et al. in a representative sample were 9% in men and 21.7% in women (22). These levels increased to 15.9% and 41.6% in men and women at the ages of 40 to 59 years (22). Average BMI values in the same study were 25.4 kg/m2 in men and 27.7 kg/m2 in women. Average values of BMI reported in the Monica Study were 26 kg/m2 and 25.3 kg/m2 for men and women, respectively (19). The Procam Study from Germany revealed that 17% of German women aged over 40 years were obese (23). According to the findings of the Erica Project, BMI incidence of >30 kg/m2 varied from 12.7% to 30% in the European women aged between 40 and 59 years (13). In the National Health and Nutrition Examination Survey (NHANES III), approximately 58 million adults in the USA -one-third of Americans aged 20 years or over- were estimated to be overweight, defined as having a BMI of 27.8 kg/m2 in men and 27.3 kg/m2 in women (24).

### Physical activity

The low prevalence (5.3%) of regular physical activity

may have been the result of the education level of the study subjects and lack of public health education on the issue. Onat et al. found that the frequencies of doing regular physical exercises (including doing heavy work using large muscles) were 17.9% in males and 4.4% in females (25). Gibbons et al. reported exercise-induced decreases in blood-pressure, particularly in individuals with improved exercise capacity. The differences in blood pressure decreases were as much as 8/4 mmHg between individuals with the highest and lowest exercise capacities (26). The Multiple Risk Factor Intervention Trial (MRFIT) database showed that mild to moderate leisure-time activity significantly lowered the risk for coronary heart disease in middle-aged individuals (27). In addition, there have been at least 40 studies performed since 1953, emphasizing the relationship between exercise and coronary heart disease. Of these, 30 studies demonstrate obvious exercise-related protection varying between 10% and 50%, whereas 10 studies recommend further investigation to elucidate this protective role (28).

### Smoking

The study showed that smoking is a significant risk factor in men (58.7%) in Baskil, whereas a relatively low prevalence was detected in women (13.1%). These data are consistent with those reporting similar trends both in men and women in the Turkish literature (usually available only in Turkish). Smoking rates in both sexes are in striking contrast with those reported in developed countries, where respective figures for men and women are 27% and 23% in the USA (1995) (29), 29% and 19% in Finland (1995), 36% and 22.6% in France (1993), 36.8% and 21.5% in Germany (1992), 28% and 26% in England (1995) (30). This distribution pattern between men and women can be attributed to the traditional life style predominating in the rural areas, playing a protective role in keeping women from smoking.

### Diet

Animal products (butter and animal fat) accounted for most (46.6%) of the fat consumption of individuals in Baskil, followed by oils (28.7%), and margarine (24.7%). Depending on the geographical region where they live, people in Turkey vary significantly in terms of fat and oil consumption. People in the western regions rely primarily on oils (olive or sunflower) whereas people living on agricultural and animal products tend to use significant amounts of animal fats.

### Diabetes Mellitus

From the participants` responses to questions related

to diabetes mellitus, a prevalence of 5.6% was obtained, with a higher prevalence in women (7.7%) than in men (2.7%). Relevant incidences obtained by Onat et al. from the sample population of Istanbul were 4% in the sample, 5.2% and 2.9% in women and men, respectively. The Procam Study, using similar criteria, reported these incidences as 2.4% and 3.6% in women and men, respectively (23). The prevalence of diabetes mellitus in people aged 35 years or over was determined to be 5.8% in the Rochester Screening (20). Similarly, a female predominance was noted in the distribution of the disease.

In conclusion, considering the paucity of research evaluating the frequency and distribution of risk factors for coronary heart disease, the authors feel that this study has achieved its initial goal of accumulating data both on risk factors for, and the susceptibility of rural populations of Turkey to coronary heart disease. It can also be concluded that the preventable risk factors for coronary heart disease should be given priority in developing rural part of Turkey.

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