Urban–rural differences in the prevalence of coronary heart disease and its risk factors in Delhi

S.L. Chadha,[1] N. Gopinath,[2] & S. Shekhawat[3]

A community-based epidemiological survey of coronary heart disease and its risk factors was carried out over the period 1984–87 on a random sample of adults aged 25–64 years: 13 723 adults living in Delhi and 3375 in adjoining rural areas. ECG examination and analysis of fasting blood samples for lipids were performed on subjects with the disease and asymptomatic adults free of clinical manifestations. The overall prevalence of coronary heart disease among adults based on clinical and ECG criteria was estimated at 96.7 per 1000 and 27.1 per 1000 in the urban and rural populations, respectively.

Prevalences of a family history of coronary heart disease, hypertension, obesity and diabetes mellitus were significantly higher in the urban than in the rural population, and smoking was commoner among rural men and women. Mean levels of total serum cholesterol and low density lipoprotein cholesterol were higher among urban subjects; the mean level of triglycerides was higher in rural subjects. The proportions with total cholesterol levels >190 mg/dl were 44.1% and 23.0% in urban and rural men, respectively, and 50.1% and 23.9% among urban and rural women, respectively. High density lipoprotein cholesterol levels <35 mg/dl were found in 2.2% of urban men and 8.0% of rural men compared with 1.6% and 3.5% among urban and rural women, respectively.

An abnormal ECG pattern (Q wave or ST–T changes) in asymptomatic individuals is also considered to be a risk factor for coronary heart disease. In asymptomatic adults, 1.7% of urban men and 1.2% of urban women showed abnormal Q waves compared with 0.3% of rural men and 0.4% of rural women. A higher proportion of asymptomatic women showed ST–T changes in both populations.

Rural men and women had higher total calorie and saturated fat intakes than urban subjects. Differences in dietary cholesterol intake were marginal. Sodium intake was greater in urban adults. Average daily consumption of alcohol by urban men was 12.7 ml ethanol compared with 2.4 ml in rural men.

Introduction

Public health planning in most developing countries has focused mainly on problems related to communicable diseases, which have been responsible for high morbidity and mortality (*1*). The situation is different in developed countries, such as the USA, where coronary heart disease is the leading cause of death (*2*). However, with changing lifestyles in developing countries such as India, chronic and degenerative diseases, including coronary heart disease, are making an increasingly important contribution to mortality statistics, particularly in urban areas.

Over the last three decades, great progress has been made in identifying the risk factors for coronary heart disease. Some of the preventive measures, such as cessation of smoking, management of hypertension both by pharmacological and nonpharmacological means, control of diabetes, reduction in intake of dietary saturated fats, and early diagnosis and management of hypercholesterolaemia, have resulted in a significant decline in mortality from the condition in the industrialized world. Nevertheless, the disease continues to be the leading cause of death in many countries.

Coronary heart disease is considered to be an important public health problem not only in developed countries but increasingly in developing countries such as India. In 1959, the WHO Expert Committee on Cardiovascular Diseases and Hypertension (*3*) recommended that epidemiological surveys be conducted in as many countries as possible, in order to analyse the risk factors and to determine the prevalence of the disease in different countries. Over the past three decades a few such studies have

[1] Consultant, Community Health, Sitaram Bhartia Institute of Science and Research, B-16, Mehrauli Institutional Area, New Delhi 110 016, India. Requests for reprints should be sent to this author.

[2] Professor and Head, Department of Cardiothoracic Surgery, All India Institute of Medical Sciences, New Delhi, India.

[3] Statistician, Sitaram Bhartia Institute of Science and Research, New Delhi, India.

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been conducted in India, but the majority have been confined to hospital populations or used a sample size that was too small and/or nonrandomized, making it difficult to draw any valid conclusions.

Materials and methods

A community-based epidemiological study was conducted over the period 1984–87 on 13723 adults in the age group 25–64 years living in Delhi and 3375 living in rural areas about 50km away from the city, to determine the prevalence of coronary heart disease and its risk factors. The cluster sampling methodology, using a randomized house-to-house survey, and the criteria for diagnosis have been published elsewhere (*4*, *5*). The study was supported by ECG examination and analysis of fasting blood samples for lipids in subjects with clinically detected coronary heart disease and asymptomatic adults free of clinically manifest disease in every second and fifth household, respectively.

In the present study, the prevalence of coronary heart disease and its risk factors were compared in the two populations. The following risk factors were studied: family history of coronary heart disease, obesity, smoking, physical inactivity, hypertension, diabetes mellitus, and hyperlipidaemia. In addition, dietary intake of the following was also assessed: total and saturated fat, cholesterol, sodium, and alcohol.

The U.S. National Cholesterol Education Program Expert Panel on detection, evaluation and treatment of high blood cholesterol has defined desirable, borderline, and high levels of blood lipids as below the 50th percentile, between the 50th and 75th percentile, and above the 75th percentile values, respectively (*6*). For the present study, the cut-off levels of serum lipids were based on 50th percentile values obtained from the study population (Table 1).

Hypertension was defined as a systolic blood pressure of >160mm Hg and/or a diastolic blood pressure of >90mm Hg or currently taking antihypertensive drugs. Isolated systolic hypertension was defined as a systolic blood pressure of >160 mm Hg and a diastolic blood pressure of <90 mm Hg. Blood pressure was measured in a sitting position by medical officers and the average of two measurements made at an interval of 5 minutes was used. Phase 5 of Korotkoff sounds was taken as the diastolic blood pressure.

Table 1: **Cut-off levels of serum lipids used in the study**

Blood lipid (mg/dl)	Cut-off (mg/dl) in: Urban sample	Rural sample
Total cholesterol	190	170
Low density lipoprotein (LDL) cholesterol	110	90
High density lipoprotein (HDL) cholesterol	53	52
Triglycerides	120	138

Body mass index (BMI), i.e. weight in kg divided by the square of height in m, was used as an indicator of obesity. Subjects, wearing light clothing, were weighed to the nearest 0.5kg using standard portable scales, which were calibrated every week with a standard weight and necessary adjustments made if required. The 75th percentile value of BMI in the study populations was 25.4, and the empirical value of 25 was therefore used as a cut-off point for obesity. The waist–hip ratio was determined by measuring the circumference of the waist at the umbilicus and dividing it by that of the hips at the maximum point of protrusion, following the recommendations of Lohman et al. (*7*). Based on the 75th percentile value of the ratio in the study population, 0.88 was taken as a cut-off point for central obesity.

Diabetes mellitus was diagnosed on the basis of clinical history supported by documentary evidence of antidiabetic therapy. For physical activity, subjects were divided into three subgroups (light, medium and heavy) depending on the nature of their activities. Smoking status was evaluated by self-reporting of cigarettes/bidis smoked or tobacco chewed. Persons who smoked 10 cigarettes/bidis or more or chewed tobacco at least twice a day were categorized as smokers. Casual smokers were not included in the study.

A subsample for the dietary survey was selected at random from the same urban and rural populations covered by the initial epidemiological survey. A detailed urban and rural dietary profile was compiled using a combination of 24-hour recall and weighing. Nutrient intake calculations for each subject were determined by reference to the manual of nutritive values of Indian foods (*8*). The detailed dietary profile of the urban and rural study populations has been published elsewhere (*9*).

For statistical analysis, data were pooled and entered on a microcomputer. Intergroup comparisons for risk factors were performed using analysis of variance. The data were analysed using Student's *t* test and χ^2 test procedures.

Results

The prevalence of clinical coronary heart disease was significantly higher in the urban (31.9 per 1000)

(*4*) than in the rural population (5.9 per 1000) (*5*). A similar trend was observed for the prevalence of asymptomatic coronary heart disease (diagnosed by ECG): 64.8 per 1000 and 21.2 per 1000 adults in the urban and rural populations, respectively. Table 2 shows the prevalence of selected risk factors, by sex, in the two populations. For both men and women, the prevalences of hypertension and diabetes mellitus, obesity, and family history were significantly higher in the urban population, while smoking was more prevalent in the rural population.

Table 3 shows the mean values and standard deviations for serum lipid levels, by age and sex. Urban men and women exhibited greater prevalences of high-risk total cholesterol and LDL cholesterol levels than their rural counterparts. Rural men and women of all ages exhibited lower HDL cholesterol levels than their urban counterparts. Except for the age group 55–64 years, triglyceride levels were higher among rural than urban men. For the age groups 25–34 years and 35–54 years triglyceride levels were higher in rural than in urban women.

The proportions with total cholesterol levels >190 mg/dl were 44.1% and 23.0% for urban and rural men, respectively, and 50.1% and 23.9% for urban and rural women, respectively. HDL cholesterol levels <35 mg/dl were found in 2.2% of urban and 8.0% of rural men compared with 1.6% and 3.5% of urban and rural women, respectively (Table 4).

Asymptomatic individuals with abnormal ECG patterns, e.g. abnormal Q waves (Minnesota code 1-1-1 through 1-1-7 or 1-2-1 through 1-2-7) or ST–T changes (Minnesota code 4-1-1, 4-1-2, 5-1 and 5-2) are more prone to develop clinically manifest coronary heart disease. Such an abnormal ECG is therefore considered a risk factor for the disease. In asymptomatic urban adults, 1.7% of men and 1.2% of women showed abnormal Q waves compared with 0.3% of men and 0.4% of women in the rural population. The same trend was observed for ST–T changes (Table 5). However, the proportion showing changes was higher in women than in men in both populations.

The findings for dietary risk factors for coronary heart disease are shown in Table 6. Average total calorie intake was higher in rural men and women than in the urban population. There were no appreciable differences in total dietary fat intake in the two populations, but saturated fat intake was higher in both rural men and women than their urban counterparts. The proportion of subjects who consumed more than 15% of calories as saturated fat was calculated and added as another modifiable risk factor. A cut-off point of 15% was selected as an indicator of high saturated fat intake. Surprisingly, 28.7% of rural men and 27.7% of rural women consumed more than 15% of calories as saturated fats compared with 8.2% of urban men and 8.5% of urban women. This may be due to a greater consumption of whole milk and milk products by the rural subjects, particularly in the area where the dietary survey was conducted.

Dietary cholesterol intake showed marginal differences in the two populations. Sodium intake was higher in both sexes in the urban than in the rural population, which may be due to excessive intake of "ready-to-eat" foods by the urban subjects; such fast foods are usually rich in sodium. The average daily

Table 2: **Prevalence of selected risk factors for coronary heart disease, Delhi**

	Urban sample[a]		Rural sample		
Risk factor	Men (n = 5998)	Women (n = 7136)	Men (n = 616)	Women (n = 1116)	Urban versus rural
Hypertension	644 (10.8)[b]	878 (12.3)	25 (4.1)	37 (3.3)	$P < 0.0001$
Diabetes mellitus	97 (1.6)	117 (1.6)	3 (0.5)	—	$P < 0.00001$
BMI >25.0[c]	1222 (20.7)	2310 (32.6)	60 (9.7)	109 (9.8)	$P < 0.0001$
Smoking	1755 (29.3)	128 (1.8)	492 (79.9)	324 (29.0)	$P < 0.0001$
Family history of coronary heart disease	1296 (21.6)	1463 (20.5)	23 (3.7)	19 (1.7)	$P < 0.0001$

[a] Height and weight measurements in the urban population were available for 5898 men and 7081 women.
[b] Figures in parentheses are percentages.
[c] BMI, body mass index.

Table 3: **Serum lipid levels, mean ± SD, by age and sex, in urban and rural populations, Delhi**

Serum lipid (mg/dl)	Age group (years)	Urban sample: Men	Urban sample: Women	Rural sample: Men	Rural sample: Women
Total cholesterol	25–34	198 ± 39 (225)[a]	194 ± 37 (309)	175 ± 36[b] (31)	171 ± 20[c] (93)
	35–44	202 ± 39 (158)	203 ± 40 (257)	194±35[d] (25)	185 ± 31[c] (56)
	45–54	210 ± 43 (158)	215 ± 47 (282)	179 ± 22[b] (17)	186 ± 38[c] (47)
	55–64	211 ± 46 (140)	217 ± 42 (236)	170 ± 18[c] (27)	175 ± 20[c] (63)
Low density lipoprotein cholesterol	25–34	117 ± 38 (173)	109 ± 32 (235)	97 ± 36[b] (31)	96 ± 21[c] (93)
	35–44	119 ± 37 (135)	114 ± 37 (193)	116 ± 40[d] (25)	103 ± 30[e] (56)
	45–54	121 ± 41 (121)	120 ± 44 (212)	99 ± 21[e] (17)	104 ± 39[e] (47)
	55–64	115 ± 42 (110)	121 ± 43 (166)	90 ± 18[e] (27)	94 ± 17[c] (63)
High density lipoprotein cholesterol	25–34	53 ± 12 (173)	58 ± 12 (235)	52 ± 12[d] (31)	51 ± 9[c] (93)
	35–44	54 ± 13 (135)	57 ± 13 (193)	50 ± 12[d] (25)	54 ± 9[d] (56)
	45–54	55 ± 12 (121)	57 ± 14 (212)	49 ± 11[e] (17)	52 ± 10[e] (47)
	55–64	58 ± 14 (110)	58 ± 15 (166)	50 ± 11[b] (27)	51 ± 10[c] (63)
Triglycerides	25–34	123 ± 28 (225)	108 ± 47 (309)	128 ± 29 (31)	120 ± 22[e] (93)
	35–44	133 ± 57 (158)	126 ± 51 (257)	142 ± 26[d] (25)	138 ± 24[d] (56)
	45–54	150 ± 57 (158)	154 ± 52 (282)	155 ± 34[d] (17)	151 ± 29[d] (47)
	55–64	168 ± 52 (140)	168 ± 53 (236)	152 ± 28 (27)	151 ± 26[e] (63)

[a] Figures in parentheses are the number of blood samples analysed.
[b] $P < 0.01$ (urban versus rural).
[c] $P < 0.001$ (urban versus rural).
[d] Not significant (urban versus rural).
[e] $P < 0.5$ (urban versus rural).

Table 4: **Distribution of subjects with abnormal serum lipids, Delhi**

Lipid (mg/dl)	Urban sample: Men	Urban sample: Women	Urban sample: *P* value	Rural sample: Men	Rural sample: Women	Rural sample: *P* value
Total cholesterol >190	300/681 (44)[a]	543/1 084 (50.1)	<0.001	23/100 (23)	62/259 (23.9)	<0.001
Low density lipoprotein cholesterol >110	264/539 (49)	377/806 (46.8)	<0.001	29/100 (29)	70/259 (27)	<0.001
High density lipoprotein cholesterol <35	12/539 (2.2)	17/1 084 (1.6)	<0.001	8/100 (8)	9/259 (3.5)	<0.05
Triglycerides >120	340/681 (50)	369/806 (45.8)	<0.001	75/100 (75)	174/259 (67.2)	<0.001

[a] Figures in parentheses are percentages.

Table 5: **Abnormal ECG as a risk factor for coronary heart disease in asymptomatic adults, Delhi**

	Abnormal Q wave		ST–T changes	
Sex	Urban	Rural	Urban	Rural
Male	45/2589 (1.7)[a]	1/319[b] (0.3)	101/2589 (3.9)	1/319[c] (0.3)
Female	35/3032 (1.1)	3/728[b] (0.4)	195/3032 (6.4)	17/728[c] (2.3)
Total	80/5621 (1.4)	4/1047[b] (0.4)	296/5621 (5.3)	18/1047[b] (1.7)

[a] Figures in parentheses are percentages.
[b] $P < 0.05$.
[c] $P < 0.01$.

alcohol consumption by urban men was 12.7 ml ethanol compared with 2.4 ml by rural men. The average *annual* alcohol consumption by urban women was 14.6 ml ethanol, while no women consumed alcohol in the rural population studied.

Discussion

The prevalence of risk factors for coronary heart disease, such as hypertension, obesity, diabetes, family history of the condition and abnormal ECG (Q wave and ST–T changes) was significantly higher in the urban than in the rural study populations, while smoking was commoner among rural men and women. These variations may be explained partly by differences in lifestyle. Rural men and women work in agriculture, involving heavy physical activity, while most urban men and women have sedentary habits.

An urban–rural epidemiological survey of coronary heart disease was conducted by Gupta & Malhotra (*10*) in similar ethnic groups to those of the present study. The prevalence of the disease was almost 2.5 times commoner in both sexes in urban than in rural areas. A lesser degree of physical activity, a body weight on the higher side of normal, and higher prevalences of hypertension and diabetes mellitus in the urban population are some of the important risk factors responsible for these differences. We do not know of any other comparative urban–rural epidemiological study for the prevalence of coronary heart disease and its risk factors in India.

In the present study urban–rural differences were found in serum lipid levels, particularly high-risk total cholesterol and LDL cholesterol; the proportions of urban men and women having higher than desirable levels of these lipids were almost twice those in the rural population. A low level of HDL cholesterol is a risk factor for coronary heart disease and is usually associated with an increased triglyceride level (*11*). A higher prevalence of low HDL cholesterol (<35 mg/dl) and an elevated triglyceride level (>120 mg/dl) was found in the rural than in the urban population. This contrasts with the findings of Campos et al. (*12*), who reported a higher prevalence of low HDL cholesterol levels (<35 mg/dl) in an urban than in a rural area of Puriscal, Costa Rica. These differences may be due to different dietary patterns and lifestyles in the two countries.

Populations that consume low fat and high carbohydrate diets have low HDL cholesterol and high triglyceride levels (*13–15*). In the present study urban–rural differences in intake of total fat were marginal, but intake of saturated fat and carbohydrates and serum levels of triglycerides were significantly higher in rural than in urban areas. These

Table 6: **Dietary risk factors for coronary heart disease, Delhi**

	Urban sample			Rural sample		
Dietary intake per day	Men (n = 400)	Women (n = 506)	Total (n = 906)	Men (n = 87)	Women (n = 188)	Total (n = 275)
Total calories (kcal)	1924 ± 524	1604 ± 456	1745 ± 512	2249 ± 636	1754 ± 533	1910 ± 612
Total fat (g)	61.4 ± 28.0	50.4 ± 23.2	55.3 ± 26.0	63.1 ± 37.5	48.1 ± 25.6	52.9 ± 30.7
Saturated fatty acids (g)	16.7 ± 13.0	13.6 ± 10.8	15.0 ± 11.9	34.9 ± 26.0	26.3 ± 13.7	29.0 ± 19.9
Cholesterol (mg)	95 ± 120	68 ± 93	80 ± 107	102 ± 90	71 ± 52	81 ± 68
Polyunsaturated fatty acids (linolenic acid) (N-3) (g)	1.8 ± 1.3	1.4 ± 1.3	1.5 ± 1.3	0.9 ± 0.7	0.7 ± 0.5	0.8 ± 0.6
Linoleic acid (N-6) (g)	7.3 ± 5.5	6.0 ± 4.4	6.7 ± 5.0	5.5 ± 2.2	4.3 ± 1.9	4.7 ± 2.0
Sodium (mg)	2101 ± 1225	1799 ± 1002	1932 ± 1116	1569 ± 919	1309 ± 972	1391 ± 962

observations indicate that a low HDL cholesterol level may not enhance the risk of coronary heart disease but rather represents a marker for increased levels of other atherogenic lipoproteins particularly LDL cholesterol (*16*). An important determinant of atherosclerosis is the ratio of LDL to HDL cholesterol. This lends support to the view that low HDL cholesterol levels are not a risk factor for coronary heart disease in the presence of low LDL cholesterol levels, as observed in rural areas in our study.

There is an increasing awareness of and interest in asymptomatic coronary heart disease. Post-mortem angiographic studies indicate that the severe disease often occurs without symptoms. In the Framingham study more than 25% of patients with coronary heart disease were identified from routine periodic ECG (*17*). The ECG evaluation of 5021 asymptomatic subjects who formed the controls for the epidemiological study (*4*) produced 376 abnormal ECG traces indicative of a risk of developing coronary heart disease. Of these, 297 were re-valuated in the 3-year follow-up study (*18*); 14 had developed clinically manifest disease. ECG evidence of left ventricular hypertrophy is another important risk factor for coronary heart disease. In the follow-up study (*18*), 82 of the 4152 adults who were re-examined had had ECG evidence of left ventricular hypertrophy at the time of initial epidemiological survey, and 18 (22%) of these had coronary heart disease on re-evaluation. This finding is consistent with the findings of the Framingham study (*19*).

It is important to consider the role of air pollution in the pathogenesis of coronary heart disease in the urban population. According to available information, 1280 tonnes of pollutants are emitted daily by vehicles in Delhi. At least some of the striking differences between the urban and rural populations in this study could therefore be attributable to air pollution. The toxic compounds involved in air pollution, e.g. oxides of nitrogen, sulfur dioxide and suspended particles, are powerful pro-oxidants that enhance the oxidation of lipoproteins; and oxidized lipoproteins, particularly LDL cholesterol, are powerful inducers of atherosclerosis.

Other studies (*20–21*) have confirmed that risk factors, such as obesity, hypertension, diabetes, increased intake of energy-rich foods and saturated fats, a relatively sedentary occupation, increased stress, and high LDL cholesterol are more prevalent in urban than in rural areas. The present study confirmed these findings with the exception of average daily saturated fat intake, which was higher in the rural than in the urban population. These trends are disturbing because it is estimated that more than 40% of populations in developing countries such as India will be living in urban areas by the year 2000, with coronary heart disease risks similar to those in developed countries (*22*). Although reliable mortality data are not available in India, it is presumed that mortality rates for coronary heart disease will become greater, particularly in urban areas, with the constantly increasing prevalence of risk factors, in line with findings elsewhere (*6*).

It is clear from the present study that the prevalence of coronary heart disease and its urban–rural differences are not related to any particular risk factor, and it is therefore necessary to look for other factors beyond the conventional explanations. The heavy deleterious pro-oxidant burden imposed by air pollutants may be an important contributory factor in the higher prevalence of coronary heart disease observed in urban areas. The prevalence of coronary heart disease appears to depend on a combination of lifestyle, dietary, environmental, and population-specific risk factors. The factors responsible are of considerable importance from the point of view of preventing and controlling the disease, which represents an important public health problem. The answer may lie not only in educating people about known risk factors but also in instituting measures to control air pollution in the world's major cities.

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Résumé

Prévalence des maladies coronariennes et de leurs facteurs de risque à Delhi: différences entre zones urbaines et rurales

Une enquête épidémiologique en communauté, portant sur les maladies coronariennes, a été effectuée sur un échantillon aléatoire d'adultes de 25 à 64 ans, dont 13723 habitaient à Delhi et 3375 dans les régions rurales avoisinantes. L'étude comportait un électrocardiogramme et une recherche des lipides dans des prélèvements de sang à jeun, chez des sujets atteints de coronaropathie et chez des adultes asymptomatiques. La maladie était diagnostiquée d'après les antécédents cliniques (dossiers) ou d'après les résultats de l'ECG selon les codes Minnesota. La prévalence globale des maladies coronariennes pour 1000

adultes, d'après les critères cliniques et électrocardiographiques, a été estimée à 96,7 chez les populations urbaines et 27,1 chez les populations rurales. Les facteurs de risque étudiés étaient les antécédents familiaux de la maladie, l'obésité, la sédentarité, le tabagisme, le diabète sucré, l'hypertension, l'hyperlipidémie, et les facteurs alimentaires (consommation de graisses totales et de graisses saturées, de cholestérol, de sodium et d'alcool). La prévalence des antécédents familiaux, de l'hypertension, de l'obésité et du diabète sucré était significativement plus élevée dars les populations urbaines. Le tabagisme était plus fréquent dans les populations rurales, chez les deux sexes. Le taux moyen de cholestérol total et de cholestérol LDL (lipoprotéines de faible densité) était plus élevé en zone urbaine, et le taux moyen de triglycérides en zone rurale. Chez les hommes, la proportion de sujets ayant un taux de cholestérol total >190 mg/dl était de 44,0% en zone urbaine et de 23,0% en zone rurale. Les pourcentages correspondants chez les femmes étaient de 50,1% et de 23,9%. Des taux de cholestérol HDL (lipo-protéines de haute densité) >35 mg/dl ont été observés chez 2,2% des hommes en zone urbaine et 8,0% des hommes en zone rurale, contre 1,4% et 3,5% respectivement chez les femmes. Les anomalies de l'ECG, à savoir des ondes Q anormales (codes Minnesota 1-1-1 à 1-1-7 ou 1-2-1 à 1-2-7) ou des modifications du segment ST–T (codes Minnesota 4-1-1, 4-1-2, 5-1 et 5-2) chez les sujets asymptomatiques ont également été considérées comme un facteur de risque. Chez les adultes asymptomatiques, 1,7% des hommes et 1,2% des femmes des régions urbaines ont présenté des ondes Q anormales, contre 0,3% des hommes et 0,4% des femmes des régions rurales. Dans les deux populations, une plus forte proportion de femmes asymptomatiques présentaient des modifications du segment ST–T par rapport aux hommes.

Dans les régions rurales, les hommes comme les femmes consomment davantage de calories et de graisses saturées qu'en zone urbaine. Les différences de consommation de cholestérol alimentaire sont négligeables. La consommation de sodium est plus élevée chez les adultes des zones urbaines. La consommation quotidienne moyenne d'alcool chez les hommes des régions urbaines était de 12,7 ml, contre 2,4 ml dans les régions rurales.

En conclusion, la prévalence des maladies coronariennes et les différences entre zones urbaines et rurales ne peuvent être reliées à aucun facteur de risque particulier. Il est donc nécessaire d'expliquer autrement les fortes différences, observées à Delhi, entre populations urbaines et rurales. La prévalence de la maladie semble dépendre d'une association de divers facteurs de risque concernant le mode de vie, l'alimentation et l'environnement, et de facteurs spécifiques de la population.

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