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Int J Biol Med Res
International Journal of
BIOLOGICAL AND MEDICAL RESEARCH
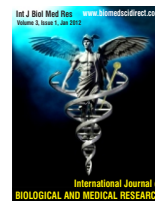
Original Article

A study of coronary heart disease and the associated risk factors in lucknow district, India

[a]M.Z.Idris, [b]R.K. Saran, [c]S.M. Natu

Liverpool, Professor and Head, Department of Community Medicine
Professor, Department of Cardiology

A R T I C L E   I N F O

A B S T R A C T

Cardiovascular disease is progressively becoming a major cause of morbidity and mortality in India generally in young adults.The objective of the present was to study the prevalence of CHD among adult population of Lucknow District. For this a community based cross sectional study was done on 4 randomly selected villages and 8 randomly selected urban areas .1047 (385 Rural and 662 Urban)subjects over and above the age of 20 years old were surveyed using Questionnaire including general information, physical examination and, Electrocardiography(ECG). It was found that the overall prevalence of CHD based on clinical diagnosis & ECG was 7.1% with 8.8%in Urban area and 3.8% in Rural area.(p<0.01).The prevalence was higher in females 8.9% as compared to males 6.2% (p<0.001).Diagnosis on the basis of ECG alone was 3.0% in males and 8.1% in females (p<0.05).Isolated Q wave was present in 2.1% subjects while ST segment depression was present in 3.0% of subjects. Rose Angina Questionnaire was positive in 2.7%of the studied population. It is concluded that Coronary Heart Disease is more prevalent in urban as compared to the rural population. Disease was more prevalent in females as in contrast to the hospital setting.

1. Introduction

The rapidly increasing burden of non communicable diseases is a key determinant of global public health. In India, Cardiovascular diseases are projected to be the largest cause of death and disability by 2020 of these 2.6 million Indians are predicted to die due to coronary heart disease, which constitute 54.1% of all Cardio vascular disease death1. Nearly half of these deaths are likely to occur among young and middle-aged individuals (30-69 yrs)2-4.

Published data from a multicentre study of men aged 35-59 years, conducted on behalf of the Indian Council of Medical Research during 1990-4, showed rising prevalence rates of coronary heart disease with increasing urbanization (rural Vellore 3.15 per 1000 male population; rural Haryana 4.48/1000; urban Vellore 5.92/1000; and urban Delhi 8.72/1000 male population). Tertiary care centers have documented a steep rise in the proportion of admissions for coronary heart disease5-7. In Uttar Pradesh the prevalence of coronary heart disease has increased from 1.05% in 1960 to 9.67% in 1995 in urban population7.

Studies from rural area have shown a lower prevalence as compared to urban areas but rising trend is seen there as well. The prevalence of the coronary heart disease in the rural India has risen from 2.03% in 1974 to 3.7% in 19957,13.

This present study aims to find out the prevalence of coronary heart disease and coronary risk factors in the adult population of Lucknow district.

2. Material and Methods

The community based cross sectional study was conducted in the adult population (equal or above the twenty years) living in the urban and rural Lucknow district. Documented prevalence of CHD in India is 9.67% in urban and 3.7% in rural area and by accounting population proportion in urban & rural Lucknow according to 2001 census the estimated prevalence was calculated as 7.51%. Therefore, by using the formula of sample size8 and

* Corresponding Author : **Pradeep Joshi**
House no 22, new bopalpura,
Near jagdama asharam,
Panna viahr colony, Udaipur Rajasthan 313001
E-mail : joshi_udr@yahoo.com

taking precision (d) as 2%,design effect of 1.5,and non respondent as 10%, the effective sample size comes out 1101.Four randomly selected villages and wards(covering both slum and non sum area) each were taken by multistage random sampling technique.

The present study was conducted by house to house survey. Pre-designed and pre-tested interview and examination schedule was used which recorded information on background particulars age, sex, marital status, religion, caste, education, occupation, income, number of family members, type of family and migration. For assessing the socio-economic status, modified Kuppuswamy scale was used in the urban areas and Parikh scale was used in the rural area. Specific individual information on family and personal history of CHD, diabetes, and hypertension was taken. Habit of smoking, tobacco chewing, and alcohol consumption was elicited9.

Diet intake was recorded as frequency of food items consumed and dominant type of oil used. Level of physical activity was computed after collecting data (on a 24hrs recall basis), on the type of work and number of hours spent on each work done during the day. Along with it recreation activity, yoga, and time spend in physical inactivity was also documented.

Body weight, height, waist, and hip circumference was measured according to the WHO criteria.BMI (Kg/m2) was calculated according to the WHO classification10. Central obesity was classified as waist hip ratio >0.88 for males and >0.85 for females. Hypertension was defined when systolic blood pressure was 140 mmHg and above and diastolic blood pressure was 90 mmHg and above (JNC VI).

For the diagnosis of CHD three criteria were used 1) History of documented angina / infarction and previously diagnosed disease.2) Affirmative response to Rose Angina questionnaire.3) 12 lead ECG finding namely Minnesota codes 1-1, 4-1, 4-2, 5-1, 5-2, or 9-2. Isolated T wave inversion in lead III or V1 was ignored. Fulfilment of any of these three criteria was taken as confirmation of the diagnosis of CHD.

Statistical Analysis:

Data was analysed using the software SPSS 15.0 for window and EPI INFO 6.0.The prevalence rates were given as percentage and 95% confidence intervals were estimated. Discrete data was analysed using Pearson's Chi Square test for difference and trend as per suitability.

3. Results

A total sample of 1047 subjects (95.05% of the estimated 1101 sample) was included in the study. Out of 1047 subjects, ECG recording was done in 754 subjects (496 and 258 subjects were drawn from urban and rural area respectively).

Table(1) shows the prevalence of CHD according to clinical findings (based on fulfilment of either positive response to Rose angina or had history of known CHD) the prevalence came out to be 2.9% with slightly higher in male (3.4%) as compared to females (2.2%).Rose angina questionnaire was positive in 3.1% of male subject and 2.0% of female subjects.

Table 1: Distribution of Coronary Heart Disease based on Clinical Finding in Lucknow district.

Age (yrs)	No. Examined N=1047	Clinical		TOTAL NO. of Subjects with CHD	Combination
		Known CHD only	Rose Angina only		Known+ Rose Angina
20-29	329	0 (0.0)	2 (0.6)	2 (0.6)	0 (0.0)
30-39	237	0 (0.0)	5 (2.1)	5 (2.1)	0 (0.0)
40-49	267	5 (1.8)	14 (5.2)	15 (5.6)	4 (1.4)
50-59	104	1 (0.9)	5 (4.8)	5 (4.8)	1 (0.9)
≥60	110	2 (1.8)	2 (1.8)	4 (3.6)	0 (0.0)
Total	1047	8 (0.7)	28 (2.7)	31 (2.9)	5 (0.4)

*Value in parentheses represent percent

The prevalence of CHD according to ECG criteria was 4.7% in the study area with abnormal wave pattern mainly seen in females (8.1%) as compared to male (3.0%). x2for trend=5.00(p=0.02) Changes were predominately found in 40-49 year age group (6%). Overall, Q wave was found in 2.1% of subjects with female dominance (3.5%) Q wave were mainly (4.5%) observed in 40-49 year age group. ST-T wave changes were found in 3.0% subjects, more commonly in female (4.6%) as compared to male (2.2%).(table2)

For the fulfilment of the CHD diagnostic criteria only 754 (72.4%) out of 1047 studied subjects were included. Remaining 293 subjects, clinical findings (Known CHD or Rose angina response) were not taken for further analysis.

Table 3 shows Overall, prevalence of CHD was 7.1% based on clinical as well as ECG criteria, with 4.7% showed ECG changes, 2.6% gave positive response to Rose angina questionnaire, and 0.7% had known documented history. Combination of known CHD subjects and ECG changes were found in 0.7% with predominantly in male subjects (0.8%). This combination was found mainly in 40-49 year age group (2.0%).

The prevalence of CHD in rural area was 3.8% and 8.8% in urban area with significant difference (p<0.01). Most of the CHD cases (16.1%) were found in urban in the age group of 50-59 year while in rural it was found (6.5%) in the 40-49 year age group(Table4).

Table 5 shows the prevalence of CHD was 8.9% in female and 6.2% in male and this difference was statistically significant (x2 m/f= 17.01 (p<0.001). The relative risk was 4.0 times higher in age group of 40-49 year as compared to 20-29 year age group and this trend was significant. In female majority of cases were in 50-59 year age group (14.3%) while in male majority (8.5%) were from 30-39 year age group (fig1).

2. Methods

Table 2. Distribution of Coronary Heart Disease based on ECG Wave Pattern in Lucknow district.

Age (yrs) and Sex		No. Examined N=754	ECG WAVE PATTERN			No. of CHD Cases Suggested by ECG	RR
			Isolated Q-wave	Isolated ST-T changes	Combined Q+ ST-T Changes		
20-29	M	153	0(0.0)	2(1.3)	0 (0.0)	2(1.3)	1.0
	F	70	1(1.4)	2(2.9)	0 (0.0)	3(4.3)	
	Total	223	1(0.4)	4(1.8)	0 (0.0)	5(2.2)	
30-39	M	106	2(1.9)	2(1.9)	0 (0.0)	4(3.8)	2.1
	F	68	1(1.5)	3(4.4)	0 (0.0)	4(5.9)	
	Total	174	3(1.7)	5(2.9)	0 (0.0)	8 (4.6)	
40-49	M	131	4(3.1)	3(2.3)	2 (1.5)	5(3.8)	2.8
	F	68	5(7.4)	2(2.9)	0(0.0)	7(10.3)	
	Total	199	9(4.5)	5(2.5)	2 (1.0)	12(6.0)	
50-59	M	54	0(0.0)	2(3.7)	0 (0.0)	2(3.7)	3.1
	F	21	1(4.8)	2(9.5)	0 (0.0)	3(14.3)	
	Total	75	1(1.3)	4(5.3)	0 (0.0)	5(6.7)	
≥60	M	53	1(1.9)	2(3.8)	1 (1.9)	2(3.8)	3.4
	F	30	1(3.3)	3(10.0)	0 (0.0)	4(13.3)	
	Total	83	2(2.4)	5(6.0)	1 (1.2)	6(7.2)	
Total	M	497	7 (1.4)	11 (2.2)	3 (0.6)	15 (3.0)	
	F	257	9 (3.5)	12 (4.6)	0 (0.0)	21 (8.1)	
	Total	754	16(2.1)	23(3.0)	3 (0.3)	36(4.7)	
Chi Square trend						$x^2$for trend=5.00	
P value						(p=0.02)	

Value in parentheses represent percent

Table 3 Distribution of Coronary Heart Disease based on Clinical and ECG changes in Lucknow district

Age (yrs) and Sex		No. Examined	Clinical		Diagnostic ECG Changes	TOTAL NO. of Subjects with CHD	Combination	
			Known CHD only	Rose Angina only			Known +ECG change	Rose Angina+ ECG changes
20-29	M	153	0(0.0)	1(0.7)	2(1.3)	3 (1.9)	0(0.0)	0 (0.0)
	F	70	0(0.0)	0(0.0)	3(4.3)	3 (4.2)	0(0.0)	0 (0.0)
	Total	223	0(0.0)	1(0.4)	5(2.2)	6 (2.6)	0(0.0)	0 (0.0)
30-39	M	106	0(0.0)	5(4.7)	4(3.8)	9 (8.4)	0(0.0)	0 (0.0)
	F	68	0(0.0)	0(0.0)	4(5.9)	4 (5.8)	0(0.0)	0 (0.0)
	Total	174	0(0.0)	5(2.9)	8 (4.6)	13 (7.4)	0(0.0)	0 (0.0)
40-49	M	131	2(1.5)	8(6.1)	5(3.8)	11 (8.3)	2(1.5)	2 (1.5)
	F	68	2(2.9)	2(2.9)	7(10.3)	9 (13.2)	2(2.9)	0 (0.0)
	Total	199	4 (2.0)	10(5.0)	12(6.0)	20 (10.0)	4 (2.0)	2 (1.0)
50-59	M	54	0(0.0)	2(3.7)	2(3.7)	4 (7.4)	0(0.0)	0 (0.0)
	F	21	0(0.0)	1(4.8)	3(14.3)	3 (14.2)	0(0.0)	1 (4.8)
	Total	75	0(0.0)	3(4.0)	5(6.7)	7 (9.3)	0(0.0)	1 (1.3)
≥60	M	53	2(3.8)	0(0.0)	2(3.8)	4 (7.5)	2(3.8)	0 (0.0)
	F	30	0(0.0)	1(3.3)	4(13.3)	4 (13.3)	0(0.0)	1 (1.3)
	Total	83	2(2.4)	1(1.2)	6(7.2)	8 (9.6)	2(2.4)	1 (1.2)
Total	M	497	4 (0.8)	16 (3.2)	15 (3.0)	31 (6.2)	4 (0.8)	2 (0.4)
	F	257	2 (0.7)	4 (1.5)	21 (8.1)	23 (8.9)	2 (0.7)	2 (0.7)
	Total	754	6 (0.7)	20 (2.6)	36(4.7)	54 (7.1)	6 (0.7)	4 (0.5)
Chi Square trend					$x^2$for trend=0.73	$x^2$for trend= 5.00		
P value					(p>0.05)	(p<0.05)		

Value in parentheses represent percent

Table 4. Distribution of Coronary Heart Disease according to Place of Residence

Age groups in yrs	Rural n=258		Urban n=496		Total n=754	
	No. of subjects	Coronary heart disease	No. of subjects	Coronary heart disease	No. of subjects	Coronary heart disease
20-29	80	2 (2.5)	143	4 (2.8)	223	6 (2.7)
30-39	48	1(2.1)	126	12 (9.5)	174	13 (7.5)
40-49	46	3(6.5)	153	17 (11.1)	199	20 (10.1)
50-59	32	1(3.1)	43	6 (14.0)	75	7 (9.3)
≥60	52	3(5.8)	31	5 (16.1)	83	8 (9.6)
Total	258	10 (3.8)	496	44 (8.8)	754	54 (7.1)
	x^2=13.05 (p<0.01)					

Value in parentheses represent percent

Table 5. Distribution of Coronary Heart Disease according to Gender

Age groups in yrs	Male n=497		Female n=257		Total n=754		RR
	No. of subjects	Coronary heart disease	No. of subjects	Coronary heart disease	No. of subjects	Coronary heart disease	
20-29	153	3 (2.0)	70	3 (4.3)	223	6 (2.7)	1.0
30-39	106	9 (8.5)	68	4 (5.9)	174	13 (7.5)	2.8
40-49	131	11(8.4)	68	9 (13.2)	199	20 (10.1)	4.0
50-59	54	4 (7.4)	21	3 (14.3)	75	7 (9.3)	3.7
≥60	53	4 (7.5)	30	4 (13.3)	83	8 (9.6)	3.9
Total	497	31 (6.2)	257	23 (8.9)	754	54 (7.1)	
					$x^2$for trend=7.69 (p<0.005)		

Value in parentheses represent percent

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4. Discussion

CHD prevalence was 7.1% after the fulfilment of the any of the three criteria for the diagnosis of CHD which was consistent with finding of study in Jaipur and Kashmir valley 11,12but was higher than the finding found by Singh RB (1997)13 (6.1%).

In the present study prevalence of CHD diagnosed by past history alone was 0.7%, according to Rose Angina was 2.6% and was 4.7% by ECG changes. There was a considerable difference between men and women in measures of myocardial infarction and in the measures of angina according to the ECG wave pattern. However, there was a weak relation between the ECG pattern and the positive Rose Angina Questionnaire8 in both men and women. Similar criteria (Minnesota Code) as compared to the Whitehall criteria were used and proved the validity of resting ECG in diagnosis of CHD in the community and its use in estimating the CHD prevalence as documented in the studies across the world and India11-15.

In the present study prevalence of CHD was higher in females (8.9%) comparison to male (6.2%) and finding was significant. Jaipur heart watch study16 also reports similar prevalence of 6% in males and 10.4% in females. High prevalence of CHD in females may be in fact due to more prevalence of asymptomatic ST-T wave changes in ECG of females as women with angina had better prognosis, selection bias (availability of more symptomatic females for examination). Results should be interpreted in the limelight of these factors as in clinical practice CHD cases are more common in males.

This study reports on the prevalence of CHD in urban North Indian population i.e.8.8% and shows that the prevalence of CHD in urban population is now approaching the prevalence reported in North-West Indian population documented by Chadha et al. (1990)17(9.8%), Gupta et al. (1995)11 (7.6%), Singh RB (1997)13 (8.98%), Kumar Rajesh et al. (2005)18 (7.1%), Kamili MA (2007)12 (7.4%).

Based on various study in India, the average prevalence of the CHD in rural area is 4.76%. Present study also reported CHD prevalence of 3.8% in a rural area which is similar with finding found by Uday Mohan (1982)19 (3.9%), Kutty R.22 (3.6%), and was higher than the finding by Singh RB (1998)20 (3.25%) but lower than the prevalence found by Gupta (2002) (7.4%), Gupta SP (1997)21 (4.53%) and Kamili MA (2007)12 (6.7%). Rising prevalence in rural area must be considered as a rising alarm as the modifiable risk factors are encroaching in this population also showed by other studies.

Limitation of the study are that resting 12 lead ECG and Rose Angina Questionnaire are not mentioned specific for the diagnosis of CHD but their use in the population based study is considered suitable11-15. Also, minor electrocardiographic changes especially in the ST and T segments are common with ageing and these findings should be interpreted with caution23. The prevalence of the study area may be considered undervalued as the lesser number of ECG was recorded in the studied population among what was calculated for the sample size but then also the trend was positive across the ages.

Although, a multicentre study is needed to track down the trend of the cardiovascular diseases including coronary heart disease, this present paper provides data on the prevalence of the coronary heart disease in both men and women which will be valuable for the planning of cardio logical services.

The increase in prevalence and the rural-urban differences in the prevalence of coronary artery disease also indicate the differences in the diet and lifestyle characteristics and other conventional risk factors.

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