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A Cross Sectional Study of Behavioral Risk Factors of Coronary Heart Disease among the Rural Population of Karnataka, South India

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ABSTRACT

Background and Objectives: Lifestyles of populations across the world have changed dramatically in the 20th century. This epidemiologic transition has led to the rapid rise in the burden of cardio vascular diseases in developing countries. The present study was undertaken to find out the behavioral risk factors of Coronary Heart Disease (CHD) in the rural South Indian population of Bagalkot, Karnataka.

Methods: A cross sectional study was conducted in Shirur, the rural field practice area of S. Nijalingappa Medical College, Bagalkot from 1st January 2011 through 31st October 2012. The data was collected by house to house survey using a pre-designed, semi structured proforma. The study for prevalence of the behavioral risk factors of CHD was conducted among a sample of 1226 respondents aged 20 years and above selected by systematic random sampling method.

Results: The prevalence of CHD was found to be 7.58% which was significantly associated with nature of work, mixed diet consumption, smoking, central obesity and history of hypertension.

Conclusion: The higher prevalence of CHD in Shirur, a rural area of North Karnataka is a matter of concern and CHD was found significantly associated among hypertensive, those with positive family history of hypertension, among those consuming mixed diet, smokers, sedentary physical activity.

Key Words: Coronary Heart Disease; Risk factors; Behavior; Hypertension; Obesity;

INTRODUCTION:

"A lifestyle is a characteristic bundle of behaviors that makes sense to both others and to oneself in a given time and place, including social relationships, consumption, entertainment and dress." The behaviors and practices within lifestyle are mixture of habits, conventional ways of doing things and reasoned actions. The individual lifestyle has become the cause his/her illness. Understanding the serious impact of modern lifestyle on cardiovascular diseases is the emerging new concept.[1]

Lifestyles of populations across the world have changed dramatically in the 20th century. These changes (collectively termed as epidemiological transition) have been brought about by a number of developments in science and technology that now affect every facet of human existence. Most human societies have moved from agrarian diets and active lives to fast foods and sedentary habits. Combined with increasing tobacco use, these changes have fuelled the epidemic of obesity, diabetes, hypertension, dyslipidemia and cardiovascular diseases (CVD).[2]

Over the time many of the behavioral risk factors for CVD have also shown to increase in developing countries. A range of factors contribute to this trend including the impact of industrialization, urbanization, globalization and affluence.[3]The main approach to reduce the social and economic burden due to CHD and other non-communicable diseases is based on the identification of risk factors at the level of the individual. This work began with the Framingham study in 1948 and has continued unabated.[4]

The risk factor prevalence rates may not be uniform throughout the country as the dietary habits and cultural practices vary in a vast country like India, hence a cross sectional study on the prevalence of behavioral risk factors of coronary heart disease among the people aged 20 years and above, is taken up in Shirur, the rural field practice area of S.N.Medical College Bagalkot, a village in Karnataka, South India.

MATERIAL AND METHODS:

A cross-sectional study was conducted in Shirur, the rural field practice area of S. N. Medical College, Bagalkot Karnataka among the population of 20 years and above. Of the total 12498 population 7,015 were of age 20 years and above and rural prevalence of CHD based on previous studies was 4% [5] using Open Epi version 2.3.1, a sample size was calculated to be 1219. Using Systematic Random Sampling technique, every 5th person was included, interviewed and checked for exclusion criteria. Thus the effective sample size was found to be 1226 respondents. Inclusion criteria were permanent resident of Shirur village from at least last 5 years, men and women aged 20 years and above and known patients with coronary heart disease. The pregnant women, individuals not willing to participate, those who will be absent on three repeated visits, those who are not able to stand erect were excluded from the study.

After obtaining informed consent data collection was done using oral interview technique. A prestructured and pretested, questionnaire was used to collect information on the risk profile, anthropometry, medical history, physical activity, and dietary habits. Assessment of angina was done by a pretested and semi structured questionnaire (Rose questionnaire from the cardiovascular survey methods of WHO-1982).[6]

The investigator who administered the questionnaire carried out anthropometric, BP measurements and electrocardiographic (ECG) recording. Motivation and instructions were given to participants on the previous day to stay in fasting state the following day. Weight, Height, Waist and hip measurements were taken from all participants. The procedure for measuring waist and hip circumference was demonstrated to women subjects and measurements were done when the auxiliary nurse midwife (ANM) or lady health visitor (LHV) was present.

Electrocardiography: A resting 12 lead ECG was recorded by RMS Vesta 302i Electrocardiograph, an automated, multichannel electrocardiograph machine. Each ECG was reviewed by cardiologist.

Coronary artery disease was diagnosed if one or more criteria were satisfied:[7]

a) Documented history of chest pain suggestive of angina or infarction and previously diagnosed as coronary artery disease;

b) Affirmative response to the rose questionnaire after excluding any obvious cause of pain due to local factors;

c) Coronary artery disease was also diagnosed in the absence of (a) and (b) but in the presence of electrocardiographic changes, namely Minnesota code1-1-1 to 1-1-7 or 1-2-1 to 1-2-7 (pathological Q), 4.1.1- 4.1.2 (ST depression), or 5.1, 5.2 (T wave inversion) and additional ST change code 9.2 to define CHD.[8]

Definitions:

Diet: Vegetarian: A person consuming fruits, vegetable, wheat, rice, pulses, milk and milk products. Mixed diet: A person consuming egg and/or meat in addition to what a vegetarian eats.[9]

Smoker: A person who has been smoking at least a bidi, a cigarette, or any other form of tobacco used for smoking for at least last six months.

Alcohol user: A person from study population who has been consuming at least 30 ml alcohol per day for at least last six months.

Physical activity: Any bodily movement produced by skeletal muscle that results in a substantial increase over the resting energy expenditure. Physical activity was assessed using close-ended questions probing self-perceived, self-reported type (occupational, domestic, leisure time and transport related) during the past 5 years. The intensity of physical activity was classified as sedentary (light) moderate and heavy work according to recommendations of Ad hoc 'Expert Committee on Energy and Protein Requirements' – Report of a joint FAO and WHO (1973).[10]

Measurements:

Height: Height was measured with a Stadiometer mounted on weighing scale to the nearest 0.5cm.

Subjects were requested to stand upright without shoes with their back and head against the height rod, heels together and eyes directed forward.[11]

Weight: Weight was measured with traditional spring balance that was kept on a firm horizontal surface. The scale was checked every day and calibration was done with "known" weights. Subjects were asked to wear light clothing and weight was recorded to the nearest 0.5 kg.[11]

BMI: Body mass index (BMI) was calculated using the formula weight in kilograms for height and classified based on WHO recommendations.[12]

Hip Circumference: Hip was taken as the greatest circumference at the level of greater trochanters (the widest portion of the hip) on both sides. Measurements were made to the nearest centimetre.[11]

Waist Circumference: Waist was measured using a non-stretchable fibre measuring tape. The participants were asked to stand erect in a relaxed position with both feet together; one layer of clothing was accepted. Waist girth was measured as the smallest horizontal girth between the costal margins and the iliac crests at minimal respiration.[11]

Waist and hip ratio (WHR): WHR was calculated by dividing the waist circumference (cm) by the hip circumference (cm) and classified as follows: a) Central obesity: WHR ≥ 0.80 in women, WHR ≥ 0.90 in men; b) Normal WHR: WHR < 0.80 in women, WHR < 0.90 in men.

Blood Pressure: Blood pressure was recorded in the sitting position in the right arm to the nearest 2mm Hg using the same mercury sphygmomanometer machine. Three readings were taken 5 minutes apart and the mean of the three was taken as the blood pressure. Disappearance of Korotkoff sound was considered as diastolic B.P[11] Hypertension was classified according to Joint National Committee (JNC) 7 criteria.[13]

Mental stress score: To assess the exposure to uncope stress, 'Mental stress score' was used. This score has been given on the basis of the Presumptive Stressful Life Events Scale [PSLES].[14, 15]

Blood sugar Estimation: Two venous blood samples were taken for glucose estimation. One sample after 8 hours of overnight fast was taken and considered for fasting blood sugar and for total cholesterol.The other venous blood sample was drawn after two hours after having food for postprandial blood glucose levels in each participant in the study.

Study protocol was approved by the Institution's Ethical Committee. Data was analyzed with SPSS version 20. Proportions, Chi square test, Fisher exact test, odd's ratio were used wherever relevant.

RESULTS

Out of total 1226 study participants, 539 were males with the mean age 45.06 (±16.08) years& 687 were females with the mean age 44.27(±16.48) years. A total of 93 participants of the 1226, were diagnosed as having CHD giving the prevalence of 7.58%.

In the present study there was very highly significant (p<0.001) difference of blood pressure levels noticed in individuals with CHD and those without CHD and also the prevalence of CHD increased with increasing blood pressure which was revealed by odds ratio[table 1]. The history of hypertension in the past was very highly significant among the individuals with CHD (13.98%) compared to the individuals without CHD (2.12%) (p < 0.001).Even the family history of hypertension was significantly more among the individuals with CHD (6.45%) compared to the individuals without CHD (2.03%) (p < 0.05) [table 2] .

The prevalence of CHD has shown significant association with mixed diet (52.69%)(p<0.05). There was significant positive relation noticed among smokers (8.60%)(p>0.05) but not so in case of alcohol consumption (10.75%) (p>0.05).

The individuals having central obesity had higher prevalence of CHD (53.76%) which was statistically significant (p < 0.05) but it was not so in case of BMI. Only obese individuals (6.46%) showed more risk of getting CHD compared to overweight, normal and underweight individuals, the difference being not statistically significant. (p>0.05) [table 2].

Table 1: Distribution of respondents according to current blood pressure level

Current blood pressure level	CHD	Non-CHD	Specific prevalence (%)	P	OR	95% CI
Normal (<120/80)	12 (12.90)	297 (26.21)	3.88	0.000	0.08	Reference
Pre Hypertension	41 (44.08)	512 (45.19)	7.41	0.936	1.022	(0.602 -1.734)
Stage 1 HT (140/90-159/99)	22 (23.66)	235 (20.74)	8.56	0.841	0.937	(0.494 -1.777)
Stage 2 HT (>160/100)	18 (19.35)	89 (7.86)	16.82	.531	1.282	(0.589 -2.789)
Total	93 (100.00)	1133 (100.00)	7.58			

HT=Hypertension; Chi Square= 19.44, df=3, p < 0.001 (very highly significant)

Table 2: Behavioral risk factor profile of respondents

Risk factors	Respondents with CHD (%)(n=93)	Respondents without CHD (%) (n=1133)	P value	OR	95% CI
History (past) of hypertension	13 (13.98)	24 (2.12)	< 0.001*	0.133	0.065-0.271
Family h/o hypertension	6 (6.45)	23 (2.03)	0.0184 *	0.300	0.119- 0.757
Diet					
Mixed	49 (52.69)	462 (40.78)	0.025*	1	reference
Vegetarian	44 (47.31)	671 (59.22)		0.618	0.405- 0.945
Smoking Status	8 (8.60)	35 (3.09)	0.01280*	0.339	0.152- 0.753
Alcohol Consumption	10 (10.75)	78 (6.88)	NS	0.614	0.306-1.230
BMI					
Underweight < 18.50	22 (23.66)	313 (27.63)	NS	1	Reference
Normal 18.50 - 24.99	55 (59.11)	647 (57.11)		0.777	0.285-2.120
Overweight 25.00-29.99	10 (10.75)	133 (11.73)		0.575	0.217-1.525
Obese >30	6 (6.46)	40 (3.53)		0.82	0.276-2.438
Waist Hip Ratio					
Central Obesity	50 (53.76)	482 (42.54)	0.03582	2.792	0.445-17.539
Mental Stress	7 (7.53)	109 (9.62)	NS	.752	0.346-1.639
Diabetic Status	11 (11.83)	76 (6.71)	NS	1.079	0.7892-1.476
Total Cholesterol (>200 mg/dl)	6 (6.45)	40 (3.53)	NS	2.175	1.503-3.19

p-value <0.05 (significant); * Fisher exact test

Table 3: Distribution of respondents according to physical activity

Physical Activity	Respondents with CHD (%) (n=93)	Respondents without CHD (%) (n=1133)	Specific prevalence (%)	p	OR	CI
Sedentary	52 (55.91)	499 (44.04)	9.44	.044	3.369	1.031-11.008
Moderate	38 (40.86)	537 (47.40)	6.61	.175	2.288	0.693-7.560
Heavy	3 (3.23)	97 (8.56)	3.0	.000	.031	Reference

Chi square = 6.478 p = 0.039 df =2

Other risk factors like mental stress (7.53%), diabetic status (11.83%) and total cholesterol levels (6.45%), did not show any statistically significant association with occurrence of CHD (p>0.05)[table 2]. For all the parameters in the table 2 respective odds ratio and 95% confidence limits have been mentioned.

The physical activity was significantly different among the individuals with CHD compared to those without CHD. The odds ratio revealed a significant reduction of specific prevalence of CHD according to the nature of work from sedentary (9.44%) to heavy work (3.00%) [table 3].

DISCUSSION

In India, the rapid rise in the burden of CVD occurred because of the rapid pace of economic development, epidemiological transition in a short span of time which has lead CVD as most common cause of death all over India, with CHD. Current estimates from various cross-sectional studies indicate the prevalence of CHD to be between 2-7% in rural India.[2]

The present study was conducted at Shirur, a rural area of Bagalkot, for the prevalence of CHD and its behavioral risk factors. It is difficult to compare the results of previous epidemiological studies with present one due to heterogeneous population composition with diverse socio cultural patterns affecting lifestyles of individuals, different definitions and criteria used in different studies, need of large sample size. The this study revealed a prevalence of CHD was 7.58% which is high in rural area compared to other studies but Sriharibabu M et al[5] reported the prevalence of CHD as 8.58% in rural Andhra Pradesh.

The prevalence of CHD was lowest among normotensives (3.88%) and highest among stage 2 hypertensives (16.82%), the difference being very highly significant (p<0.001). Also there was highly significant association noticed revealing an increasing prevalence of CHD with increasing blood pressure. Similar results were reported by Mohan V et al.[16], Mandal S et al.[17], Sriharibabu M et al.[5] However, Murthy PD et al reported that the prevalence of hypertension was higher among respondents with CHD it was not statistically significant.

The prevalence of CHD in this study was 6.45% in respondents with family history of hypertension which was significantly among individuals with CHD (p < 0.05). However, we couldn't find a study reporting on association between family history and CHD in the available research with us.

In the present study prevalence of CHD was more among respondents consuming mixed diet (52.69%) was significantly more compared to vegetarians (47.31%) ($p < 0.05$).Similar result was reflected by Goyal A et al.[18]reported that increased consumption of fruits and vegetables was associated with a 16 % lower risk of cardiovascular deaths. However Mandal S et al.[17]reported that 88% of IHD can be explained by predictor variables and no significant relation was found between IHD and diet habit.

Present study reported that out of total 93 respondents with CHD, 8.60% were smokers and among them CHD was significantly more as compared to non-smokers (3.09%) ($p < 0.05$).Similar findings were reported by Mandal S et al.[17], Sriharibabu M et al.[5]Waingankar PJ et al.[19]However, Mohan V et al.[16]reported that 6.4% among the group with coronary artery disease (CAD) and 13.8% among the group without CAD were current smokers. Smoking did not show any association with CAD in their study ($p > 0.05$).

The prevalence of CHD in this study was associated with 10.75% of alcohol consumers which did not show any significantly association between the two ($p>0.05$).Similar report was given by Mohan V et al.[16] Goyal A et al.[18] revealed Mild to moderate alcohol consumption has been associated with lower rates of CVD events in multiple Western-based observational studies and Waingankar PJ et al.[19] noticed that out of 186 cases 58 (31.2%) were alcohol consumers but did not mention any statistical association.

This study reported only obese [BMI >30] individuals (6.46%) having more risk of getting CHD compared to others but the difference was not significant ($p>0.05$).Mandal S et al.[17] and Sriharibabu M et al.[5] reported similarly.

In the present study central obesity [WHR] (53.76%) was significantly high among respondents with CHD ($p < 0.05$). Mohan V et al.[16]revealed that BMI was found significantly higher among the group with CAD compared to the group without CAD ($p = 0.006$). However no significant association found between WHR and CHD in this study ($p > 0.05$).Murthy PD et al.[20] revealed that BMI ($P < 0.01$), WHR ($P < 0.01$) were significantly higher among the group with CAD.

In our study we could not establish any association between mental stress and CHD ($p>0.05$) but many of the observational studies have reported psychological prodromata in the months preceding development of acute MI. In one study, marked elevations in recent life change scores were seen for most cases of MI or sudden cardiac death during the 6-month period preceding these events.[21]

Diabetes a well-established determinant had no significant association with CHD ($p > 0.05$) in the present study. The absence of association can be attributed to small sample size or under reporting of diabetes. Mohan V et al.[16] revealed that the prevalence rates of CAD was 21.4% in those with type 2 diabetes and 9.1% in normal subjects. The attributable risk due to diabetes for myocardial Infarction was 9.9% in the inter heart study.

In the present study 6.45% of respondents with CHD had hypercholesterolemia and it did not show any association ($p>0.5$) with prevalence of CHD. Some studies consider total and LDL cholesterol as important determinant of CHD, while hypertriglyceridemia and dyslipidemia (TC/HDL ≥4.5) as major determinant. The absence of association can be attributed to small sample size and unfortunately we could not perform further investigations on lipid profile.

The prevalence of CHD among sedentary workers was 9.44%, moderately active workers was 6.61% and heavy workers was 3%. A highly significant association was found between physical activity and CHD ($p < 0.01$) revealing that prevalence of CHD reduced as the type of work increased from sedentary to heavy work. Similar results were quoted in following studies. Rastogi T et al.[22]revealedmeasures of sedentary lifestyles or physical inactivity have been associated with a 1.5- to 2.4-fold elevation in CHD risk. However, Mandal S et al.[17] showed no significant relation was found between IHD and physical activity.

CONCLUSION

The higher prevalence of CHD in Shirur, a rural area of North Karnataka, in the present study is a matter of concern and CHD was found significantly associated among hypertensive, those with positive family history of hypertension, among respondents consuming mixed diet, in smokers, sedentary physical activity. However, the study did not reveal any association of CHD with alcohol consumption, BMI, diabetes and hypercholesterolemia.

Further research is required to document the prevalence of CHD as well as its determinants and impact of interventions like increased physical activity, change in dietary habit to more quantities of fruits and vegetables and reduced use of poly unsaturated fatty acid, no smoking and controlling blood pressure. There is also need of screening programs and early intervention measures by educating the people regarding the modifiable lifestyle risk factors.

REFERENCES

1. Kishore J. National health programs of India: National policies and legislations related to health: Century Publications, New Delhi 2012:503.
2. Prabhakaran D, Yusuf S. Cardiovascular disease in India: Lessons learnt & challenges ahead. Indian J of Medical Research. November 2010;132(5):529-30.
3. Kusuma YS, Das PK. Hypertension in Orissa, India: a cross-sectional study among some tribal, rural and urban populations. Public health. 2008;122(10):1120-3.
4. Beaglehole R, Magnus P. The search for new risk factors for coronary heart disease: occupational therapy for epidemiologists? International Journal of Epidemiology. 2002;31(6):1117-22.
5. Sriharibabu M, Himabindu Y, Kabir Z. Prevalence and associated risk factors of coronary artery disease in a rural South Indian population on a governmental health insurance scheme. Journal of Indian College of Cardiology 2. 2012:150-155.
6. Russel VL EA, McKeigue P, Reddy SK. Cardiovascular survey methods. 3 edn: WHO Geneva 2004: Appendix 21:159-60, 185.
7. Singh RB, Sharma J, Rastogi V, Niaz M, Ghosh S, Beegom R, et al. Social class and coronary disease in a rural population of north India The Indian Social Class and Heart Survey. European heart journal. 1997;18(4):588-95.
8. Ahmad N, Bhopal R. Is coronary heart disease rising in India? A systematic review based on ECG defined coronary heart disease. Heart. 2005;91(6):719-25.
9. Jain B, Jain S. Blood Pressure Level Amongst Lacto-vegetarian And Non-Vegetarian Males. Indian Journal of Community Medicine. 1999;24(03):111.
10. Joint FAO WHO Ad Hoc Expert Committee 1973 Energy and Protein Requirements. WHO Technical Report Series 522.
11. Deepa M, Pradeepa R, Rema M, Mohan A, Deepa R, Shanthirani S, et al. The Chennai Urban Rural Epidemiology Study (CURES)--study design and methodology (urban component) (CURES-I). J Assoc Physicians India. 2003;51:863-70.
12. Park K. Park's textbook of preventive and social medicine. 22 ed: Banarasidas Bhanot; 2013:369.
13. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure - Complete Report Available from: http://www.nhlbi.nih.gov/guidelines/hypertension/jnc7full.pdf.
14. Singh G, Kaur D, Kaur H. Presumptive stressful life events scale (PSLES)—a new stressful life events scale for use in India. Indian J Psychiatry. 1984;26(2):107-14.
15. Mannapur B, Dorle A, Hiremath L, Ghattargi C, Ramadurg U, Kulkarni K. A study of Psychological stress in undergraduate Medical students at SN Medi-cal College, Bagalkot, Karnataka. Journal of Clinical and Diagnostic Research. August 2010;4(4):2869-74.
16. Mohan V, Deepa R, Rani SS, Premalatha G. Prevalence of coronary artery disease and its relationship to lipids in a selected population in South India: The Chennai Urban Population Study (CUPS No. 5). JACC. September 2001; 38(3):682-7.
17. Mandal S, Saha JB, Mandal SC, Bhattacharya RN, Chakraborty M, Pal PP. Prevalence of ischemic heart disease among urban population of Siliguri, West Bengal. Indian Journal of Community Medicine. January 2009; 34(1):19-23.
18. Goyal A YS. The burden of cardiovascular disease in the Indian subcontinent. The Indian journal of medical research. September 2006;124(3):235-44.
19. Waingankar P, Pandit D. A Cross sectional study of Coronary Heart Disease in Urban Slum Population of Mumbai. International Journal of Medical and Clinical Research. 2012;3(5):180-9.
20. Murhty PD, Prasad KT, Venugopal P, Rao KV, Muralibabu RR. A survey for prevalence of coronary arrtery disease and its risk factors in an urban population of Andhra Pradesh JAPI. March 2012;60:17-20.
21. Rajeev Gupta TK, VP Gupta. Emerging Importance of Social and Psychological Factors in Coronary Heart Disease. South Asian Journal of Preventive Cardiology. Retrieved on November 2, 2012 from http://sajprev cardiology.com/vol7/vol7_3/emergingimportance.htm.
22. Rastogi T, Vaz M, Spiegelman D, Reddy KS, Bharathi A, Stampfer MJ, et al. Physical activity and risk of coronary heart disease in India. International Journal of Epidemiology. August 2004 33(4):759-67.