**Research Article**

# Prevalence of coronary heart disease in rural population of Bagalkot, Karnataka, India

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**ABSTRACT**

**Background:** Coronary heart disease contributes much to the burden morbidity and mortality from chronic diseases globally and more than 80% of CVD-related deaths worldwide now occur in low and middle income countries. By the year 2020, India will bear 60% of the world's cardio vascular disease burden. The present study was undertaken to find out the prevalence of Coronary Heart Disease (CHD) in the age group of 20 years and above among the rural population of Bagalkot, Karnataka.
**Methods:** A cross sectional study was conducted in Shirur, a rural field practice area of S. Nijalingappa Medical College, Bagalkot between 1st January 2011 to 31st October 2012, to study the prevalence of CHD among individuals aged 20 years and above. The systematic random sampling method was used to draw the sample of 1226 respondents from 7015 eligible individuals.
**Results:** The present study revealed the prevalence of CHD as 7.58% with the prevalence of symptomatic CHD (4.81%) was higher compared to asymptomatic (2.77%) cases. CHD was found to be significantly associated with increasing age in both genders (p<0.001) with male (60.22%) predominance. Higher prevalence of CHD was found among Hindu individuals, married people, illiterate and also among the individuals belonging to lower socio economic class.
**Conclusions:** Higher prevalence of CHD was found in the study in Shirur; a village of North Karnataka is a matter of concern and has to be addressed by regular screening and health education regarding the risk factors and lifestyle modification.

**Keywords:** Coronary heart disease, Rural area, Prevalence

## INTRODUCTION

Cardiovascular diseases (CVD) comprising coronary heart and cerebro-vascular diseases, are currently the leading cause of death globally, accounting for 21.9% of total deaths and are projected to increase to 26.3% by 2030.[1] CVD is often thought to be a problem of wealthy, industrialized nations. Indeed, nearly 30% of all deaths in low and middle income countries are attributable to CVD, and more than 80% of CVD-related deaths worldwide now occur in low and middle income countries.[2] By the year 2020, India will bear 60% of the world's cardio vascular disease burden. There were 2.3 million CVD-related deaths in India in 1990, 2.8 million in 2002 and it is expected to cause an alarming 5 million deaths by 2020. This is perhaps due to rapid epidemiological transition, increased life expectancy, lifestyle changes and genetic predisposition of Indians to atherosclerotic coronary heart disease (CHD).[3]

The risk of CHD in Indians is 3-4 times higher than white Americans, 6 times higher than Chinese and 20 times

higher than Japanese. Among adults over 20 year of age, the estimated prevalence of CHD is around 3-4 per cent in rural areas and 8-10 per cent in urban areas, representing a two-fold rise in rural areas and a six-fold rise in urban areas between the years 1960 and 2000.[4] CVDs are only perceived to affect the rich within developing countries. However, the burden of CVD is shifting from the richer and better-educated sections to the poorer and less-educated section. Rising burdens of CVD are now being reported in the poor in several developing countries.[5]

The Indian subcontinent (including India, Pakistan, Bangladesh, Sri Lanka, and Nepal) is home to 20% of the world's population and may be one of the regions with the highest burden of CVD in the world. Although studies have documented that immigrants from the Indian subcontinent (South Asians) living in Western countries have a higher burden of cardiovascular disease than other ethnicities, less attention has been paid to the enormous burden of CVD in the Indian subcontinent itself.[6] Data from the Registrar General of India reported greater age-adjusted cardiovascular mortality in southern and eastern states of the country. CHD mortality is greater in South India.[7]

According to Census of India 2011 Rural-Urban population distribution is 68.84% & 31.16% respectively[8] and the rural population of Karnataka is 61.32%.[9] As studies on prevalence of coronary heart disease have been sparse in rural India and especially in Karnataka state, the present study was conducted to estimate the prevalence of coronary heart disease and to know the socio demographic factors associated with the disease, among people aged 20 years and above, at Shirur, a rural field practice area of S. Nijalingappa Medical College, Bagalkot.

## METHODS

A cross-sectional Study was conducted in Shirur, which has a population of 12,498 residing in 2055 houses served by a total of 14 Anganwadis, as per house to house survey at Shirur. Among them, the population aged 20 years and above was 7015 (63.69%).

Inclusion criteria for study subjects were all the men and women aged 20 years and above, who were residents of Shirur village from at least last 5 years and the individuals with known history of heart disease or on treatment. Individuals not willing to participate or those who will be absent on three repeated visits, pregnant women and those who are not able to stand erect were excluded from the study.

For a population of 12498 with a sampling frame of 7,015 and prevalence of 4%,[4] 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.

***Data collection:*** The population enumeration and the sample population were interviewed by house-to-house survey. The help of anganwadi workers was obtained for initial survey to delineate the areas covered by each anganwadi. All the houses in each of the anganwadi were numbered continuously for study purpose. Structured, Close ended questionnaire was used to collect information on the socio demographic profile, which included contact details, age, gender, religion, marital status, education, occupation, and income. The survey was done by the investigator who administered the questionnaire and electrocardiographic (ECG) recording. Assessment of angina was done by a pretested and semi structured questionnaire (Rose questionnaire from the cardiovascular survey methods of WHO-1982).[10]

***Definitions:***

Age of the person was recorded in completed year. Marital Status was recorded as currently married at the time of study, unmarried (participants who were not married) and others which included Widowed (participants whose spouse is dead), Separated (a person who has been voluntarily separated from spouse without obtaining a court order) and Divorced (Person having legally taken divorce from a previous marriage and currently not married to anyone).[11]

The maximum level of educational qualification attained was taken as literacy status which was defined as Illiterate and literate.

***Illiterate:*** A person who could not read or write. This category also includes those who could only sign or reproduce some writing mechanically without any meaning.

***Literate:*** Those who had taken formal education. This category also included those who could read or write with meaning but had not taken any formal education in school.[12]

***Socio economic classification:*** Monthly earning of each individual from all the sources was recorded and the agricultural income in the form of crops is converted into present price rates and was taken for calculation of income. B G Prasad classification was used with correction to March 2011 for Socio Economic Classification.[13]

***Electrocardiography:*** A resting 12 lead ECG was recorded by RMS Vesta 302i Electrocardiograph, an automated, multichannel electrocardiograph machine. Each ECG was reviewed by cardiologist.[10]

Coronary artery disease was diagnosed if one or more criteria were satisfied:[14]
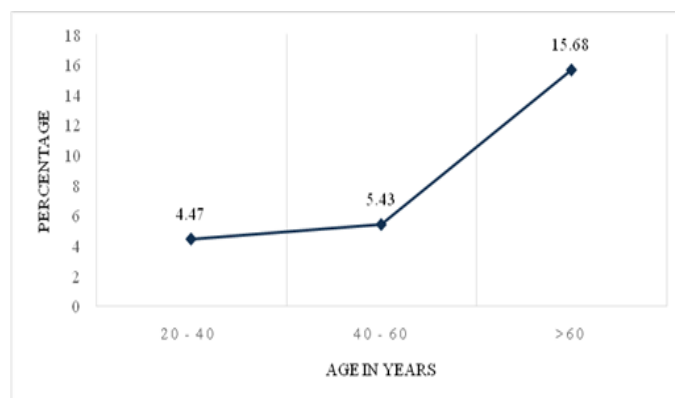
a) Documented history of chest pain suggestive of angina or infarction and previously diagnosed as coronary artery disease;
b) Affirmative response to the rose questionnaire after excluding any obvious cause of pain due to local factors;
c) Coronary artery disease was also diagnosed in the absence of (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.[15]

The individuals who were either positive for affirmative response to Rose angina questionnaire or having past history of CHD were called as symptomatic or known cases of CHD or ischemic heart disease (IHD).Individuals having only ECG changes were called as asymptomatic or silent CHD cases.[18]

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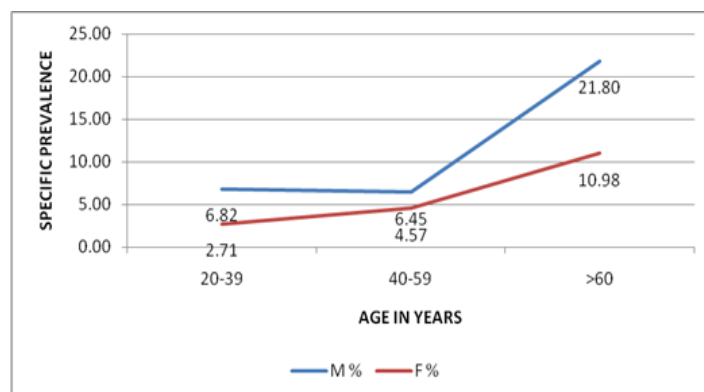
## RESULTS

Of the1226 individuals who took part in the study 93 were found to have CHD according to diagnostic criteria; hence the prevalence of CHD came out to be 7.58% in Shirur. Out of 93 respondents with CHD, 34 (36.56%) were silent cases and 59 (63.44%) were symptomatic cases. The specific prevalence of symptomatic CHD was 4.81% as compared to silent CHD 2.77%. The prevalence of CHD increased with age which was very highly significant (p<0.001) [Table-1, Fig. 1].



**Figure 1: Age specific prevalence of CHD.**

The mean age of individuals with CHD in the present study was 43.60 (±15.34) years and mean of group without CHD was 44.67 (±16.39) years (p>0.05). Prevalence of CHD was higher among males (60.22%) as compared to females (39.78%) (p<0.01). There was increase in prevalence of CHD observed with increase in age in both the genders (Fig. 2). Other demographic factors like religion, marital status, literacy and socio economic class were also studied.



**Figure 2: Age and gender wise distribution of respondents.**

**Table 1: Distribution of respondents according to diagnostic criteria.**

| Age Group (In Years) | Study Population | Symptomatic (Known = Rose Questionnaire) (A) | % | Electrocardiographic (Silent CHD) (B) | % | Total (A+B) | Age specific prevalence % | Odds Ratio |
|---|---|---|---|---|---|---|---|---|
| 20-39 | 515 | 20 | 3.88 | 3 | 0.58 | 23 | 4.47 | 1 |
| 40-59 | 405 | 16 | 3.95 | 6 | 1.48 | 22 | 5.43 | 1.23 |
| >60 | 306 | 23 | 7.52 | 25 | 8.17 | 48 | 15.68 | 3.98 |
| | 1226 | 59 | 4.81 | 34 | 2.77 | 93 | 7.59 | |

Chi-square = 29.55, p-value < 0.001

The prevalence of CHD was significantly high among married people (82.80%) as compared to unmarried (4.30%) or others (p<0.05). More of individuals with CHD belonged to Hindu religion (96.77%) and higher prevalence was found among illiterate respondents (52.69%). However there was no statistically significant relation found between CHD either with religion or with literacy status [Table-2].

**Table 2: Socio demographic profile of respondents.**

| Socio-demographic profile | Total respondents (n=1226) | Respondents with CHD (n=93) | P value |
|---|---|---|---|
| **Gender** | | | |
| Male | 539 (43.96) | 56 (60.22) | < 0.01 |
| Female | 687 (56.04) | 37 (39.78) | |
| **Religion** | | | |
| Hindu | 1181 (96.33) | 90 (96.77) | > 0.999 |
| Muslim | 45 (3.67) | 3 (3.23) | |
| **Marital status** | | | |
| Married | 1021 (83.28) | 77 (82.80) | < 0.05 |
| Unmarried | 112 (9.14) | 4 (4.30) | |
| Others | 93 (7.59) | 12 (12.9) | |
| **Literacy status** | | | |
| Literate | 629 (51.31) | 44 (47.31) | > 0.05 |
| Illiterate | 597 (48.69) | 49 (52.69) | |

If p<0.01 & <0.05 (significant)

CHD was found high (57.34%) among the lower socio economic status group compared to upper class (4.16%) but odds ratio indicates that the risk of CHD goes on increasing from lower to upper socio economic class [Table 3].

**Table 3: Distribution of respondents according to socio economic status.**

| Socio-economic status | Cases (n=93) | Total (n=1226) | Odds Ratio |
|---|---|---|---|
| Lower | 49 (52.69%) | 703(57.34%) | 1 |
| Middle | 37(39.78%) | 472(38.50%) | 1.14 |
| Upper | 7(7.53%) | 51(4.16%) | 2.12 |
| **Total** | 93 | 1226 | |

Chi square =1.69, p-value = 0.1933

**Table 4: Regional variations in the prevalence of CHD in India*.**

| Author | Year of study | Place of study | Residence | Age (in years) | Sample | Prevalence |
|---|---|---|---|---|---|---|
| ICMR study | 1989-1994 | Vellore | Rural | 25-64 | 4693 | 1.5% |
| ICMR study | 1989-1994 | Delhi | Rural | 25-64 | 3019 | 5.3% |
| Kutty et al | 1993 | Kerala | Rural | 25-64 | 1130 | 7.43% |
| Gupta et al | 1994 | Rajasthan | Rural | 25-64 | 1905 | 3.53% |
| Wander GS | 1994 | Punjab | Rural | 30-70 | 1100 | 3.09 |
| Singh RB[15] | 1995 | Uttar Pradesh | Rural | 20-80 | 162 | 3.09% |
| Reddy KS | 1998 | Haryana | Rural | 35-64 | 2800 | 6% |
| Mohan V[20] | 2001 | Chennai | Urban | $\geq 20$ | 1262 | 11% |
| Gupta AK | 2002 | Himachal | Rural | 35-65 | 1160 | 5% |
| Bharadwaj R[22] | 2009 | Himachal | Rural | $\geq 30$ | 812 | 4.06% |
| Mandal S[18] | 2009 | West Bengal | Urban | $\geq 40$ | 250 | 11.6% |
| Murthy PD[21] | 2009 | Andhra Pradesh | Urban | $\geq 20$ | 534 | 5.4% |
| Sriharibabu M[3] | 2007-2011 | Andhra Pradesh | Rural | $\geq 25$ | 43,025 | 8.58% |
| Waingankar PJ[19] | 2012 | Maharashtra | Urban slum | 25-64 | 11,772 | 1.58% |
| Present study | 2012-2013 | Karnataka | Rural | $\geq 20$ | 1226 | 7.58% |

## DISCUSSION

Cardiovascular diseases are major causes of mortality and morbidity in the Indian subcontinent, causing >25% of deaths. The epidemic of CAD in India is advancing rapidly and there has been a dramatic rise in the prevalence of CAD which is further projected to rise substantially. It is predicted that India will host more than half of heart disease in the world within next 15 years, what is even more distressing is the fact that they affect the productive workforce aged 35-65years.[16] The present study was conducted among 1226 respondents of the age group 20 years and above at Shirur, a rural field practice area of S. Nijalingappa Medical College, Bagalkot for the prevalence of coronary heart disease. It is difficult to compare the results of previous epidemiological studies with present one due to:

- Heterogeneity of population and different socio-cultural patterns existing in our country.
- Different criteria used in defining CHD.
- Need of large sample size to study epidemiology of CHD.
- The time difference between the various studies.
- Predominance of lower socio-economic status in rural population.

The present study revealed a prevalence of CHD in this rural area as 7.58%. According to current estimates the CAD prevalence rates in India vary between 2 and 7% in rural areas and 7 - 13% in urban areas. The higher CHD prevalence rate in present study reflects that CHD burden is increasing even in the rural population and prevalence rates are relatively high in south Indians compared to north Indians (Table 4).[3]

The prevalence of symptomatic CHD was 4.81% as compared to asymptomatic 2.77% in the present study which was comparable to study done by Mandal S et al.[17] which reported prevalence of symptomatic IHD was 6.4% and asymptomatic IHD was 5.2%.

In the present study, age specific prevalence of CHD was highest (15.68%) among more than 60 years and it increased with age which was very highly significantly (p < 0.001) revealing that as age increased, the risk of CHD also increased. Similarly Mandal S et al.[17] reported that the prevalence of IHD significantly increased with an increase in age (P < 0.01) and Waingankar PJ et al.[18] reported that highest prevalence (9.91%) in the age group of 55 to 64 years.

The mean age of individuals with CHD in the present study among group with CHD was comparable to group without CHD. Similar report was given by Murthy PD et al.[19] but Mohan V et al.[20] reported that the group with CAD was older (58 ± 12 years) compared to group without CAD (42±11 years) (p < 0.001).

The prevalence of CHD was more among males compared to females in the present study. Mandal S et al.[17] reported that males had a higher (13.5%) prevalence of IHD than females (9.4%) (P> 0.05). Similar reports were given by Bhardwaj R et al.[21] and Murthy PD et al.[19]

The age wise prevalence of CHD among males was also high when age wise prevalence of compared to females. (p = 0.01). Waingankar PJ et al.[18] reported that there was marked and monotonic increase in prevalence with increase in age in both sexes (p < 0.01). In the present more number of respondents with CHD was Hindus compared to Muslims. But Waingankar PJ et al.[18] observed that majority of the cases (90.9%) were Muslims and Hindu were 7.5% which was due to predominance of Muslim population in that community.

In the present study maximum number the respondents with CHD were married and marital status and CHD have shown significant positive association (p < 0.05). Similar finding was reported by Waingankar PJ et al.[18]

In the present study, the prevalence of CHD in the study more among illiterates (p >0.05).Similar report was given by Waingankar PJ et al.[18] that respondents with CHD were more among illiterates (64.5%). The prevalence of CHD was found higher (57.34%) among lower socio economic class indicating an extra financial burden even on very poor people. Similarly Waingankar PJ et al.[18] reported that 72.6% cases were belonged to socio-economic class IV or V.

## CONCLUSION

India is in the grip of a CHD epidemic with increasing prevalence rates in both rural and urban areas as a result of epidemiological transition. A higher prevalence of CHD in the present study and CHD was found to be significantly associated with following variables age, male gender, with age and in both the genders, marital status. However, the study did not reveal any association of CHD with religion, literacy status and level, socio economic status. The higher prevalence of CHD in Shirur, a village of North Karnataka, is a matter of concern and has to be addressed by regular screening and health education to create awareness among population and to motivate to modify the risk factors by changing the lifestyle as it is a multifactorial disease. The symptom of chest pain even if of a vague type should be investigated thoroughly before labelling the individual not suffering from CHD. Further research is required to document the prevalence of CHD as well as its determinants and impact of lifestyle modification is recommended.

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