

Original Research Article

Risk prediction of cardiovascular event using WHO/ISH chart and awareness regarding the cardiovascular risks among adult population in rural areas of Krishnagiri district, Tamil Nadu: a cross-sectional study

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ABSTRACT

Introduction: Identification of risks and increasing awareness levels is essential for primary and secondary prevention of cardiovascular diseases (CVD). Our study focused on distribution of risk for cardiovascular events and the awareness levels among the rural adult population.

Method: A cross-sectional study was conducted among 220 participants in ten selected villages in Hosur, Krishnagiri district. Participants aged above 40 years were selected by systematic random sampling with allocation proportional to village population. Data were collected using a pre-tested questionnaire, anthropometric measurements, and laboratory investigations. WHO/ISH chart (laboratory based) was used to predict 10 years risk for CVD and ABCD questionnaire containing 4 domains with total score of 80 was used to assess the awareness for CVD risks.

Results: The mean age of the participants was 53.4 ± 9.6 years, and 30% were males. The study predicted that 20% (95% CI:14.2%-25.2%) of the participants were at moderate-high risk for CVD. The mean score for awareness was 50.0 ± 4.6 . Those divorced/separated ($X^2=25.3$, $p < 0.001$) had a significant high risk for CVD. Those with education above high school ($F=3.3$, $p=0.014$), non-tobacco users ($t=4.5$, $p < 0.001$), and hypertensives ($t=2.2$, $p=0.023$) had higher awareness levels.

Conclusion: The proportion of population at moderate-high risk for CVD was 20%. Awareness regarding CVD risks was 50.0 ± 4.6 (out of 80). Use of WHO/ISH chart at grass root level will help in the identification of individuals at moderate to high risk. Regular health education sessions in the community are needed to enhance awareness levels.

Keywords: ABCD questionnaire, Awareness, Cardiovascular disease, Rural area, WHO/ISH Chart

INTRODUCTION

Global morbidity and a lower standard of living are primarily caused by cardiovascular diseases (CVD)s, which include heart failure, stroke, ischemic heart disease, and other conditions. Globally, 17.8 million people died in 2017, according to estimates related to CVD.^{1,2} Most CVD deaths take place in low and middle-income countries (LMIC), where the burden of CVD and risk factors is increasing due to an ongoing epidemiological transition.³ It continues to be a significant factor in early mortality and rising health care

costs.⁴ In India, deaths from coronary heart disease (CHD) are a major cause of CVD deaths. The burden of CVD in India can be significantly reduced by risk stratification and the identification of people who have a high risk for CVD and who might benefit from intensive primary prevention efforts.⁵ The main risk factors for cardiovascular risk are high blood pressure, diabetes mellitus, dyslipidaemia, and a high body mass index (BMI).^{6,7} The current distribution of risk factors within the population needs to be lessened for CVD prevention and control, which can significantly lessen the CVD epidemic. To prevent cardiovascular disease, risk

assessment has become crucial. In 2007, the World Health Organization (WHO) and International Society of Hypertension (ISH) released the CVD risk prediction charts. Risk prediction charts can help us to estimate a person's absolute risk of cardiovascular disease and to identify those who are at high risk.⁸ Also, little is known about the general public's awareness of cardiovascular risks, which must be changed to persuade more people to live cardio-protective lifestyles.⁹ Identification of risks and increasing awareness levels is essential for primary and secondary prevention of cardiovascular diseases. Fewer studies have been done on risk prediction in India, but further research is needed to understand the real distribution, burden, and awareness of CVD in different geographic areas. Hence, in this study we wanted to determine the distribution of 10-year risk of fatal or non-fatal cardiovascular events using WHO/ISH chart (laboratory based) and assess the awareness regarding cardiovascular risks among the study population.

METHODS

Study design and sample size

This is a cross-sectional study conducted in selected villages of Hosur, Krishnagiri district, Tamil Nadu between September 2021 to November 2021 among adult population aged 40 years and above. The Prevalence of high risk for cardiovascular event in the next 10-years was 17% in a previously conducted study in rural areas of Pondicherry.¹⁰ With this prevalence(p), the sample size was calculated using the formula, $n=z^2 (p \times q)/d^2$. The calculated sample size was 216. It was rounded off to 220.

Sampling technique

Proportional allocation followed by systematic random sampling was done in this study. A population list for 10

selected villages under the AGAPE Hospital, Hosur outreach areas were taken. Based on proportionality, the sample size was divided among the villages. From the centre of each village, a street was chosen at random. On each street, the first house was chosen randomly. Following that every 7th house (n) was taken till the required sample size is achieved for that village. If there is more than one person aged 40 years and above in a house, then the subject is chosen randomly using lottery method. Similarly, 10 villages were covered.

Inclusion and exclusion criteria

All the adults aged 40 years and above living in the village for more than 1 year were included. 1) Subjects who already suffered a cardiovascular event like myocardial infarction, angina, and stroke, 2) Subjects unable to comprehend the questionnaire, 3) Subjects who are morbidly ill were excluded from the study.

Study tools

A questionnaire about sociodemographic details of the subjects like name, sex, age, education, occupation, location, type of family, and family income were administered. A questionnaire regarding the risk factors for cardiovascular diseases was administered. WHO/ISH charts (Laboratory based - South Asia region) were used to predict the 10-year risk of developing cardiovascular diseases.¹¹ A pre-existing validated ABCD questionnaire used for assessment of awareness about cardiovascular risks.¹² ABCD questionnaire includes 4 domains: 1) knowledge, 2) perceived risk of heart attack/stroke, 3) perceived benefits and intentions to changes and 4) healthy eating intentions with a total score of 80. Weighing scale, measuring tape, Digital sphygmomanometer, Blood sample collection for random blood sugar and total cholesterol were used.

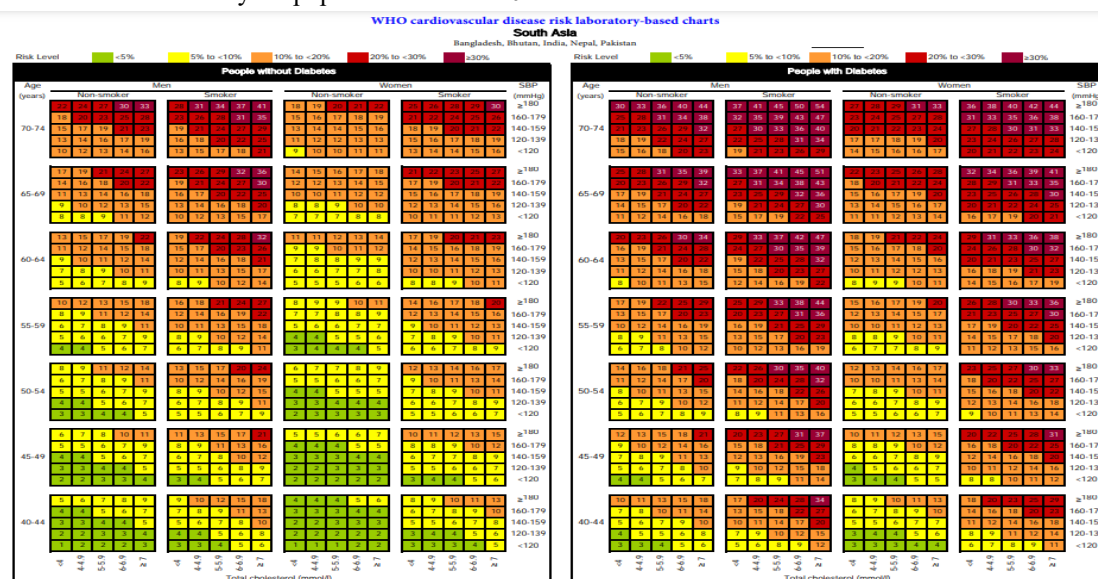


Figure 1: WHO/ISH risk prediction charts South Asia (laboratory based).

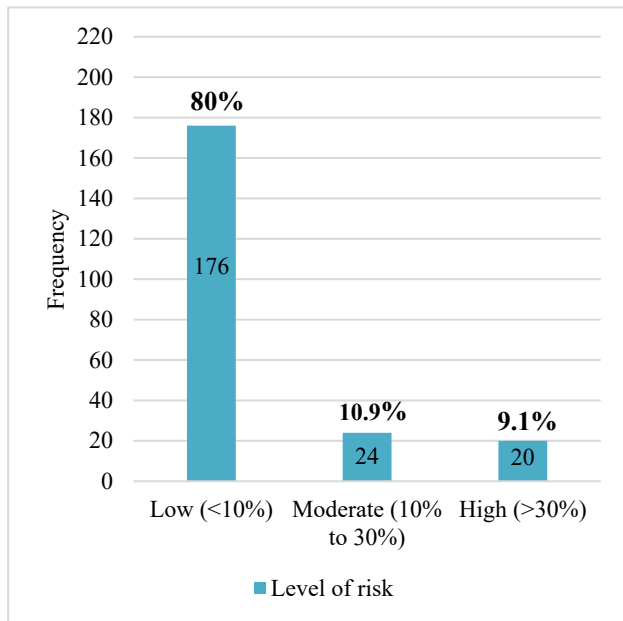


Figure 2: Risk for CVD Event in the next 10-years in the study population (N=220).

Ethics and consent

Ethical approval was obtained from the Institutional Ethics Committee, St. John's National Academy of Health

Sciences. Informed consent obtained from all the study participants.

Statistics analysis

Outcome variables are the risk of cardiovascular events in the next 10 years and awareness about the cardiovascular risks. Data was collected using Epicollect5 and collated to MS excel.

Analysis was done using SPSS Version 21. Data was analysed to percentages, mean and standard deviation. Relevant tests of significance used are Chi Square test, Independent T test, and ANOVA test. P value<0.05 was considered significant. Results are depicted in tables and charts.

RESULTS

Among the 220 participants in our study, the mean age of the population was 53.4 ± 9.6 years. Based on the age group, 30.4% were 60 years and above. Majority of the study population were females (155, 70.5%). Most of them were married (205, 93.2%) and half of the participants did not have any formal education (114, 51.8%). More than one-third of the population were involved in agriculture as their occupation (82, 37.3%). More than half of the population were below middle class of socioeconomic status (126, 57.3%). (Table 1).

Table 1: Socio-demographic details of study population.

Variables	Frequency (n=220)	%
Age (in years)	40-49	43.6
	50-59	25
	60-69	21.4
	≥ 70	10
Gender	Male	29.5
	Female	70.5
Marital status	Married	93.2
	Widow/Separated	6.8
Education	No formal education	51.8
	Primary (class 1-4)	8.6
	Middle (class 5-7)	15
	High (class 8-10)	19.1
	Intermediate (11-12)	5.5
Occupation	Agriculture	37.3
	Self employed	4.1
	Salaried	9
	Daily wage worker	15.9
	Retired	1.4
	Homemaker	35.9
	Others	4.5
Socioeconomic status	Upper	7.7
	Upper middle	10
	Middle	25
	Lower middle	38.2
	Lower	19.1

Table 2: CVD risk factors distribution among the study population based on gender (Total n=220).

Variables		Total N (%) 220 (100%)	Male N (%) 65 (100%)	Female N (%) 155 (100%)	P value
Behavioural risk factors	Smoking	19 (8.6)	19 (29.2)	0 (0)	<0.001
	Tobacco chewing	81 (36.8)	12 (18.4)	69 (44.5)	<0.001
	Alcohol use	16 (7.2)	15 (23)	1 (0.6)	<0.001
	Physical inactivity	100 (45.4)	15 (23)	85 (54.8)	<0.001
	Unhealthy eating habits	73 (33.1)	27 (41.5)	46 (29.6)	0.088
Metabolic risk factors	BMI (≥ 23 kg/m ²)	132 (60)	35 (53.8)	97 (62.5)	0.228
	Central obesity	84 (38.1)	15 (23)	69 (44.5)	0.003
	Diabetes	38 (17.2)	14 (21.5)	24 (15.4)	0.278
	Hypertension	43 (19.5)	10 (15.3)	33 (21.2)	0.314
	Dyslipidaemia	38 (17.2)	16 (24.6)	22 (14.1)	0.062

Table 3. Awareness regarding CVD risks among the study population (n=220).

Domains	Total score	Mean score	%
Knowledge	8	5.2 $\pm$ 1.5	65.2
Perceived risk of heart attack/stroke	24	14.8 $\pm$ 3.3	61.9
Perceived benefits and intentions to change	36	20.6 $\pm$ 2.1	57.3
Healthy eating intentions	12	9.3 $\pm$ 0.9	78.1
Total	80	50 $\pm$ 4.6	62.5

Table 4. Associated factors for the risk of CVD events among the study population.

Variable		Level of risk for CVD event			P value
		Low	Moderate	High	
Religion	Hindu	174 (80.2%)	23 (10.6%)	20 (9.2%)	0.490
	Christian	2 (66.7%)	1 (33.3%)	0 (0%)	
Marital status	Married	171 (83.4%)	17 (8.3%)	17 (8.3%)	<0.001
	Widow (er)	5 (33.3%)	7 (46.7%)	3 (20%)	
Education	No formal education	89 (78.1%)	12 (10.5%)	13 (11.4%)	0.565
	Primary and middle school	41 (78.8%)	8 (15.4%)	3 (5.8%)	
	High school and intermediate	46 (85.2%)	4 (7.4%)	4 (7.4%)	
Employment	Working	114 (83.8%)	14 (10.3%)	8 (5.9%)	0.053
	Not working	3 (60%)	2 (40%)	0 (0%)	
	Homemaker	59 (74.7%)	8 (10.1%)	12 (15.2%)	
Alcohol use	Yes	10 (62.5%)	3 (18.8%)	3 (18.8%)	0.117
	No	166 (81.4%)	21 (10.3%)	17 (8.3%)	
Stress	Present	95 (84.8%)	9 (8%)	8 (7.1%)	0.201
	Absent	81 (75%)	15 (13.9%)	12 (11.1%)	
Physically active	Yes	101 (84.2%)	11 (9.2%)	8 (6.7%)	0.232
	No	75 (75%)	13 (135%)	12 (12%)	
Diet	Healthy	114 (77.6%)	16 (10.9%)	17 (11.6%)	0.210
	Unhealthy	62 (84.9%)	8 (11%)	3 (4.1%)	
Family history of CVD	Yes	13 (81.3%)	2 (12.5%)	1 (6.3%)	0.892
	No	163 (79.9%)	22 (10.8%)	19 (9.3%)	
BMI	Underweight	18 (85.7%)	2 (9.55)	1 (4.8%)	0.260
	Normal	91 (84.3%)	11 (10.2%)	6 (5.6%)	
	Overweight	67 (73.6%)	11 (12.1%)	13 (14.3%)	
Central obesity	Present	64 (76.2%)	9 (10.7%)	11 (13.1%)	0.292
	Absent	112 (82.4%)	15 (11%)	9 (6.6%)	

Table 5: Associated factors for awareness regarding CVD risks among the study population (n=220).

Variables	Total awareness Score	P value
Age (in years)	40 to 59	50.3±4.8
	60 and above	49.7±4.3
Gender	Male	49.7±5.4
	Female	50.2±4.2
Marital status	Married	50±4.6
	Widow/separated	50.3±5.1
Religion	Hindu	50.1±4.6
	Christian	50.6±2.5
Education	No formal education	49.3±4.6
	Primary/Middle school	50.4±4.2
	High school and above	51.5±4.7
Occupation	Working	50±4.8
	Home maker	50.3±4.5
	Not working	49±2.7
Smoking	Yes	49.6±3.4
	No	50.1±4.7
Tobacco chewing	Yes	48.3±4.2
	No	51.1±4.5
Alcohol use	Yes	49.8±3.3
	No	50.1±4.7
Diabetes	Present	50.6±4.7
	Absent	50±4.6
Hypertension	Present	51.5±5.4
	Absent	49.7±4.4
Central obesity	Present	49.7±4.4
	Absent	50.3±4.8

The cardiovascular risk factors distribution among the population based on the gender shows that males have significantly higher risk factor of smoking ($p<0.001$) and alcohol use ($p<0.001$) than females. In females, the tobacco chewing ($p<0.001$), physical inactivity ($p<0.001$), and central obesity ($p=0.003$) risk factors were significant compared to males (Table 2). Using the WHO/ISH chart for 10-year risk prediction of fatal/non-fatal CVD event, we noticed that 20 (9.1%) of the participants are at high risk, 24 (10.9%) at moderate risk and 176 (80%) at low risk (Figure 2). On assessing the awareness regarding CVD risks among the study population, we noticed that the mean scores for the 4 domains were 5.2 ± 1.5 , 14.8 ± 3.3 , 20.6 ± 2.1 and 9.3 ± 0.9 . The total awareness score among the population was 50 ± 4.6 , which is 62.5% of the total score of 80 (Table 3). On association of other factors with 10-year risk of CVD event among the study population, we observed that the subjects who were widow were significantly at high risk for CVD event than those who were married ($p<0.001$). There was no other significant association between the factors and the CVD event (Table 4).

On association of other factors with the total awareness regarding CVD risks among the study population, it showed that with increase in the educational status of the participants, there were a significant increase in the total awareness for CVD risks ($p\leq0.014$). The study population

with no tobacco use have a significantly higher total awareness than the tobacco users ($p<0.001$). Also, the hypertensive participants had a significantly higher awareness than non-hypertensives ($p=0.023$). Other factors had no significant association with the total awareness for CVD risks (Table 5).

DISCUSSION

In this study, 9.1% of the study population are at high risk, 10.9% at moderate and 80% at low risk for CVD event in the next 10-years. The awareness for CVD risks among the study population was mediocre with a mean score of 50 ± 4.6 , which is 62.5% of the total score. There was a significant high risk for CVD events among the widows compared to those married. The awareness for CVD risks was significant with higher education status, non-tobacco users and hypertensives in the study population.

A population-based cross-sectional study conducted by Norman et al on 3780 adult subjects in rural Bengaluru District, Karnataka have found that 15.2% are at high risk for CVD event.⁷ In a cross-sectional study done by Ghorpade et al on 570 subjects in rural areas of South India have showed that 10.2% of the population are at high risk.¹⁰ This is in accordance with our finding of 9.1% of high risk for CVD event.

The increasing prevalence of risks for fatal or non-fatal CVD events are due to the increasing age, behavioural risk factors and metabolic risk factors among the population. In a hospital-based prospective study conducted on 50 patients in Coimbatore, Tamil Nadu by George et al have found that awareness for CVD risks was 48%. A study conducted by Aminde et al on 1162 adult subjects in Cameroon showed that the awareness scores were 12.1 out of 25.¹³ In the study, the awareness score was 50 ± 4.6 , which is 62.5% of the total score. This poor level of awareness among the population could be attributed to their education, socio-economic status, and other chronic morbid conditions.⁹

A systematic review and meta-analysis done by Wong CW et al showed that being unmarried and separated had an increased odds of having a CVD event compared to those who were married.¹⁴ This is in accordance with our study finding, where marital status had a significant association with CVD events. This could be due to low social support and lack of motivation. Also, economic, emotional, and behavioural well-being and poor health seeking behaviour among unmarried, separated or widow. A study conducted by Aminde et al on 1162 adult subjects in Cameroon showed that education status and tobacco use had significant association with the awareness for CVD risks.¹³ The study has similar findings of education status and tobacco use being significant to the awareness regarding CVD risks.

In the study, the population with hypertension had a significantly higher awareness than normotensives. This could be due to their health care system visit for blood pressure monitoring and treatment, where health related advice or education is provided to the hypertensive individuals by the health care workers.

In the study, majority of the study subjects are females, because the male members in the family were not available at home as they went for work. There could be a social desirability bias in this study, because the behavioural or lifestyle factors were self-reported, and the data was collected in front of other family members.

CONCLUSION

In the study, we observed that 80% of the population were at low risk but 9.1% and 10.9% of the population were at high and moderate risk for fatal or non-fatal cardiovascular disease event in the next 10-years. The awareness score regarding the cardiovascular disease risks were 50 ± 4.6 , which is 62.5% of the total score of 80. There was a significant association between marital status and CVD events. Also, the awareness regarding CVD risks had a significant association with educational status, tobacco use, and hypertension.

Recommendations

All the study participants were educated about the cardiovascular risk factors, importance of physical activity, healthy diet, regular monitoring of blood pressure and sugars, and strict adherence to medications. The study population who was found to have cardiovascular risk factors such as high blood pressure, high blood sugars and elevated cholesterol levels were advised to review at the hospital for further management. Individuals who were at moderate and high risk of developing cardiovascular diseases were also referred to the hospital for further assessment and preventive management. Use of charts such as WHO/ISH chart by healthcare workers at grass root levels will help in the identification of individuals at moderate to high risk and appropriate referral. Regular health education sessions in the community are needed to enhance awareness levels.

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