



PREDICTING CARDIOVASCULAR RISK BY USING WHO/ISH RISK PREDICTION CHART AMONG RURAL POPULATION OF GUNTUR

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ABSTRACT

Introduction: Coronary artery disease (CAD) is a leading global cause of death, disproportionately affecting low- and middle-income countries and causing significant economic burden. In India, CAD accounts for 20.3% of male and 16.9% of female deaths, particularly impacting individuals aged 25–69 and leading to loss of productive years. Traditional approaches targeting single risk factors may over- or under-treat patients, highlighting the need for risk stratification and early identification of high-risk individuals. The WHO/ISH risk prediction charts provide simple, cost-effective 10-year estimates of major cardiovascular events (fatal or non-fatal) based on age, sex, blood pressure, smoking, cholesterol, and diabetes, across 14 WHO sub-regions. **Methodology:** A cross-sectional study was conducted among the rural population of Guntur district. A total of 340 people were selected through a simple random sampling method, and data was collected using structured interviews and anthropometric measurements. The ten-year risk of CVD was assessed using the interview responses and WHO/ISH risk prediction charts. The data was coded and entered into MS Excel, and statistical analysis was performed using SPSS version 25 software. **Results:** 39.7% and 21.4% of study population are at moderate and severe risk of CVD in the next ten years. 55.2% of hypertensives, 56.9% of smokers and 56.1% of diabetics are at high risk among our study participants. Of the 73 participants who came under high risk, 60 persons are of 40-60yrs age group whereas 13 people are of 60-80 yrs age group. Our study showed that there is significant association between risk factors like age, smoking, diabetes, hypertension and CVD risk categorization using WHO/ISH charts. **Conclusions:** In this study, most participants were at moderate (39.7%) and mild (38%) risk. This classification helps prioritize and manage individuals based on risk severity. Using simple tools like the WHO/ISH risk prediction charts enables early identification of high-risk groups, helping reduce the future burden of cardiovascular diseases.

KEYWORDS : CVD risk prediction, WHO/ISH charts, Hypertension, Diabetes

INTRODUCTION:

Coronary Artery Disease (CAD) is the foremost single cause of deaths globally. A large percentage of this burden is found in low and middle income countries. This accounts for nearly 7 million deaths annually and is a huge global economic burden. In India, more than 10.5 million deaths occur annually. CAD led to 20.3% of these deaths in men and 16.9% of all deaths in women¹.

Cardiovascular diseases (CVDs) disproportionately affect individuals aged 25–69, resulting in loss of productive years. Current approaches often treat patients based on single risk factors, which can either over-treat low-risk individuals or under-treat those at higher overall risk. Risk stratification and identification of high-risk individuals are crucial for effective primary prevention. Tools like the WHO/ISH risk prediction charts provide simple, cost-effective 10-year CVD risk estimates for people without established disease, guiding targeted interventions. However, few studies in India have used these charts to assess cardiovascular risk.³

The WHO/ISH risk prediction charts, developed from large datasets for various world regions and tailored to specific countries, are widely utilized. These charts estimate the 10-year risk of a major cardiovascular event—fatal or non-fatal, such as myocardial infarction or stroke—based on age, sex, blood pressure, smoking status, total cholesterol, and the presence of diabetes across 14 WHO epidemiological sub-regions.⁵

There Are Two Sets Of Charts.

1. One set can be used in settings where blood cholesterol can be measured.

2. The other set is for settings in which blood cholesterol cannot be measured

The Risk Is Classified As Follows:

Green	< 5%	Yellow	5% to < 10%	Orange	10% to < 20%	Red	20% to < 30%	Deep red	≥ 30%
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The purpose of this study was to evaluate the 10-year cardiovascular risk among a rural population using WHO/ISH risk prediction charts.

Objectives:

- To estimate the prevalence of HTN & DM in rural population of Guntur.
- Predicting Cardiovascular risk by using WHO/ISH risk prediction chart among rural population of Guntur.
- Predicting risk factors associated to the Cardiovascular risk.

MATERIALS & METHODS:

- **Study Design And Population:** Community based cross sectional study done for 5 months (feb – june 2023)
- **Study Population:** Rural population of Guntur District
- **Sample Size:** Sample size was calculated using the formula, $4pq/l^2$ (where p -29.8%, q- 100-p, l-5%). Sample size came to 334, which is rounded off to 340.

Inclusion Criteria:

- > 40 years of age
- Those who were willing to participate in the study.

Exclusion Criteria:

- Individuals with confirmed coronary heart disease, stroke

- or other atherosclerotic diseases were excluded.
- Individuals who did not wish to participate in the study.

Sampling Method: Simple random sampling method was used to get the desired sample size.

Data Collection Tool: Data was collected using the following tools

1. Socio demographic profile and information regarding smoking, alcohol, diabetes and hypertension status were collected using pretested and structured questionnaire by interview.
2. Anthropometric measurements like height, weight, were recorded. Blood pressure was recorded and digital glucometer was used for Random capillary Blood glucose.
3. WHO/ISH risk prediction chart for SEAR D (South East Asian sub-Region D) was used to predict the risk of developing CVD events in next 10 years.

Data Analysis And Interpretation:

Data was entered in Microsoft excel sheet and analyzed using SPSS software version 25 and Chi square test was used to find out the association. Statistical comparison was done using appropriate statistical method and level of significance was estimated with 95% confidence intervals and p value <0.05.

RESULTS:

Results are discussed under the following headings

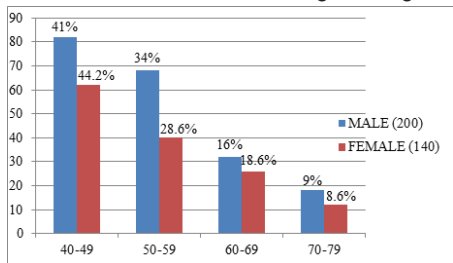


Fig 1: fig 1. Age and gender wise distribution (n = 340).

Fig 1 shows that there are 59% males and 41% females distributed across different age groups from 40 yrs to 80 yrs. The highest percentage of population is present in 40-49 yrs age group with about 42.3% followed by 31.7% in 50-59 yrs age group

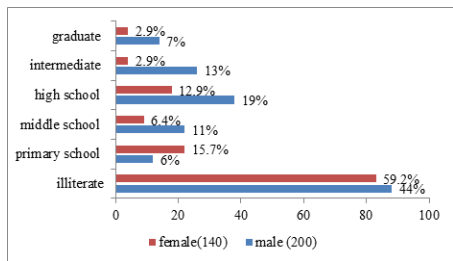


Fig 2. Educational status among study population (n = 340).

Fig 2 shows that about 50% of the population under study are illiterate, 35% completed various levels of schooling and only about 5% are graduates. From the figure above, we can note that literacy in females is less than that of males

Table 1. Socio-demographic Characteristics Of The Study Participants (n = 340).

Status		Frequency	% of people
Occupation	Employed	118	34.7
	Un employed	222	65.2
Type of family	Nuclear	176	51.7
	Joint	162	47.6
	Three generation	2	0.5
Socio economic	Upper class	18	5.2

status	Upper middle	52	15.2
	Lower middle	56	16.4
	Upper lower	84	24.7
	Lower	130	38.2

From table 1, we can see that 65% people are unemployed, with more than half (51.7%) population living in nuclear families. Majority of the study population belong to Lower class (38.2%) followed by Upper lower class (24.7%)

Table 2. Distribution Of Risk Factors Of CVD Among Study Participants (N = 340).

RISK FACTORS	STATUS	Frequen cy	% of people
Age	40-60	252	74.1
	60-80	88	25.2
Sex	Male	200	58.8
	Female	140	41.1
BMI	UNDER WEIGHT	6	1.76
	NORMAL	259	76.1
	OVER WEIGHT	55	16.1
	OBESE	20	5.8
Smoking		82	41
Alcohol		60	30
Family history of CAD		46	13.5

Table 2 shows the distribution of risk factors of CVD among study participants. 41% of the population had habit of smoking whereas 30% had habit of alcohol consumption. 13.5% had family history of CAD which is a significant risk factor.

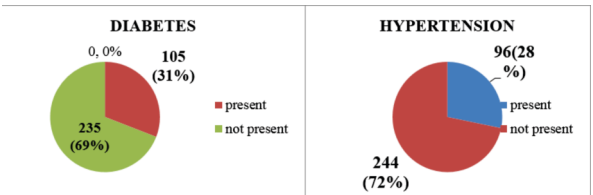


Fig 3. Prevalence of diabetes and Hypertension (n = 340).

Fig 3 shows that, at the time of the study, 31% of study population have diabetes whereas 69% are free of DM. Coming to hypertension, 28% are hypertensives and on medication and 72% are normotensive.

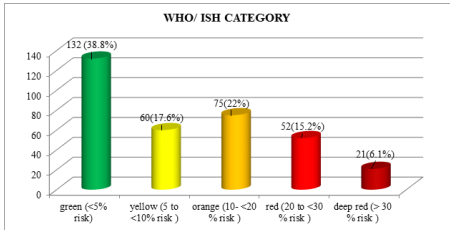


Fig 4. Prediction of ten-year total CVD risk using WHO/ISH sear d charts (n = 340).

From Fig 4, we can see the ten-year total CVD risk calculated using WHO/ISH risk prediction chart for SEAR D countries. 132 out of 340 people studied (38.8%) are at <5% risk and 21 people (6.1%) are at high risk i.e., >30% risk of a cardiovascular event in the next ten years of their life.

Table 3 Association Between CVD Risk Factors And CVD Risk Category.

Risk factor		WHO/ISH category			Total (340)	P value
		Mild (132)	Moderat e (135)	Severe (73)		
Age in years	40-60 years	110(43.6%)	82(32.5%)	60(24.6%)	252 (100%)	0.0002
	60-80 years	22(25%)	53(60.2%)	13(14.7%)	88 (100%)	

Occupation	Employed	26(22%)	70(59.3%)	22(18.6%)	118 (100%)	0.0001
	Unemployed	106(47.4%)	65(29.2%)	51(22.9%)	222 (100%)	
Hypertension	Present	24(25%)	19(19.7%)	53(55.2%)	96 (100%)	0.001
	Absent	108(44.2%)	116(47.5%)	20(8.1%)	244 (100%)	
Smoking	Present	04(4.8%)	32(39.2%)	46(56.9%)	82 (100%)	0.001
	Absent	128(49.6%)	103(39.9%)	27(10.4%)	258 (100%)	
Diabetes	Present	13(12.3%)	33(31.4%)	59(56.1%)	105 (100%)	0.0012
	Absent	119(50.6%)	102(43.4%)	14(5.95%)	235 (100%)	

Mild-Green (< 5%), Moderate-Yellow (5% -<10%) & Orange (10% -<20%) and Severe-Red (20% -<30%) & Deep red (≥30%).

From Table 3, we can see that 132 people (38.8%) are at mild risk, 135 people (39.7%) are at moderate risk and 73 people (21.4%) are at severe risk out of the 340 people studied. The p values are significant across different variables like age, occupation, status of hypertension, smoking and diabetes.

DISCUSSION:

The prevalence of diabetes and hypertension found in this study are in line with other studies conducted as shown in the table below.

Variables	Present study	Sri keerthana study et al	Sunil kumar et al	Shankar et al
SMOKING	41%	48%	36.7%	7.50%
DIABETES	31%	22%	3.3%	15%
HYPERTENSION	28%	23%	48%	17.50%

This study found that a considerable proportion of participants (21.4%) had a moderate to high risk, which aligns with findings from studies conducted in similar settings. Ghorpade reported that 17% of a rural South Indian population had moderate to high cardiovascular risk using WHO/ISH charts.⁶ On the other hand, a study by Vikramaditya et al. in rural Punjab reported that 19.1% of participants were at moderate risk (10–20%) and 16% at high risk (>20%) of cardiovascular events using WHO/ISH charts.⁷

These risk estimates offer an approximate assessment of cardiovascular disease (CVD) risk in individuals without existing coronary heart disease, stroke, or other atherosclerotic disorders. They are useful for identifying high-risk individuals and motivating patients to adopt lifestyle changes and, when necessary, take antihypertensive, lipid-lowering medications, or aspirin. Recent studies indicate that medication based therapy guided by total CVD risk assessment, instead of a single-disease approach, can result in substantial cost savings.^{8,9}

In the present study, half of the study population (50%) were illiterate. The prevalence of diabetes and hypertension was found to be 31% and 28%, respectively, indicating a significant burden of non-communicable diseases in the community. Assessment of cardiovascular risk revealed that 38% of participants were at mild risk, 39.7% at moderate risk, and 21% at severe risk of developing coronary artery disease (CAD).

Among the risk factors analyzed, smoking was strongly associated with severe risk of CAD. Additionally, age between 40–60 years and unemployment status were also identified as significant risk factors, showing a statistically significant association with cardiovascular risk. These findings highlight

the importance of targeted interventions for high-risk groups to prevent CAD and related complications.

CONCLUSIONS:

- In the present study, majority of the study population are at moderate risk (39.7%) and mild risk (38%). So, by this classification, we can prioritize the risk population according to the severity and treat them effectively.
- By using the simple tool like WHO/ISH risk prediction charts, we can identify the risky groups in prior to the development of the disease, thereby we can reduce the prevalence of cardiovascular diseases.

Recommendations And Limitations:

Adoption of this method at the primary care level can help in early identification of individuals at risk, thereby reducing the overall burden on healthcare costs. A cohort study design in the future could provide better predictive accuracy compared to the current cross-sectional study. Implementing such an approach would enable more efficient utilization of available health services, especially in settings with limited resources. Since advanced diagnostic facilities like ECG and ECHO are not available in every primary health centre, this method can play a crucial role in identifying high-risk individuals early, allowing timely referral and appropriate treatment to prevent complications.

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