Original Article

Assessment of 10-year Risk of Cardiovascular Events among Adult Residents of Field Practice Area of an Urban Health Training Centre: A Community Based Cross-Sectional Study

Kalpana Dangi[1], Harsh Manda[2], Manoj Verma[3], Suman Bhansali[4], *Gitashree Dutta[5], Tarun Kumar[6]

[1]Senior Medical Officer, Medical & Health Department, Government of Rajasthan, India.
[2]Senior Medical Officer, Medical & Health Department, Government of Rajasthan, GSH Digadi Kalla, Rajasthan. India.
[3]Assistant Professor, Department of Community Medicine, Dr. S.N. Medical College, Jodhpur, Rajasthan, India.
[4]Ex- Head of the Department, Senior Professor, Department of Community Medicine, Dr. S.N. Medical College, Jodhpur, Rajasthan, India.
*[5]Assistant Professor, Department of Community Medicine, Government Medical College, Pali, Rajasthan, 342001, India.
[6]Assistant Professor, Department of Pharmacology, All India Institute of Medical Sciences, Jodhpur, Rajasthan, 342005, India.
***Corresponding author's E-mail:** gitsempire@gmail.com

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ABSTRACT

Background: Primary prevention is the best method for reducing burden of cardiovascular disease. Understanding a person's risk of cardiovascular disease over the next ten years can make them more aware of the need for both individual and community-level preventive interventions. Risk prediction charts from the World Health Organization / International Society of Hypertension (WHO/ISH) predicts risk of cardiovascular event in next 10 years.

Objectives: To estimate the risk for Cardiovascular event using WHO/ISH Risk Prediction Chart among adult residents (≥40 years) of UHTC and to determine association with Socio Demographic variables.

Methods and Material: This cross sectional, community-based study was conducted among 300 participants aged ≥40 years residing at field practice area of UHTC, selected by systematic random sampling. The WHO/ISH risk prediction chart was used to assess the risk of cardiovascular disease.

Results: This study revealed that 34 (11.3%) participants in the urban field practice region had a high risk (>20%), 60 (20%) had a moderate risk (10-20%), and 206 (68.7%) had low risk (<10%) of a fatal or non-fatal cardiovascular event in the next ten years. Higher age, male gender, lack of physical activity, history of hypertension, and diabetes and family history were found to be significantly associated with high cardiovascular risk ($p<0.05$).

Conclusions: Modifiable risk factors such as sedentary behaviour, smoking, hypertension could be addressed timely to reduce future cardiovascular disease. WHO/ISH charts are a valuable tool for advising and motivating individuals to change their lifestyles or take their medications as prescribed.

Keywords: Cardiovascular disease, WHO, Non-communicable disease, hypertension, diabetes, smoking.

INTRODUCTION

The world is currently undergoing an epidemiological and demographic shift that is resulting in a rising burden of non-communicable diseases (NCDs).[1,2] According to a 2019 World Health Organization (WHO) report, cardiovascular diseases (CVDs) account for 32% of all deaths globally, with the majority of these deaths taking place in low- and middle-income nations. Additionally, CVDs significantly impact global Disability-Adjusted Life Years (DALYs).[3-6] The goal of lowering NCD-related premature deaths to one-third of all premature deaths by 2030 was part of the Sustainable Development Goals, which were created in response to the growing burden of NCDs.[7] By 2025, India's National Health Policy of 2017 aimed to eradicate 25% of cardiovascular disease-related premature deaths.[8]

By addressing the risk factors for CVD, this burden can be lessened. The total-risk strategy is a suggested and economical method of cardiovascular disease prevention.[9] By taking into account the co-existence of several risk variables, the total-risk approach assesses a person's overall risk of developing CVD. This strategy targets those who are above a predetermined "high-risk" threshold for CVD, allowing for the best possible use of healthcare resources. According to the total-risk approach, an individual's overall risk of CVD is higher when several moderate-level risk factors interact with one another than when a single risk factor is elevated. The conventional "vertical" or single risk factor method has been replaced by this one. In general, it makes sense for medical professionals to focus only on the high-risk population.[10]

So, in order to direct preventive measures to lower the mortality rate from CVD, it is vital to quantify and classify the population based on the degree of CVD risk score or categories. Numerous methods, such as charts or equations involving different risk factors, have been employed to calculate the CVD risk.[4,11] One such technique is the use of risk prediction charts from the World Health Organization/International Society of Hypertension (WHO/ISH), which classify individuals whose cardiovascular disease has not yet shown clinical symptoms into distinct risk groups that can be treated with medication therapy or lifestyle modifications alone.[4] These charts estimate the overall risk of developing both fatal and non-fatal

cardiovascular diseases in the next ten years. The chart is simple to for health care professionals at all levels of care and assists in clinical decision-making as well as assesses and monitors the entire CVD risk distribution in the population. This present study aimed to estimate cardiovascular risk in persons over the age of 40 years, using the WHO/ISH risk charts.

MATERIALS AND METHODS

This cross-sectional study was conducted at Urban health training centre (UHTC) associated with a Medical College and teaching hospital of western India. Individuals aged above 40 years, of either gender residing in field practice area of UHTC for at least last 6 months were included in the study. Person already diagnosed with any CVD or having pre-diagnosed genetic disorder predisposing to CVD and pregnant women were excluded from the study.

The sample size was determined using the formula for estimating a single sample proportion, with a 95% confidence range and 6% absolute precision –

$$N = \frac{(Z_{1-\alpha/2})^2 \; P\,(1-P)}{E^2}$$

Where, P, the proportion of moderate to high risk of CVD was assumed to be 44% as reported by past study.[12] Sample size was calculated to be 263, considering 10% non-response rate it was enhanced and rounded to 300 subjects. UHTC practice area caters its services to total of 50000 adults. Subjects were selected by systematic random sampling from 5000 adults aged more than 40 years residing in that area.

A semi-structured Performa was used for data collection on various domains such as socio-demographic characteristics, behavioural and personal status, diet, hypertension and diabetes status, physical measurements and risk of CVD using WHO/ISH risk prediction chart. Socioeconomic status classification of the study participants was done according to Modified B.G. Prasad scale for socio-economic classification 2021 update.[13]

Cardiovascular Risk assessment: The WHO/ISH risk prediction chart for the South East Asian Region- D (SEAR-D) was used to assess the 10-year risk of a fatal or non-fatal major cardiovascular event (myocardial infarction, stroke).[14] Due to lack of resources, we used a chart without cholesterol in our research (Figure 1). We calculated the 10-year cardiovascular risk as follows:

Step 1: Depending on whether or not person has diabetes, choose the appropriate chart.

Step 2: Choose between male and female tables.

Step 3: Choose smoker or non-smoker box.

Step 4: Check the box for person's age group (eg. if age is 50-59 years select 50)

Step 5: Within this box, locate the cell with the lowest systolic blood pressure (mm Hg) of the individual.

The 10 year cardiovascular risk was determined by the colour of this cell.

The following are the CVD risk strata:

- Low risk - group with a score of 0-10%,
- Intermediate-risk group (scores of 10-20%),
- High-risk groups include those with a score of 20-30%, 30-40%, and >40%.

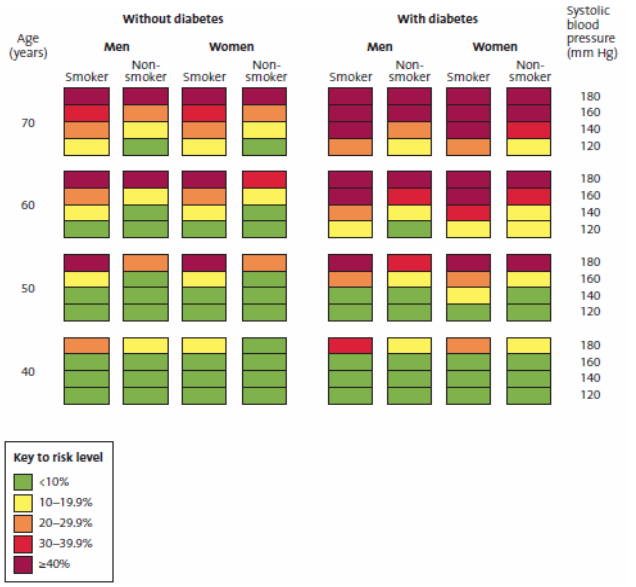

Figure 1: WHO/ISH risk prediction charts for the South East Asian Region- D

Ethical aspect: Ethical clearance was obtained from Institutional Ethics committee. Written informed consent was obtained from all patients prior to inclusion into the study. Strict confidentiality was maintained regarding identity of the subjects.

Statistical analysis: Continuous variables were described using measures of dispersion and central tendencies, whereas categorical variables were described using descriptive statistics.

Chi square test was used to determine the association between various socio-demographic variables and clinical variables with CVD risk. Probability (p) value of <0.05 was considered statistically significant. IBM SPSS version 21 for Windows (IBM Inc. Armonk, New York, USA) statistics software was used for all statistical analysis.

RESULTS

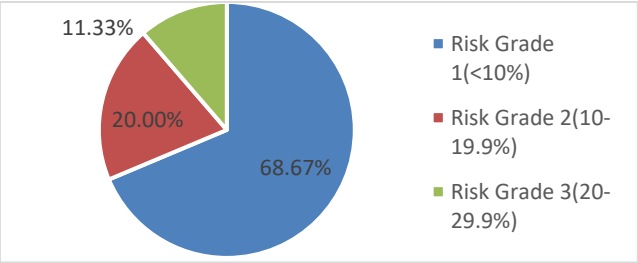

Figure 2: Frequency of WHO ISH risk category among study subjects (N=300)

Table 1: Cardiovascular risk in relation to socio demographic factors

Socio- demographic factors	Categories	Cardiovascular risk grade			Total	P value
		Grade 1	Grade 2	Grade 3		
1. Age group (years)	40-49 year	92 (100%)	0(0%)	0(0%)	92	**< 0.001**
	50-59 year	64 (100%)	0(0%)	0(0%)	64	
	60-69 year	48(45.3%)	52(49.1%)	6(5.6%)	106	
	70-79 year	2(5.3%)	8(21.1%)	28(73.6%)	38	
2. Gender	Female	66(76.7%)	20(23.3%)	0(0%)	86	**0.0004**
	Male	140(65.4%)	40(18.7%)	34(15.9%)	214	
3. Religion	Hindu	168(68.9%)	50(20.5%)	26(10.6%)	244	0.772
	Muslim	33(68.7%)	9(18.8%)	6(12.5%)	48	
	Others*	5(62.5%)	1(12.5%)	2(25%)	8	
4. Education	Illiterate	50(73.5%)	12(17.6%)	6(8.8%)	68	0.138
	Primary	31(73.8%)	8(19.1%)	3(7.1%)	42	
	Middle	28(70%)	8(20%)	4(10%)	40	
	Secondary	11(50%)	8(36.4%)	3(13.6%)	22	
	Higher Secondary	28(58.3%)	14(29.2%)	6(12.5%)	48	
	Graduate	26(76.5%)	6(17.6%)	2(5.9%)	34	
	Post graduate	32(69.5%)	4(8.7%)	10(21.8%)	46	
5. Occupation	Unemployed	92(60.5%)	46(30.3%)	14(9.2%)	152	**< 0.001**
	Employed	32(100%)	0(0%)	0(0%)	32	
	Retired	12(33.3%)	6(16.7)	18(50%)	36	
	Unskilled	48(92.3%)	4(7.7%)	0(0%)	52	
	Skilled	20(100%)	0(0%)	0(0%)	20	
	Professional	2(25%)	4(50%)	2(25%)	8	
6. Socioeconomic class	Upper class	36 (72%)	8(16%)	6(12%)	50	**< 0.001**
	Upper middle	104(72.2%)	22(15.3%)	18(12.5%)	144	
	Middle	58(59.2%)	30(30.6%)	10(10.2%)	98	
	Lower middle	8(100%)	0	0	8	

*Others include Christians, Jains, etc.

Table 2: Cardiovascular risk in relation to personal habit / lifestyle factors

Personal habit	Responses	Cardiovascular risk grade			Total	P value
		Grade 1	Grade 2	Grade 3		
1. History of Insomnia	No	176(71%)	46(18.5%)	26(10.5%)	248	0.172
	Yes	30(57.7%)	14(26.9%)	8(15.4%)	52	
2. Smoker	No	150(79.8%)	30((15.9%)	8(4.3%)	188	**<0.001**
	Yes	56(50%)	30(26.8%)	26(23.2%)	112	
3. Dietary Habit*	Non-vegetarian	80(65.6%)	28(22.9%)	14(11.5%)	122	0.553
	Vegetarian	126(70.8%)	32(18%)	20 (11.2%)	178	
4. Physical Exercise#	Yes	144(82.7%)	26(14.9%)	4(2.3%)	194	**<0.001**
	No	62(49.2%)	34(27%)	30(23.8%)	126	
5. Family h/o Diabetes$	No	176(65.7%)	60(22.4%)	32(11.9%)	268	**0.003**
	Yes	30(93.7%)	0(0%)	2(6.3%)	32	

*,#,$self-reported

Table 3: Cardiovascular risk in relation to physical/ disease status

Physical/ disease status	Categories	Cardiovascular risk grade			Total	P value
		Grade 1	Grade 2	Grade 3		
1. Hypertension*	No	136(87.2%)	16(10.2)	4(2.6%)	156	**<0.001**
	Yes	70(48.6%)	44(30.5%)	30(20.8%)	144	
2. Diabetes mellitus#	No	180(85.7%)	22(10.5%)	8(3.8%)	268	**<0.001**
	Yes	26(28.9%)	38(42.2%)	26(28.9%)	32	
3. BMI (kg/m^2)$	18.5-23.49	108(69.2%)	26(16.7%)	22(14.1%)	156	**0.008**
	23.5-24.99	66(61.1%)	30(27.8%)	12(11.1%)	108	
	≥25	32(88.9%)	4(11.1%)	0(0%)	36	
4. Waist circumference@	Normal	164(65.1%)	54(21.4%)	34(13.5%)	252	**0.004**
	High	42(87.5%)	6(12.5%)	0(0%)	48	

*,# self-reported or under medications

$,@ classified according to WHO classification of obesity among South East Asians[15]

RESULTS

A total of 300 adults with a mean age of 56.7 ±10.6 years were included in the study. Of these, 214 (71.3%) were males and 86 (28.7%) were females.

Of the 300 adults assessed using WHO ISH chart, 206 (68.67%) were found to be in Risk category 1 with a <10% risk of major cardiovascular event in coming 10 years; 60 (20%) were found to be in risk category 2 with 10-19.99% risk of major cardiovascular event in coming 10 years, while only 34 (11.3%) subjects were in risk category 3 with 20-29.99% risk of major cardiovascular event in coming 10 years (Figure 2).

Table 1,2 demonstrates that highest risk of CVD was seen among study participant aged 70-79 years (p<0.001). Female gender, smoking habit, lack of physical activity and family history of diabetes were significantly associated with higher risk of cardiovascular disease.

Table 3 shows that presence of hypertension, diabetes, high BMI and high Waist circumference were significantly associated with higher risk of cardiovascular risk.

DISCUSSION

The purpose of this community-based observational study was to evaluate adult participants' cardiovascular risk using the WHO/ISH risk prediction chart. Due to the limited resources available, the WHO chart was utilized without cholesterol estimation. An overall concordance rate of 89.5% between the WHO charts with and without cholesterol estimate has been observed in previous researches.[16]

As has been extensively shown, a single prospective risk factor rarely causes the final outcome of myocardial infarction, stroke, or death; instead, as a result of multiple risk factors working together.[17,18] Several socio-demographic and lifestyle related risk factors have been evaluated in our research to determine the association with the cardiovascular risk grade. Age, male gender, socio-economic class, occupation, smoking habit, lack of physical activity, family history of diabetes, presence of hypertension and diabetes, overweight or obesity and high WHR were significantly associated with higher risk of cardiovascular disease. Past studies have reported similar association of male gender with cardiovascular risk.[19,20] Association between physical inactivity and cardiovascular risk were also reported by Vasankari V et al and Norman Get al.[21,22] Compared to other anthropometric measures, such as BMI, the waist to hip ratio (WHR), which measures central obesity and visceral fat, may be a better indicator of obesity because a high WHR can indicate both a relative lack of gluteal muscle and an increase in visceral fat, both of which have been found to be independently associated with the risk of cardiovascular disease.[23-25]

Nearly half of the participants (48%) were hypertensive which is line with a study done in Kolkata slums where 42% of the population were hypertensive.[26] Many studies, notably the Framingham Heart Study project, WHO MONICA Project and the INTERHEART research, have provided additional insights into the significance of these risk factors in CVDs which is in line with our study findings.[4] Numerous Indian studies that used the WHO/ISH cardiovascular risk chart to predict adult cardiovascular risk found that high risk scores for CVD ranged from 2.5% to 28%, intermediate risk scores from 6.8 to 20%, and low risk scores from 55.8% to 98.3%.[19,22,27-30] Of the participants in our study, 11.3 percent had a high risk (>20%) of a cardiovascular event within the following ten years, 20% had a moderate risk (10-20%), and 68.7% had a low risk (<10%). This variability in cardiovascular risk distribution across different studies could be attributed to different study population characteristics. The WHO/ISH cardiovascular risk prediction charts have been used in several research worldwide to evaluate risk in a variety of scenarios.[31-33]

Prediction of future risk of cardiovascular disease allows time for preventive and control measures at both population and individual level. Preventive measures and policy reforms can focus on lowering the burden of

modifiable factors prevalent in the population under consideration, which will help to lower the community's overall cardiovascular risk.

One of the limitations of our study is that few variables were self-reported and recall bias cannot be completely ruled out.

CONCLUSION

The WHO/ISH charts can assist in undertaking prompt actions to prevent or delay cardiovascular event, thereby increase life expectancy, improve quality of life, and reduce health-care costs. WHO/ISH charts is a valuable tool for advising and motivating individuals to change their lifestyles or take their medications as prescribed.

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