Original Article

Cardiovascular Risk Assessment Using WHO/ISH Risk Prediction Charts In a Rural Area of North India

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ABSTRACT

Background: Cardiovascular disease (CVD) is emerging as a public health problem among low and middle income countries. Recent trends show that these risk factors are spreading fast from urban to rural populations.

Objectives: The present study was conducted to assess the cardiovascular risk among adults aged ≥40 years, utilizing the WHO/ISH risk charts in a rural population of North India.

Material and Methods: A cross-sectional study was carried out at rural health training centre (RHTC) of North India. The information was collected by using a pretested questionnaire from adults aged ≥ 40 years, who had come to attend a health check up camp at the centre. Anthropometric measurements and laboratory investigations were completed for 133 participants. The data was analysed by using statistical software SPSS.

Results: Risk of CVD was assessed to be ≥ 10% in 44.4% of subjects in 10 years duration. CVD risk (≥10%) was found to be higher in females (59.3%) as compared to males (40.7%). However this difference was found to be statistically non-significant (p=0.325). Greater than 10% CVD risk was significantly associated with illiteracy (p=0.043), raised pulse rate (p=0.031), systolic hypertension (p=0.00) and diabetes (p=0.00).

Conclusion: The study points towards significant burden of CVD risk in rural North India, thus necessitating further evaluation/ research by using these charts, which is a low cost and easy screening tool in other settings, warranting an urgent need of actions to address this problem.

Key Words: Cardiovascular Diseases, Rural population, WHO/ISH risk prediction chart

INTRODUCTION

Cardiovascular diseases (CVD) constitute a major public health problem in world accounting for 30% of all global deaths [1]. Low and middle income countries are experiencing demographic and epidemiological transition. The cardiovascular disease (CVD) burden of India is expected to double in the next two decades, making it the single largest cause of death and the second largest cause of disability by the year 2020 [2].

Cardiovascular diseases have a multifactorial etiology; therefore require a comprehensive risk assessment for screening purposes. Recent trends show that these risk factors are spreading fast from urban to rural populations. Further, because of weak health systems, the number of people with undiagnosed, untreated and uncontrolled CVD risk factors is also higher in rural populations [2].

The risk prediction charts are a simple way of calculating the approximate combined risk due to multiple risk factors. The World Health Organization (WHO) and the International Society of Hypertension has formulated CVS risk prediction charts for use in different sections of the globe using the best available mortality and risk factor data [3, 4]. Therefore risk stratification approach provides a rational mean of making decisions about intervening in a targeted way thereby making best use of resources available to reduce cardiovascular risk [4, 5, and 6].

The present study was conducted to assess the cardiovascular risk among adults aged ≥ 40 years, using the WHO/ISH risk charts in a rural population of North India and to estimate the magnitude of CVD risk factors in the study population.

MATERIAL AND METHODS

A cross sectional study was carried out at Rural Health Centre of department of Community

Medicine. The information was collected by using a pretested questionnaire from adults aged ≥ 40 years, who had come to attend a health check up camp at the centre.
Anthropometric measurements and laboratory investigations were completed for 133 participants. WHO/International Society of Hypertension (ISH) risk prediction charts for the South- East Asia sub-region D (in settings where blood cholesterol cannot be measured) were used to assess the ten year risk of a fatal or non-fatal cardiovascular event by gender, age, systolic blood pressure, smoking status and presence or absence of diabetes mellitus [4].

Charts provide approximate estimates of CVD risk in people who do not have established coronary heart disease, stroke or other atherosclerotic disease [2]. Hence self-reported cases of established myocardial infarction, angina, stroke, intermittent claudication and other cardiovascular diseases were excluded from the study. For purpose of analysis the study subjects were divided into two risk categories as 'low risk' (<10%) and 'moderate to high risk' (≥10%).

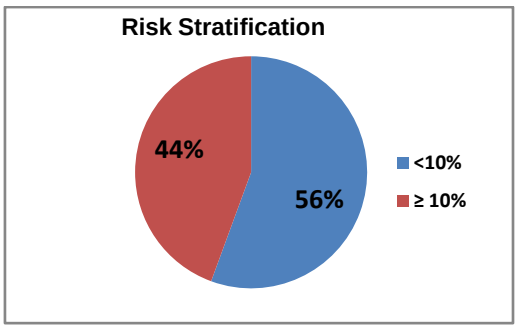
Participants were interviewed using a structured questionnaire which contained basic demographic details i.e. Age, Marital status, education, Occupation, Type of family and information on history of premature menopause, positive family history of CVS and diabetes. The body mass index (BMI) was computed by using Quetelet index. Blood pressure (BP) was recorded by a trained physician in the sitting position in the right arm using Doctor's Aneroid sphygmomanometer (BP set). Three readings were taken 5 minutes apart and the mean of the two lower readings was taken as final BP.
The verbal informed consent was taken from the subjects before interviewing them and utmost care was taken to maintain privacy and confidentiality. The ethical approval was taken from institutional ethics committee.

The data was analyzed using Microsoft excel and SPSS version 20.0 (IBM SPSS, Chicago, Illinois). Chi Square was applied to analyze association between the two attributes and Logistic Regression analysis was done to find out significant contributing factors for cardiovascular diseases. p- value ≤ 0.05 was taken as significant.

RESULTS

A total 133 subjects were analyzed for 10 year risk of fatal or nonfatal cardiovascular events according to WHO/ ISH risk prediction chart. Risk of CVD was assessed to be ≥ 10% in 44.4% of subjects , while 55.6% subjects were predicted to have <10% risk of the CVD in 10 years duration [Fig-1].
Among 133 participants, 85(63.9%) were females and 48 (36.1%) were male. Mean age of subjects was 54.5 years and majority of participants were from age group 40-49 years (36.8%). Most of the study subjects were married (94.7%), staying in joint type of family (62.4%) and engaged in household work (55.6%). There were 30.1% subjects who had received education up to high school whereas 28.6% subjects had not been to school [Table 1]. Amongst the study subjects only two were smokers as almost all subjects were followers of Sikh religion and smoking is prohibited in Sikh religion.

Fig1: Distribution of study subjects based on WHO/ISH CVD risk prediction chart



The risk for a fatal or non fatal CVD events were grouped as 'low risk' (<10%) and 'moderate to high risk (≥10%). It was found that with increasing age the risk of CVD increases and this difference was found to be statistically significant (p=0.00).

CVD risk (≥10%) was found to be higher in females (59.3%) as compared to males (40.7%). However this difference was found to be statistically non significant (p=0.325).
Greater than 10% CVD risk was significantly associated with illiteracy (p=0.043), raised pulse rate (p=0.031), systolic hypertension (p=0.00) and diabetes (p=0.00) [Table 2].

All the variables (i.e. age, education, occupation, diabetes, systolic BP, raised pulse rate) with p value <0.25 in chi-square analysis were included in binary logistic regression model. It was seen that adjusted odds ratio (OR) for age, diabetes, systolic BP and raised pulse rate were significantly more and therefore these factors were acting as independent risk factors for high risk of CVD among study subjects [Table-3].

Table 1: Distribution of study subjects as per Socio-Demographic variable and WHO/ISH CVD risk prediction chart

Variables	Categories	CVD risk Prediction		Total No (%)	P value
		<10% risk (n=74)	≥ 10% risk (n=59)		
Age	40-49	48 (64.9)	1 (1.7)	49 (36.8)	0.00
	50-59	16 (21.6)	8 (13.6)	24 (18.0)	
	60-69	8 (10.8)	37 (62.7)	45 (33.8)	
	≥70	2 (2.7)	13 (22.0)	15 (11.3)	
Gender	Male	24 (32.4)	24 (40.7)	48 (36.1)	0.325
	Female	50 (67.6)	35 (59.3)	85 (63.9)	
Education	Illiterate	14 (18.9)	24 (40.7)	38 (28.6)	0.043
	Primary	13 (17.6)	9 (15.3)	22 (16.5)	
	Middle	20 (27.0)	13 (22.0)	33 (24.8)	
	High School +	27 (36.5)	13 (22.0)	40 (30.1)	
Occupation	Unemployed	4 (5.4)	8 (13.6)	12 (9.0)	0.232
	Household Work	43 (58.1)	31 (52.5)	74 (55.6)	
	Unskilled	5 (6.8)	7 (11.9)	12 (9.0)	
	Skilled	22 (29.7)	13 (22.0)	35 (26.3)	
Marital Status	Married	71 (95.9)	55 (93.2)	126 (94.7)	0.484
	Unmarried	3 (4.1)	4 (6.8)	7 (5.3)	

Table 2: Distribution of study subjects as per CVD risk factors and WHO/ ISH CVD risk prediction chart

Variables	Categories	CVD risk Prediction		Total No (%)	P value
		<10% risk (n=74)	≥ 10% risk (n=59)		
Diabetes	Present	11 (14.9)	25 (42.4)	36 (27.1)	0.000
	Absent	63 (85.1)	34 (57.6)	97 (72.9)	
Systolic Bp (Mm Hg)	100-120	22 (29.7)	4 (6.8)	26 (19.5)	0.000
	121-140	28 (37.8)	12(20.3)	40 (30.1)	
	141-160	19 (25.7)	21 (35.6)	40 (30.1)	
	161-180	5 (6.8)	22 (37.3)	27 (20.3)	
BMI	Normal (18.5-22.9)	14 (18.9)	12 (20.3)	23 (19.5)	0.367
	Overweight (23.0-24.9)	9 (12.2)	3 (5.1)	12 (9.0)	
	Obese (>25.0)	51 (68.9)	44 (74.6)	95 (71.4)	
Premature menopause	yes	12 (16.2)	10(16.9)	22(16.5)	0.910
	no	62(83.8)	49(83.1)	111(83.5)	
Raised Pulse Rate (>100 /min)	yes	4(5.4)	10(16.9)	14(10.5)	0.031
	no	70(94.6)	49(83.1)	119(89.5)	
Positive family history	yes	19(25.7)	18(30.5)	37(27.8)	0.537
	no	55(74.3)	41(69.5)	96(72.2)	

DISCUSSION

Present study presented the CVD risk factors burden and assessment of short term CVD risk prediction in rural area of North India.

In the present study, high CVD risk was seen in 44.4% of subjects in 10 years duration. Similarly Norman *et al* (2014) in his study in Karnataka observed that 40.9% subjects had more than 10% risk for fatal or non fatal myocardial infarction or stroke in 10 years [2].

Table 3: Logistic Regression analysis with dependent variable CVD Risk Prediction

Variables	Exp(B)	95% Confidence interval	P value
Age			
40-49®			
50-59	35.54	0.82- 1539.71	0.003
60-69	55927.05	154.45-20250961.93	
≥70	125045.05	178.91- 87399149.38	
Education			
Illiterate®			
Primary	0.43	0.04- 5.02	0.155
Middle	.52	0.04-6.64	
High School +	8.73	0.57-133.00	
Occupation			
Unemployed®			
Household Work	3.10	0.22- 43.82	0.241
Unskilled	22.2	0.22- 2284.17	
Skilled	.22	3.74	
Diabetes			
Absent®			0.011
Present	21.63	2.03- 230.93	
Systolic Bp (Mm Hg)			
100-120®			
121-140	9.87	0.61- 159.22	0.013
141-160	51.68	2.25- 1189.89	
161-180	8106.99	37.77- 1739992.38	
Raised Pulse Rate (>100 /min)			
No®			0.007
yes	561.67	5.77- 54711.75	

* ® Reference category

In another cross-sectional study by Norhayati *et al* (2013) done on 196 subjects (aged 40-70 years) attending outpatient clinic, USM hospital, Kelantan, in Malaysia observed that 78.6% of patients had 10-year CVD risk of <10% [7]. Otgontua D *et al* conducted a study using data from national STEPS survey in Cambodia, Malaysia and Mongolia on men and women aged 40-64 years and found that majority of people in all three countries has low 10 - year CVD risk ranging from 89.6% in Mongolia to 94.4% in Malaysia to 97% in Cambodia [8]. Reason behind these variations could be attributed to different geographical areas, genetic variability, different ethnicity and culture related variables i.e. health and socio-economic conditions.

In the present study it was seen as the age increases the risk of CVD increases. This was in consonance with findings of Dhungana RR *et al* (2014) in their population based study in Kathmandu, Nepal [9].

In the present study, CVD risk (≥10%) was found to be higher in females (59.3%) as compared to males (40.7%). The results are consistent with another cross-sectional study conducted in selected community of Kathmandu, Nepal where females had higher CVD risk. On the contrary, Nordet *et al* (2013) study on "total cardiovascular risk assessment and management " in Havana, Cuba showed significant difference that males had more risk of fatal or nonfatal myocardial infarction or stroke in 10 years as compared to females [10]. The difference in observations could be attributed to different study sites and populations.

The present study identified illiteracy, diabetes and systolic hypertension as strong predictors of CVD risk. Similarly, a study conducted in rural Nepal also identified hypertension and diabetes as strong CVD risk factors [9]. Another study conducted by Norhayati *et al* (2013) showed that diabetes and

hypertension played main role in influencing cardiovascular risk factors [7].

In the present study chances to have high 10 year CVD risk was more in illiterate subjects as compared to those who have certain level of education. A study assessing 10-year CVD risk among Canadian adults using Framingham Scoring system (FRS) is in concordance with present study finding by showing that higher CVD risk was associated with lower educational background [11]. Similarly, the outcome of a cross sectional design of German Cardiovascular Prevention Study as measured by years of schooling reported that CHD was associated with lower level of education [12]. This may be due to the fact that people with better education background are more aggressive in practicing healthy lifestyle, hence, reducing the risk for CVD and its complications.

LIMITATIONS

Risk factors like physical activity, unhealthy diet, alcohol, tobacco consumption, stress which may contribute to cardiovascular events were not addressed in this study. Also the sample size in this study was relatively smaller; therefore findings cannot be inferred to general population of North India. This necessitates more studies with bigger sample size for precise estimation of CVD risk prediction.

CONCLUSION AND RECOMMENDATIONS

Present study points towards significant burden of CVD risk in rural North India. Use of WHO/ISH CVD risk charts can be used as a screening tool for risk stratification in the population in low resource setting. This can further help in planning and implementing targeted interventions amongst identified high risk population.

REFERENCES

1. Dhungana RR, Devkota S, Khanal MK, Gurung Y, Giri RK, Parajuli RK et al. Prevalence of cardiovascular health risk behaviors in a remote rural community of Sindhuli district, Nepal. BMC Cardiovascular Disorders. 2014; 14:92.
2. Norman G, George CE, Krishnamurthy A, Mukherjee D. Burden of cardiovascular risk factors of a rural population in South India using the WHO multivariable risk prediction algorithm. International Journal of Medical Science and Public Health. 2014;3:764-8.
3. Mendis S, Lindholm LH, Mancia G, Whitworth J, Alderman M, Lim S, et al. World Health Organization (WHO) and International Society of Hypertension (ISH) risk prediction charts: assessment of cardiovascular risk for prevention and control of cardiovascular disease in low and middle-income countries. Journal of Hypertension. 2007; 25(8): 1578-82.
4. WHO/ISH Risk prediction charts for 14 WHO epidemiological sub-regions [internet]. 2007. [cited 2015 feb19]. Available from: http://ish-world.com/downloads/activities/colour_charts_24_Aug_07.pdf .
5. World Health Organization (WHO). Prevention of cardiovascular disease: Guidelines for assessment and management of cardiovascular risk. Geneva: WHO; 2007.
6. Ndindjock R, Gedeon J, Mendis S, Paccaud F, Bovet P. Potential impact of single-risk-factor versus total risk management for the prevention of cardiovascular events in Seychelles. Bulletin of the World Health Organization. 2011; 89: 286-95.
7. Norhayati MN, Amirah SASH, Husniati YL.Cardiovascular risk: associated factors, assessment and agreement between WHO/ISH risk prediction chart and Framingham Scoring System among Primary Care Patients in Kelantan, Malaysia. International Journal of Collaborative Research on Internal Medicine & Public Health. 2013;5(12):652-62.
8. Otgontuya D, Oum S, Buckley BS, Bonita R. Assessment of total cardiovascular risk using WHO/ISH risk prediction charts in three low and middle income countries in Asia. BMC public health. 2013;13(1):539. doi:10.1186/1471-2458-13-539.
9. Dhungana RR, Khanal MK, Pandey AR, Thapa P,Devkota S,Mumu SJ et al . Assessment of Short Term Cardiovascular Risk Among 40 Years and Above Population in a Selected Community of Kathmandu, Nepal. Journal of Nepal Health Research Council. 2015 Jan - Apr;13(29): 66-72.
10. Nordet P, Mendis S, Dueñas A, Noval RD, Armas M, Noval ID et al. Total Cardiovascular Risk Assessment and Management Using Two Prediction Tools, with and without Blood Cholesterol. MEDICC Review. 2013;15(4):36-40.
11. Setayeshgar S, Whiting SJ, Vatanparast H. Prevalence of 10-Year Risk of Cardiovascular Diseases and Associated Risks in Canadian Adults: The Contribution of Cardiometabolic Risk Assessment Introduction. International Journal of Hypertension. 2013; 2013:1-8.
12. Helmert U, Shea S, Herman B, Greiser E. Relationship of social class characteristics and risk factors for coronary heart disease in West Germany. Public Health. 1990; 104: 399- 416.

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