Cardiovascular Risk Assessment Using Updated WHO/International Society of Hypertension Risk Prediction Charts and Atherosclerotic Cardiovascular Disease Risk Score in Residents of Amreli District

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Abstract:

Introduction: India is one of the countries the World Health Organization (WHO) has recognized as having the majority of lifestyle-related illnesses in the near future. The highest incidence of CVD are found on the Indian subcontinent. **Objectives:** To assess the cardiovascular risk among adults aged >40 years using the updated WHO/ISH risk prediction charts and ASCVD risk score and to compare baseline cardiovascular risk estimation by both risk scores. **Method:** This cross-sectional study was done among 228 individuals aged 40–74 years of urban and rural areas. A semi-structured interviewer administered questionnaire was developed. The data was collected in Epicollect 5 mobile application and analyzed using Jamovi software. **Results:** The mean age of the study participants was 56.54 ±0.73 years. CVD high risk was significantly higher in males as compared to females (P<0.05). The ASCVD risk score classified (38.2%), of the participants as high-risk, whereas the lab-based and non lab-based versions of WHO/ISH risk prediction classified less than 10% as high risk. There was moderate agreement between the lab-based and non lab-based versions of the WHO/ISH risk prediction (Kappa-0.724, p-0 .000), fair between ASCVD risk score and non lab-based versions of the WHO/ISH (Kappa-0.310, p-0.000). The agreement between, ASCVD risk score and lab-based version of WHO/ISH risk predictor was fair (Kappa-0.309, p-0 .000). **Conclusion:** In current study, it was observed that one-third of the participants had a high risk of CVD events based on the ASCVD risk score, and a smaller number of participants were found to be at high risk according to the WHO/ISH risk chart. So we need to implement this risk scores predictors of CVD events for identify the high risk individual and their further management.

Keywords: Atherosclerotic Cardiovascular Disease Risk Score, Cardiovascular Disease, WHO/International Society of Hypertension

Introduction:

Cardiovascular diseases (CVDs) are a major public health concern globally, and India is no exception. India is a diversified country, and several of its states are undergoing an epidemiological health shift due to high rates of urbanization. This has resulted in economic growth, which has resulted in increased food intake, tobacco usage, and decreased physical activity. One of the consequences of the economic transition is a shift in disease prevalence from communicable to non-communicable diseases (NCD), particularly cardiovascular disease (CVD) and diabetes. NCD has a multi-factorial etiology, with lifestyle influencing many of the risk factors.[1]

India is one of the countries the World Health Organization (WHO) has recognized as having the majority of lifestyle-related illnesses in the near future.[2] The highest incidence of CVD are found on the Indian subcontinent.[3] The enormous population and high frequency of CVD risk factors across the

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Indian subcontinent result in a significant burden of cardiovascular disease.[4] Death from NCDs is on the rise, with developing world being hit hardest. CVD prevention must be effective in order to reduce this enormous burden and associated financial costs. The majority of these ailments are preventable. Therefore, interventions targeting the main risk factors (such as alcohol consumption, smoking, and physical inactivity) may significantly lessen the burden of non-communicable diseases.[5]

Estimating the population's lifetime and baseline CVD risk is a crucial component of a preventative program. Given the interplay of multiple factors related to the etiology of CVDs, using a single risk factor to predict cardiovascular risk is erroneous. The best approach will be to adopt a particular risk chart which considers a maximum number of all probable determinants so that the contribution of each risk factor can be ascertained in different regions. The World Health Organization (WHO) and the International Society of Hypertension (ISH) have developed CVDs risk prediction charts for use in different part of the globe. The proposed chart provides a ten-year risk of a major cardiovascular outcome and is a cost-effective tool for risk score-based population stratification. Hence, it is useful tool to counsel patients to modify their lifestyles or comply with their medicines and in implementing timely preventive measures to improve the life expectancy, quality of life of the risk groups and reduction in the burdening of the health system.[6] Another scale put forth by the American Heart Association (AHA) and American College of Cardiology (ACC) is the atherosclerotic cardiovascular disease (ASCVD) risk score which also considers a maximum number of all probable determinants.[7]

Implementing risk assessment strategies can play a vital role in reducing the incidence and impact of CVDs in India. Regular risk assessments can track changes in an individual's cardiovascular risk over time. CVD risk assessment helps identify individuals who may be more susceptible to these lifestyle-related CVD events. Conducting risk assessment can be a cost effective in limited resource country like India. In this context, the present study was conducted with objective to assess the cardiovascular risk among adults aged >40 years using the updated WHO/ISH risk prediction charts and ASCVD risk score and to compare baseline cardiovascular risk prediction by both risk scores. The findings from this study will be instrumental in devising evidence-based interventions and preventive measures, aiming to improve life expectancy, enhance quality of life, and reduce the overall burden of cardiovascular diseases in India. Addressing the challenges posed by NCDs through comprehensive risk assessment and management will contribute to building a healthier and more resilient nation.

Method:

Study setting and selection of study participants:

This cross-sectional study was carried out during January 2022 to July 2022. (Total four Preventive health checkup camps were organized by the Community Medicine Department in urban and rural areas. Total 423 individuals were attended camps. Among them 228 individuals, aged 40 to 74 years, who had no prior history of cardiovascular events and provided informed written consent, were included in the study using a convenient sampling technique

Study tool and data collection procedure:

A semi structured interviewer administered questionnaire was developed for study based on extensive review of literature, updated WHO/ISH risk prediction charts 2019[8] and ASCVD risk score developed by the American College of Cardiology/ American Heart Association (ACC/AHA).[9] The questionnaire used in this study had three parts: (i) Socio demographic details including Modified BG Prasad socioeconomic classification[10] (ii) CVD risk factor which include age, gender, smoking status,

body mass index(BMI),blood pressure, coexistence of diabetes, and serum cholesterol level. (iii) Assessment and classification into low risk(<10%), moderate risk (10% to 20%), or high risk (>20%) of a cardiovascular event over the next 10 years based on the updated WHO/ISH risk prediction charts 2019[8] and ASCVD risk score.[9]

Height was measured using a SECA 213 stadiometer (Hamburg, Germany), weight using digital weighing machines (Essae, Bangalore, India, accuracy 0.01 kg, standardized periodically with standard weights), waist circumference by a flexible measuring tape and blood pressure using an automated monitor (Omron HEM 7080, Kyoto, Japan) in the sitting posture for two readings 15 minutes apart. The average systolic and diastolic blood pressures were recorded. Blood samples (10 ml) were collected for total serum cholesterol. A digital glucometer (Accu-chek) was used to estimate random blood sugar levels. The data were collected in Epicollect 5 application on mobile phone.

Operational definitions:

Behavioral risk factors were determined based on the cut-offs recommended by STEPS guidelines.[11] Smoking and alcohol use in last thirty days and one year respectively, was considered as current use. Behavioral assessment was based on self-report.

WC $\geq$90cm for men and $\geq$80cm for women were regarded as abdominal obesity.[12] Systolic BP (SBP) of $\geq$140mm Hg or Diastolic BP (DBP) of $\geq$90mm Hg or currently on hypertension lowering drugs was considered as raised BP (hypertension).[13] Diabetes mellitus (DM) was determined at random blood glucose of $\geq$200 mg/dl or currently on anti-diabetic medications.[14] Hypercholesterolemia was defined as those having total cholesterol level of $\geq$200mg/dl[13] or currently on lipid-lowering drugs.

Data analysis:

Data was retrieved from Epicollect 5 into Microsoft excel 2019 and was analyzed by using JAMOVI[15] software. Proportions were used to summarize categorical data while continuous variables ware summarized as means (standard deviations) as appropriate. Statistical significance between various categorical variables was assessed using the chi-square and Fisher exact tests and continuous variables were assessed using the Mann-Whitney U-test and Krushkal Wallis test. Cohen's kappa statistics was used to determine agreement between the two charts. The kappa statistic can range from -1 to +1. Cohen proposed the following interpretation of the Kappa result: ≤0 represents no agreement, 0.01-0.20 represents none to slight agreement, 0.21-0.40 represents fair agreement, 0.41- 0.60 represents moderate agreement, 0.61-0.80 represents substantial agreement, and 0.81-1.00 represents practically perfect agreement.[16] A p value < 0.05 was considered statistically significant in all analyses.

Ethics Statement:

This study protocol was reviewed and approved by Institutional Review Board (IRB).

Results:

In current study 6.1%,5.7% and 38.2% individuals had high risk of CVD events as per WHO/ISH lab based, WHO/ISH non lab based and ASCVD risk score respectively.(Figure :1) A total of 228 study participants, 126(55.26%) were women and 102(44.73%) were men. The mean age of the study participants was 56.54 ±0.73 years with. Table 1 reveals the association between different variables and the gender of the study participants. Higher proportion of women were illiterate in compare to men (p=0.001). Smoking was significantly more prevalent among males (p<0.001) and BMI >25 kg/m^2 was significantly more prevalent among females (p<0.001). Marital status, socio-economic class, diabetes, hypertension, SBP > 140 mm Hg, high waist circumference, high RBS, high TC, did not vary significantly with gender.

Table 1: Baseline characteristics of study participants (N=228)

Variables	Female n(%) or Mean±SD	Male n(%) or Mean±SD	p-value
Age (in year)	54.48±11.23	59.11±10.41	0.002*
Place			
Urban	80 (63.5)	42 (58.8)	0.001*
Rural	46 (36.5)	60 (41.2)	
Education			
Illiterate	60 (47.6)	24 (23.5)	0.001*
<High school	44 (34.9	48 (47.1)	
>High school	22 (17.5)	30 (29.4)	
Occupation			
Retired	12 (9.5)	35 (27.8)	<0.001
Service/business	35 (27.8)	28 (27.5)	
Housewife	58 (46)	0 (0)	
Agriculture/labourer	21 (16.7)	39 (38.2)	
Marital status			
married	104 (82.5)	88 (86.3)	0.44
Unmarried / Widow / Separated	22 (17.5)	14 (13.7)	
Socioeconomic class			
Upper	21 (16.7)	23 (22.5)	0.12
Middle	33 (26.2)	16 (15.7)	
lower	72 (57.1)	63 (61.8)	
Known hypertensive	31 (24.6)	31 (30.4)	0.48
SBP >140 mmhg	142.42±22.88	136.98±23.06	0.077
DBP >90 mmhg	85.09±14.47	81.15±15.09	0.046*
Known Diabetic	24 (19)	23 (22.5)	0.67
Random blood sugar >140 mg/dl (n=218)	161.95±104.13	150.10±75.42	0.337
Total cholesterol >200 mg/dl (n=209)	147.91±67.94	153.22±46.69	0.503
Current smokers	1 (0.8)	18 (17.6)	<0.001
Alcohol history	0 (0)	7 (6.9)	—
Waist circumference (cm)	89.65±17.55	88.77±17.46	0.707
Body mass Index (kg/m^2)	26.78±4.77	24.14±4.68	<0.001

*p value are statistically significant at <0.05. SBP-Systolic Blood Pressure; DBP-Diastolic Blood Pressure; WHO/ISH-world health organization /international society of hypertension; ASCVD-atherosclerotic cardiovascular disease; SD-Standard deviation.

Table 2: Association between baseline characteristics and cardiovascular disease risk among the study participants (as per WHO/ISH risk predictor)

Variables	WHO lab based (n=214) n (%) or Mean±SD				WHO non-lab based (n=228) n (%) or Mean±SD			
	High risk	Moderate risk	Low risk	p-value	High risk	Moderate risk	Low risk	p-value
Sex								
Female	4 (3.5)	32 (27.8)	79 (68.7)	0.012*	3 (2.4)	37 (29.4)	86 (68.3)	0.001*
Male	9 (9.1)	41 (41.4)	49 (49.5)		10 (9.8)	45 (44.1)	47 (46.1)	
Place								
Urban	5 (4.5)	34 (30.9)	71 (64.5)	0.301	8 (6.6)	39 (32)	75 (61.5)	0.378
Rural	8 (7.7)	39 (37.5)	57 (54.8)		5 (4.7)	43 (40.6)	58 (54.7)	
Education								
Illiterate	6 (8.1)	34 (45.9)	34 (45.9)	0.032*	5 (6)	41 (48.8)	38 (45.2)	0.026*
<High school	6 (6.8)	23 (26.1)	59 (67)		4 (4.3)	25 (27.2)	63 (68.5)	
≥high school	1 (1.9)	16 (30.8)	35 (67.3)		4 (7.7)	16 (30.8)	32 (61.5)	
Occupation								
Retired	3 (6.4)	28 (59.6)	16 (34)	<0.001*	5 (10.6)	33 (70.2)	9 (19.1)	<0.001*
Service/business	4 (6.3)	10 (15.9)	49 (77.8)		4 (6.3)	11 (17.5)	48 (76.2)	
Housewife	2 (4)	19 (38)	29 (58)		1 (1.7)	22 (37.9)	35 (60.3)	
Agriculture/labourer	4 (7.4)	16 (29.6)	34 (63)		3 (5)	16 (26.7)	41 (68.3)	
Marital status								
Married	9 (5)	59 (32.6)	113 (62.4)	0.106	8 (4.2)	66 (34.4)	118 (60.5)	0.019*
Unmarried/widow/ separated	4 (12.1)	14 (42.4)	15 (45.5)		5 (13.9)	16 (44.4)	15 (41.7)	
Socioeconomic class								
Upper	3 (7)	12 (27.9)	28 (65.1)	0.79	2 (4.5)	14 (31.8)	28 (63.6)	0.957
Middle	3 (6.5)	14 (30.4)	29 (63)		3 (6.1)	18 (36.7)	28 (57.1)	
lower	7 (5.6)	47 (37.6)	71 (56.8)		8 (5.9)	50 (37)	77 (57)	
Known hypertensive								
Yes	4 (6.9)	30 (51.7)	24 (41.4)	0.003*	5 (8.1)	34 (54.8)	23 (37.1)	<0.001*
No	9 (5.8)	43 (27.6)	104 (66.7)		8 (4.8)	48 (28.9)	110 (66.3)	
Known Diabetic								
Yes	10 (21.3)	22 (46.8)	15 (31.9)	<0.001*	2 (4.3)	25 (53.2)	20 (42.6)	0.022*
No	3 (1.8)	51 (30.5)	113 (67.7)		11 (6.1)	57 (31.5)	113 (58.3)	
Current smokers								
Yes	2 (11.8)	11 (64.7)	4 (23.5)	0.006*	3 (15.8)	12 (63.2)	4 (21.1)	0.002
No	11 (5.6)	62 (31.5)	124 (62.9)		10 (4.8)	70 (33.5)	129 (61.7)	
Alcohol history								
Yes	0 (0)	2 (33.3)	4 (66.7)	—	1 (14.3)	2 (28.6)	4 (57.1)	0.593
No	13 (6.3)	71 (34.1)	124 (59.6)		12 (5.4)	80 (36.2)	129 (58.4)	

For continuous data (Mean±SD)

Age	70.23	66.01±	50.05±	0.000*	67.92±	66.33±	49.41±	<0.001*
	±4.26	6.43	8.22		6.48	6.17	7.79	
SBP >140 mmhg	167.69	145.7±	132.99	0.000*	175.08	145±	132.89	<0.001*
	±20.84	24.8	±18.27		±18.66	23.22	±18.94	
DBP >90 mmhg	94.38±	83.49±	81.21±	0.006*	98.46	83.34±	83.32±	<0.001*
	17.75	14.81	13.57		±20.58	14.14	14.85	
Waist circumference (cm)								
Female	89.75	93.75±	87.72±	0.288	91.67±	92.30±	88.44±	0.528
	±7.85	11.6	20.41		12.58	10.91	19.85	
Male	84.22±	88.17±	90.24±	0.614	88.30±	88.96±	88.7±	0.994
	27.61	20.59	12.06		28.45	17.47	14.81	
Body mass Index	25.77	25.2	25.54	0.867	26.58	25.47	25.27	0.75
(kg/m^2)	±2.94	±5.35	±4.84		± 3.98	±5.04	±4.91	
Random blood sugar	184.46	161.95	164.27	0.7	123±	167.01	165.68	0.259
(n=218)	±89.96	±90.78	±87.91		48.97	±90.42	±88.89	
Total cholesterol	163.17	163.26	161.4	0.979	159.78	159.78	166.99	0.427
(n=209)	±37.44	±37.09	±41.80		±35.14	±35.14	±43.02	

*p value are statistically significant at <0.05. SBP-Systolic Blood Pressure; DBP-Diastolic Blood Pressure; WHO/ISH-world health organization /international society of hypertension; ASCVD-atherosclerotic cardiovascular disease; SD-Standard deviation.

Table 2 showed the association between the study variables and WHO/ISH risk. Lab-based and non lab-based WHO/ISH chart predicted CVD high risk was significantly lower in females as compared to males (P < 0.05). Aged people, male participants, lower educational qualifications, retired person, having diabetes/hypertension, currently smoking, high systolic and diastolic blood pressure were significantly associated with high risk for CVD (p<0.05). (Table 2)

With respect to ASCVD risk predictor, statistically significant difference was observed in age (p<0.001), sex (p<0.001), place (p=0.052), occupation (p<0.001), known hypertensive (p=0.000), known diabetic (p=0.000), current smoker (p=0.006), systolic blood pressure (p<0.001) and diastolic blood pressure (p=0.044). Male (56.9%) have a high risk for CVD compared to Female (23%). (Table 3)

The ASCVD risk score classified (38.2%), of the participants as high-risk, whereas the lab-based and non lab-based versions of WHO/ISH risk predictors classified less than 10% as high risk. There was substantial agreement between the lab-based and non lab-based versions of the WHO/ISH risk predictors (Kappa 0.724, p-0 .000), fair between ASCVD risk score and non lab-based versions of the WHO/ISH (Kappa 0.310, p-0.000). However, the agreement between, ASCVD risk score and lab-based version of WHO/ISH risk predictor was fair (Kappa 0.309, p-0 .000). (Table 4)

Discussion:

The current study showed that a considerable number of the study participants (38.2%) had a high 10-year ASCVD risk. But less than 10% of study participants were classified in the high-risk group according to the WHO (ISH) CVD risk chart. ASCVD risk score classified more people in the high-risk group rather than the WHO risk score. Similarly

Hasandokht et al also reported that ASCVD risk score classified more people in the high-risk group (35%) rather than the WHO risk score (4.5%).[17] Study done by Garg et al in North India reported that ASCVD risk score underestimate 28.3% CVD risk while WHO (ISH) risk score tool were estimated 16.3% CVD risk.[18] This higher CVD risk score in WHO (ISH) risk score is because of different study population. Study done at Nigeria by Ofori et al[19] also observed that WHO (ISH) risk score prediction were identified less high risk groups than ASCVD risk score, this study has also found similar type of finding.

In the present study, different variables have been assessed to identify their association with the study population with use of two different CVD risk score. Study done in South India by Ghorpade et al[6] found that level of education and employment status of the study participants was statistically associated with the gender of the study subjects which was also found similar in present study that level of education and occupations of the study participants was statistically associated with the gender of the study subjects. Current study revealed that there was a significant difference between male-female population with regards to variables like BMI, high blood glucose level, alcohol and smoking habits which was similar to National family health survey-5 (NFHS-5) data.[20] Epidemiological studies conducted in northern India showed no gender differences in parameters such as central obesity, overweight and hypertension.[21] The reasons for their differing results in their study could be due to the use of different study settings, and study participants.

The present study predicted a larger part of the male population was at high risk of CVD in comparison with the female population with use of WHO(ISH) risk prediction chart and ASCVD risk score. Other study done in North Iran by Motamed et al also reported that significant male population were at risk for 10-year CVD events.[22] The variables such as age, gender, education, occupation, having diabetes/hypertension, currently smoking, high systolic and diastolic blood pressure were significantly associated with the high risk of CVD events using of WHO/ISH risk prediction chart in present study. As compared to other study done in karnataka among tribal population of Chamarajanagar district[23] results showed significant association was seen between age, occupation, education, BMI, hypertension and smoking with CVD risk ($P< 0.05$). While using ASCVD risk score, variables like such as age, gender, occupation, known hypertension/diabetic, current smoker, and high BP were found significantly associated with high risk of CVD events in this study. The study done in urban Rajkot, India[24] observed that life time ASCVD events was associated with increasing age, male, stress, elevated BP, high level of BMI, and central obesity but no association was found between smoking with ASCVD risk events. This difference may be due to use of life time ASCVD risk score, use of different variables and different study participants.

The present study showed that a considerable number of the study participants (38.2%) had a high 10-year ASCVD risk. But less than 10% of study participants were classified in the high-risk group according to the WHO (ISH) CVD risk chart. ASCVD risk score classified more people in the high-risk group rather than the WHO risk score. A population-based national survey in Asia using the Framingham risk scale, SCORE (systemic coronary risk assessment) and WHO model[25] found that the WHO risk score did not identify individuals high-risk compared with the other two models. Similarly Hasandokht et al also reported that ASCVD risk score classified more people in the high-risk group rather than the WHO risk score.[17] Study done by Garg et al[18] in North India reported that ASCVD risk score and WHO (ISH) risk score tool were underestimated CVD risk than other tools Framingham Risk score-Coronary heart disease and Cardiovascular Disease ((FRS-CHD & FRS-CVD), QRISK2, Joint British Society risk 3 (JBS3). Study done at Nigeria by Ofori et al[19] also observed that WHO (ISH) risk score prediction were identified less high risk groups than ASCVD risk score.

Table 3: Association between baseline characteristics and cardiovascular disease risk among the study participants as per ASCVD risk predictor (N=228)

Variables	ASCVD n (%) or Mean±SD			
	High risk	Moderate risk	Low risk	p-value
Sex				
Female	29 (23)	28 (22.2)	69 (54.8)	<0.001*
Male	58 (56.9)	23 (22.5)	21 (20.6)	
Place				
Urban	42 (34.4)	23 (18.9)	57 (46.7)	0.052*
Rural	45 (42.5)	28 (26.4)	33 (31.1)	
Education				
Illiterate	32 (38.1)	26 (31)	26 (31)	0.077
<High school	34 (37)	19 (20.7)	39 (42.4)	
≥high school	21 (40.4)	6 (11.5)	25 (48.1)	
Occupation				
Retired	33 (70.2)	1 3(27.7)	1 (2.1)	<0.001*
Service/business	15 (23.8)	11 (17.5)	37 (58.7)	
Housewife	18 (31)	18 (31)	22 (37.9)	
Agriculture/labourer	21 (35)	9 (15)	30 (50)	
Marital status				
Married	69 (35.9)	41 (21.4)	82 (42.7)	0.069
Unmarried/widow/separated	18 (50)	10 (27.8)	8 (22.2)	
Socioeconomic class				
Upper	18 (40.9)	7 (15.9)	19 (43.2)	0.572
Middle	18 (36.7)	9 (18.4)	22 (44.9)	
lower	51 (37.8)	35 (25.9)	49 (36.3)	
Known hypertensive				
Yes	42 (67.7)	15 (24.2)	5 (8.1)	<0.001*
No	45 (27.1)	36 (21.7)	85 (51.2)	
Known Diabetic				
Yes	33 (70.2)	8 (17)	6 (12.8)	<0.001*
No	54 (29.8)	43 (23.8)	84 (46.4)	
Current smokers				
Yes	12 (63.2)	6 (31.6)	1 (5.3)	0.006*
No	75 (35.9)	45 (21.5)	89 (42.6)	
Alcohol history				
Yes	2 (28.6)	2 (28.6)	3 (42.9)	0.853
No	85 (38.5)	49 (22.2)	87 (39.4)	
For continuous data (Mean±SD)				
Age	65.20±6.82	59.47±9.27	46.53±6.4	<0.001*
SBP >140 mmhg	151.72±25.42	136.47±21.39	130.63±15.69	<0.001*
DBP >90 mmhg	86.20±16.02	83.20±13.94	80.62±13.79	0.044*
Waist circumference (cm)				
Female	94.55±11.62	90.43±13.48	87.28±20.54	0.167
Male	90.21±20.94	85.57±12.91	88.33±9.46	0.585
Body mass Index (kg/m^2)	26.02±4.78	24.45±5.63	25.84±4.52	0.161
Random blood sugar (n=218)	165.56±88.08	144.08±62.43	173.61±99.07	0.171
Total cholesterol (n=209)	156.16±34.41	171.07±42.84	167.69±42.31	0.072

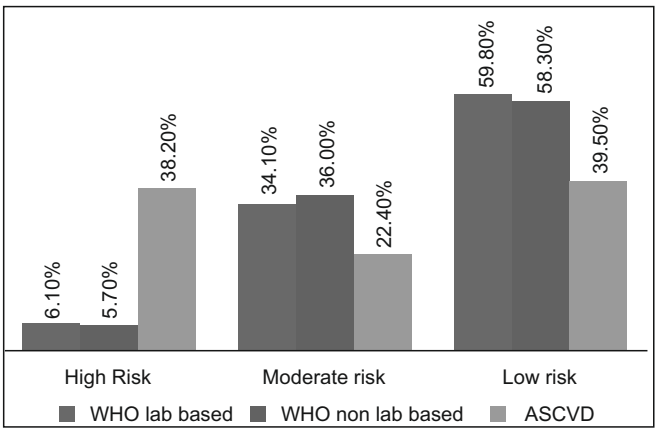
*p value are statistically significant at <0.05. SBP-Systolic Blood Pressure; DBP-Diastolic Blood Pressure; WHO/ISH-world health organization /international society of hypertension; ASCVD-atherosclerotic cardiovascular disease; SD-Standard deviation.

Table 4: Agreement between risk predictors

Risk predictors		WHO/ISH non lab risk category			Total n(%)	Kappa	P value
		High risk	Moderate risk	Low risk			
WHO/ISH lab risk category	High risk	5	8	0	13 (6.1)	0.724	<0.001
	Moderate risk	6	61	6	73 (34.1)		
	Low risk	0	11	117	128 (59.8)		
	Total n (%)	11 (5.1)	80 (37.4)	123 (57.5)	214(100)		
ASCVD risk category	High risk	12	61	14	87 (38.2)	0.31	<0.001
	Moderate risk	1	21	29	51 (22.4)		
	Low risk	0	0	90	90 (39.5)		
	Total n (%)	13 (5.7)	82 (36)	133 (58.3)	228		
Risk predictors WHO/ISH lab risk category		**ASCVD risk category**			**Total n (%)**	**Kappa**	**p value**
		High risk	**Moderate risk**	**Low risk**			
	High risk	13	0	0	13(6.1)	0.309	<0.001
	Moderate risk	54	19	0	73(34.1)		
	Low risk	17	28	83	128(59.8)		
	Total n (%)	84 (39.3)	47 (22)	83 (38.8)	214 (100)		

WHO/ISH-world health organization /international society of hypertension;
ASCVD-atherosclerotic cardiovascular disease.

Figure: 1 Distribution of study participants using risk score



Current study found a good agreement (Kappa 0.724, p-0 .000) between WHO (ISH) risk predictor tool with cholesterol and without cholesterol. Study done by Das et al also found good agreement between this tools (Kappa 0.64).[26] We observed a fair agreement (Kappa 0.310, p-0.000) between ASCVD and WHO (ISH) risk predictor tools while study done by Hasandokht et al found moderate agreement between this two tools (Kappa 0.45). We found that a sizable proportion of participants were categorized as low risk using both risk scores. We noticed that a small subset of participants who were assigned the WHO (ISH) categories of moderate risk and low risk were assigned the ASCVD score of high-risk groups. So ASCVD risk scores might be overestimating the high risk group which has been shown in several studies.[17,27,28]

Conclusion:

In present study, it was observed that one-third of the participants had a high risk of CVD events based on the ASCVD risk score, and a smaller number of participants were found to be at high risk according to the WHO/ISH risk chart. Our study indicated WHO/ISH lab based and non lab based risk scores had fair agreement with ASCVD risk scores. Moderate agreement was found between WHO/ISH lab based and non lab based risk scores. So we need to implement these risk scores of CVD events to identify the high risk individual and their further management.

Limitation:

The participants in this cross-sectional study were those who attended camps for the screening of diabetes and hypertension. It could lead to selection bias and affect the generalizability of the results. However, it has no influence on the ability of the study to assess the two cardiovascular risk assessment tools.

Declaration:

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Conflict of Interest: Nil

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