DOI: https://doi.org/10.53350/pjmhs211551460

ORIGINAL ARTICLE

Evaluating the Accuracy of the Risk Assessment Tools in Predicting CVD Events in Tertiary Care Hospital, Bangalore, India

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ABSTRACT

Aim: To evaluate the accuracy of the risk assessment tools in predicting CVD events in tertiary care hospital, Bangalore, India.
Methodology: A Prospective observational study conducted in medicine wards of a tertiary-care hospital for eight months. We collected all the details like inpatient number, age, sex, social status, laboratory data, weight, height, Blood Pressure (BP), family history, and therapeutic management. Then introduced the data to FRS and ASCVD risk score calculators and determined the risk for development of CVD in each patient and observed risk score for each risk factor in the study sample.
Results: FRS and ASCVD predicted the risk factor for developing CHD; BMI values, tobacco use, alcohol consumption, diabetes, Total Cholesterol. FRS and ASCVD risk scores were used to classify individuals according to Low, Moderate and High-risk factor, the percentage was respectively (70%, 22%, 8%) for ASCVD and (61%,21%, 18%) for FRS. Using FRS and ASCVD, we observed that patients with high BMI values, smokers, alcoholics, diabetics, and patients with high TC, LDL, and TG levels with Low HDL levels were more likely to have a high risk of developing CVDs.
Conclusion: The Risk Scores helped in investigating the status of cardiovascular patients and predicting the incidence of CVD events by determining risk factors. This study emphasizes the importance of good planning and predicting of CVDs in advance as a way to prevent the disease or lower its risk in individuals by studying the risk factors and calculating the risk using Framingham Risk Score and AHA/ACC risk score (ASCVD).
Keywords: Atherosclerosis Cardiovascular Disease (ASCVD), Risk Factors, cardiovascular disease

INTRODUCTION

Evaluating an individual's cardiovascular risk has become the acknowledged method of focusing on preventive treatment at patients who are asymptomatic however at high risk of cardiovascular disease (CVD). Multivariate risk functions determined in a few partners considers and randomized preliminaries structure the premise of prescient functions and risk scores[1,2,3,4]. Many, particularly those got from the Framingham Heart Study, have been adjusted for use in primary care as rearranged outlines, tables, PC programs, and web-based instruments, and are regularly suggested in arrangement reports and guidelines[5,6,7]. Depending on their outright risk, asymptomatic individuals might be offered pulse and cholesterol-lowering treatment and headache medicine, notwithstanding exhortation about important wellbeing practices. Such mediations might be deep-rooted and are related to risks just as advantages. Cardiovascular disease is the main source of death among high-pay nations and is projected to be the main source of death worldwide by 2030. A significant part of the flow research efforts has been pointed toward the ID, change, and treatment of individual-level risk factors[8]. The cardiovascular disease (CVD) trouble is huge and is growing in South Asia. In these nations, the period of the beginning of the first myocardial dead tissue is on normal 10 years sooner as contrasted and different nations. Cardiovascular risk forecast models are significant in the anticipation and the executives of cardiovascular diseases. Many risk assessment frameworks are in presence, the most popular and presumably the most generally utilized internationally is the Framingham Risk Score. A few altered adaptations of the 10-year Framingham Risk Calculator equation, QRISK2 model, the American Heart Association (AHA), and the American College of Cardiology (ACC) created Atherosclerotic Cardiovascular Disease (ASCVD) risk score calculator is utilized in clinical practice to recognize and regard high-risk populaces just as to impart risk viably[9]. Passings from cardiovascular diseases (CVDs) on the planet relate to about 17.5 million individuals each year[10], which is viewed as a genuine general medical condition. In agricultural nations, the morbidity and mortality credited to CVDs are expanding quickly because of financial advances and the way of life of this populace[11]. According to the World Health Organization projections, it is predicted that morbidity and mortality due to cardiovascular diseases in India will reach an epidemic proportion by the middle of this century due to rapid changes in lifestyle and a significant segment of which will be due to ischemic heart disease In India approximately 53%· of CVD deaths are in people younger than 70 years of age. By 2020 CVD will be the leading cause of death in developing countries like India[12,13]. Therefore, To study the efficacy of the risk assessment tools in predicting CVD events in patients and evaluating treatment regimens according to efficacy and safety by examining the change in Framingham risk score (FRS) arising from the short-term treatment of CVD and evaluating the accuracy of the 2013 American College of Cardiology/American Heart Association (ACC/AHA) risk equation for atherosclerotic cardiovascular disease (ASCVD) events.

MATERIALS AND METHODS

A Prospective observational study was conducted in the medical wards of a tertiary-care hospital for eight months. The newly admitted case charts to identified wards were

selected on daily basis. The required data was collected in form of case sheets, treatment charts, lab master, the physical examination of the medication with a patient is also verified. A prepared questionnaire to gather information from patients that were used with the Framingham Risk Score and ASCVD risk score tools to predict the risk factors in patients.

Inclusion criteria: Patients admitted to medical wards, and their medications chart contains one or several medications used to prevent or treat cardiovascular events in patients.

Exclusion criteria: Patients admitted to other wards rather than Medicine wards, outpatient department.

Method of collection: We chose the recently conceded case charts every day, and gathered the required information in structure case sheets, treatment diagrams, lab values, and physical examination of the drug with the patient consent. Using a prepared questionnaire to gather data from patients were utilized with the Framingham and ASCVD Risk Scores to anticipate risk factors in patients.

Data analysis: For every participant, we calculated the risk score using Framingham and ASCVD risk tools, including the risk factors; age, sex, Body Mass Index (BMI), systolic blood pressure, total and high-density lipoprotein cholesterol concentrations, smoking, diabetes mellitus, and family history. We assigned the participants to high-risk, moderate-risk, and low-risk groups based on the calculated risk scores.

RESULTS AND DISCUSSION

Clinically, when compared the risk factors with the risk score in patients using Framingham risk score to classify them according to their Low, Moderate, and High-risk factor, the percentage was respectively (61%, 21%, and 18%) (Fig. 1). When compared the risk factors with the risk score in patients using ASCVD risk score to classify them according to their Low, Moderate, and High-risk factor, the percentage was respectively (70%, 22%, and 8%) (Fig. 1). The highest risk factor according to age was in the age range of >70 years, all of the patients in this age range were having a high risk of developing CHD according to FRS, and all the patients in the age range <40 years old having low risk according to ASCVD, Females in the sample had less percentage of having High RF 18% comparing to Men 42% according to FRS and 64% of Females having Low RF while 53% of Males were having Low RF according to ASCVD proving that differences in risk factors between sexes, particularly in HDL cholesterol and smoking, explained nearly half of the difference in CHD risk between men and women[14], according to their BMI all Obese patients having BMI more than 30 had the highest risk according to FRS and ASCVD, the risk of major cardiovascular events is higher with higher BMI categories and in normal-weight individuals[15]. The total number of participants was 210, the sample included 127 men and 83 women with a mean age of 59.82 years. The statistical data in the sample were as follows:

According to their Blood Pressure, Individuals in the sample were divided according to using of Antihypertensive therapy. Risk factors for the sample according to Blood Pressure; only 13% of Individuals with Normal Blood Pressure had High RF according to FRS and 5% according to ASCVD. Hypertension predisposes powerfully to all of the major peripheral artery diseases. Risk ratios are larger for cardiac failure and stroke, but coronary disease is the most common and most lethal sequela of hypertension equaling in incidence all the other cardiovascular outcomes combined[10]. When studying the effect of Lipid profile on developing CVD according to FRS and ASCVD the results of the individuals of samples showed the significance of the role of TC in the pathology of cardiovascular events 55% according to FRS and 78% according to ASCVD of patients with TC levels more than 250 mg/dL were having a high-risk score. 93% of patients with HDL levels more than 55 mg/dL showed low risk according to FRS and 75% according to ASCVD showing the protective role of HDL against CVD development. Patients with high LDL levels have more risk score, 55% according to FRS and 62% according to ASCVD of the patients with LDL levels more than 160 mg/dL were having high risk. The results showed the significance of the role of HDL in preventing cardiovascular events, higher levels of HDL showed lower risk which is due to the protective factor of HDL against heart disease[16]. Patients with LDL >160 mg/dL all had High RF; that can be explained by the changes in the endothelial permeability and the composition of the extracellular matrix beneath the endothelium promote the entry and retention of cholesterol-containing LDL particles in the artery wall which leads to the formation of plaques and eventually Atherosclerosis[17] (Table 2).

Hypertriglyceridemia directly influences LDL and HDL composition and metabolism, an additional complication in hypertriglyceridemia states is accurate quantification of atherogenic particles in the circulation explaining the higher risk of CVDs with higher levels of TG[18]. 64% according to FRS and 79% according to ASCVD of patients with TG levels more than 200 mg/dL were having High RF. It has been known that diet plays an essential part in the etiology of hypercholesterolemia and hyperlipidemia which eventually lead to atherosclerosis[19]. Several factors; for example, high intake of saturated fats with diet, age, family history, hypertension and lifestyle, the high levels of cholesterol TC, TG, and LDL cholesterol as well play a huge part in causing CHDs[20] (Table 3, Fig. 2-5).

Table 1: Demographic Characteristics and General Information on Study Members

Average age	Women 39.52% (n = 83)	Men 60.48% (n = 127)	Total n = 210
Average BMI value	62.74 years 26.07 kg\m2 (Overweight)	57.92 years 24.67\m2 (Normal)	59.82 25.23 kg\m2 (Overweight)
Percentage of Smokers	3.6% (n=3)	29.1% (n=37)	19.04% (n=40)
Percentage of Diabetics	80.7% (n=67)	66.9% (n=85)	72.38% (n=152)
Family History of Disease	37.3% (n=31)	26.7% (n=34)	30.95% (n=65)

Table 2: Blood pressure values in the sample

Blood Pressure	Undergoing Antihypertensive therapy 66% (n=137)	Not Undergoing Antihypertensive therapy 34% (n=73)
Normal 80/120 mmHg	41% (n=56)	67% (n=49)
High >130/90 mmHg	22% (n=30)	14% (n=10)
Stage I 100/140 109/159 – mmHg	20% (n=27)	11% (n=8)
Stage II ≥160/110 mmHg	17% (n=24)	8% (n=6)

Table 2: Comparison of risk factors in a sample according to Blood Lipids Concentrations

Total Cholesterol levels in a sample				
Total Cholesterol mg/Dl	250<	200 - 249	150 - 199	<150
Ratio in Sample	4% (n=9)	24% (n=51)	42% (n=88)	30%(n=62)
HDL levels in a sample				
HDL values mg/Dl	>55	45 - 55	35 - 45	<35
Ratio in Sample	7%(n=14)	10%(n=22)	47% (n=99)	36%(n=75)
LDL levels in a sample				
LDL values mg/dL	>160	112 - 160	75 - 112	<75
Ratio in Sample	14% (n=29)	30% (n=64)	38% (n=79)	18% (n=38)
TG levels in the sample				
TG values mg/dL	>200	150 - 200	100 - 150	<100
Ratio in Sample	16% (n=33)	20% (n=43)	25% (n=53)	39% (n=81)

Figure 1: FRS and ASCVD Overall Risk in Sample

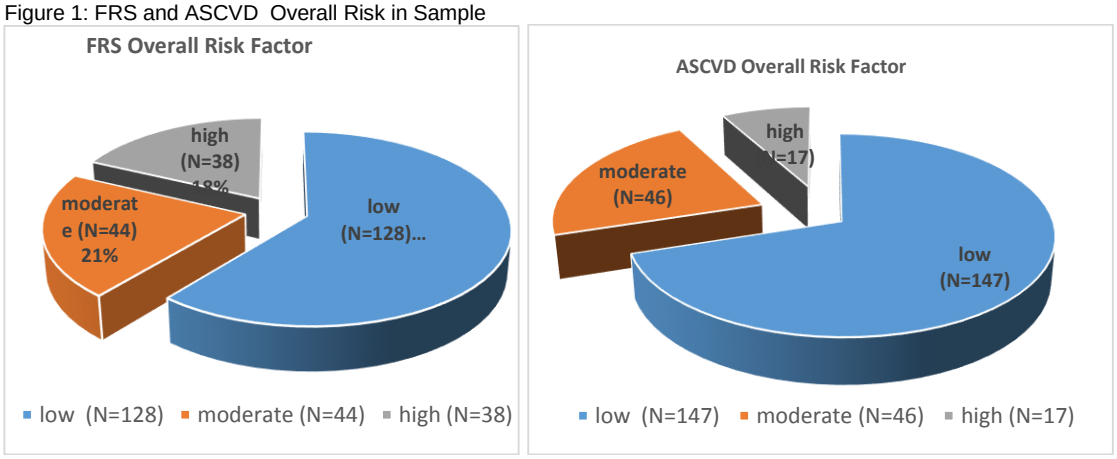


Figure 2: FRS and ASCVD Risk Ratios according to TC Levels

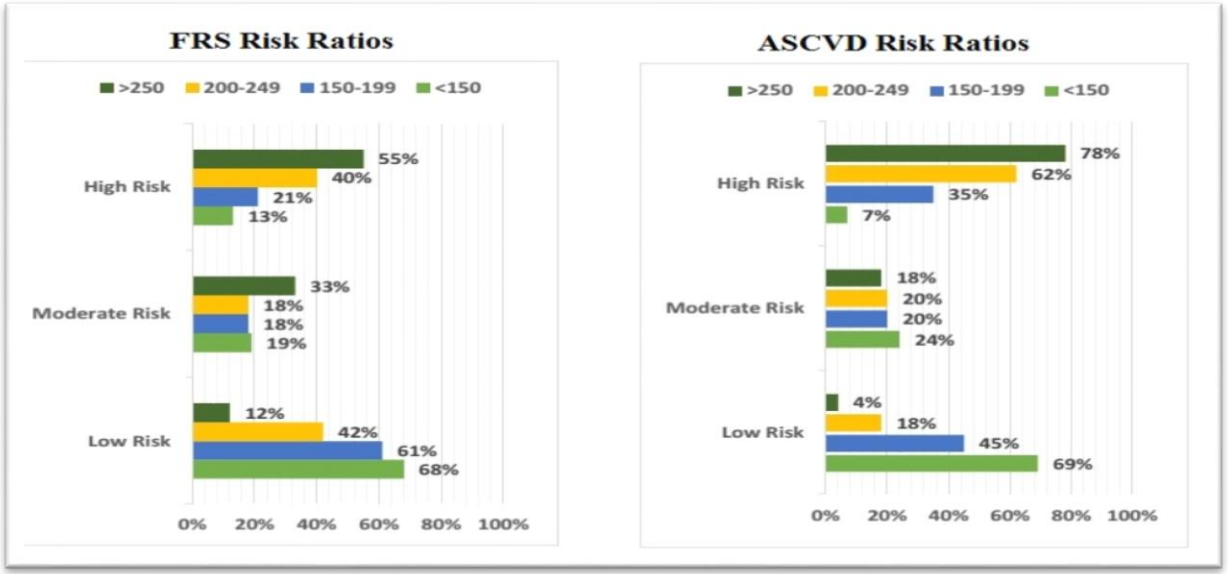


Figure 3: FRS and ASCVD Risk Ratios according to HDL Levels

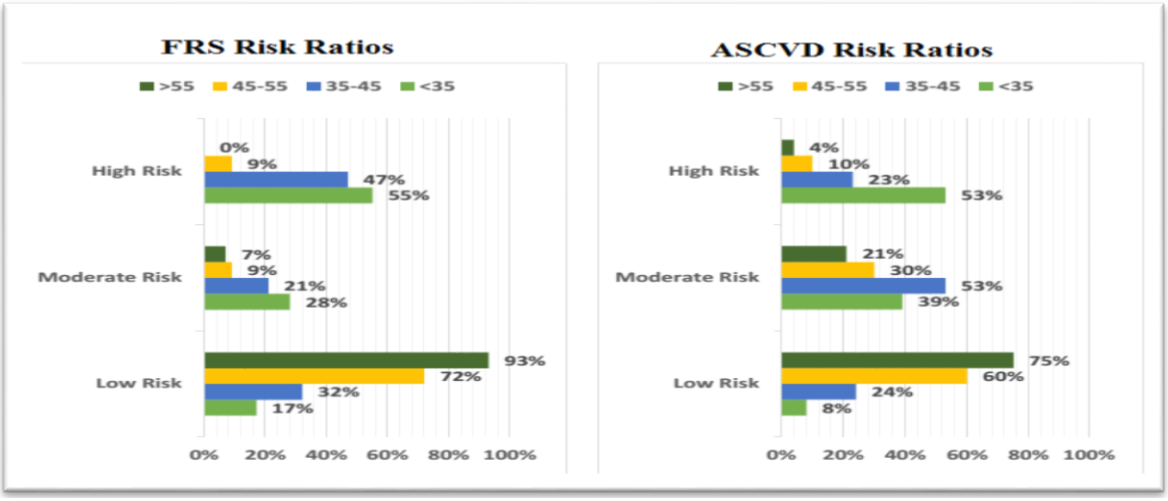


Figure 4: FRS and ASCVD Risk Ratios according to LDL Levels

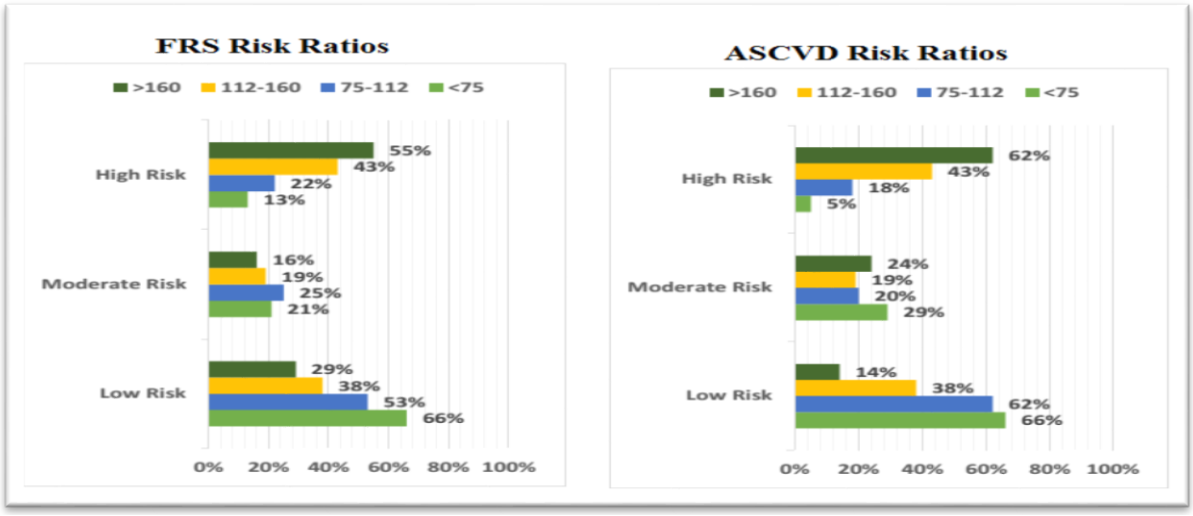
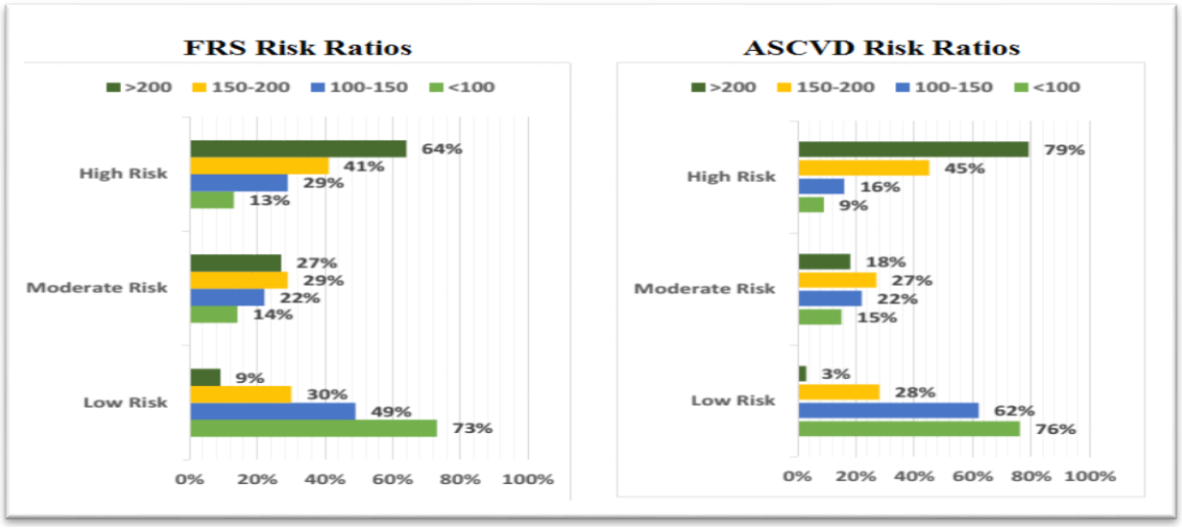


Figure 5: FRS and ASCVD Risk Ratios according to TG Levels



CONCLUSION

The accuracy of different 10-year cardiovascular disease (CVD) risk calculators in Indians may not be equivalent to in different populaces. The current investigation was led to look at the different calculators for CVD risk appraisal. Various guidelines prescribe diverse risk score calculators to evaluate the 10-year cardiovascular risk and their administration relying upon their risk scores. There are various concerns when adopting a risk prediction model for the clinical assessment of a patient to determine The significant challenge in the upkeep of CVDs, is to characterize not just the causes and their connection between different risk factors and difficulties, yet additionally to comprehend the impacts of pharmaceutical agents that are valuable in the administration of cardiac complications. Various defects in the pathophysiology of CVDs are for the most part mistakenly comprehended and consequently require more attention. This study emphasizes the importance of good planning and predicting of CVDs in advance as a way to prevent the disease or lower its risk in individuals by studying the risk factors and calculating the risk using Framingham Risk Score and AHA/ACC risk score (ASCVD).

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