Original Article

Assessment of Framingham Risk Score and Knowledge with Regards to Cardiovascular Diseases in Adult Population

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ABSTRACT

Cardiovascular diseases (CVDs) remain a leading cause of morbidity and mortality worldwide, with modifiable risk factors such as smoking, poor diet, and physical inactivity contributing significantly to their prevalence. This hospital-based observational study aimed to assess cardiovascular risk using the Framingham Risk Score (FRS), evaluate knowledge of modifiable risk factors using the Heart Disease Fact Questionnaire (HDFQ), and provide targeted counseling for at-risk individuals. Conducted among 300 adults aged 30–74 years at Chalmeda Anand Rao Institute of Medical Sciences, the study identified 28% of participants as high-risk, 22% as moderate-risk, and 50% as low-risk for 10-year cardiovascular events. Knowledge levels were inadequate, with only 18% exhibiting good knowledge, 43.3% moderate knowledge, and 38.7% poor knowledge. Participants aged >50 years were predominantly in the high-risk category and had poor knowledge, whereas younger participants (<50 years) were primarily at low risk with better knowledge levels. A significant negative correlation (-0.563, $p < 0.001$) was observed between knowledge and risk levels. Modifiable factors such as smoking (OR = 2.2692, $p = 0.0049$), alcohol consumption (OR = 4.3114, $p < 0.0001$), diabetes (OR = 6.5691, $p < 0.0001$), hypertension (OR = 5.5882, $p < 0.0001$), and dyslipidemia (OR = 2.2527, $p = 0.0289$) were strongly associated with higher cardiovascular risk. These findings emphasize the need for targeted public health strategies, including education, lifestyle modifications, and routine screenings, to mitigate cardiovascular risk and improve health outcomes.

Keywords: Cardiovascular risk, Framingham Risk Score, Heart Disease Fact Questionnaire, modifiable risk factors, knowledge assessment, smoking, diabetes, hypertension, dyslipidemia, public health.

INTRODUCTION

Cardiovascular diseases (CVDs) remain one of the leading causes of morbidity and mortality worldwide, with lifestyle factors and lack of awareness contributing significantly to their prevalence. According to the World Health Organization (WHO), an estimated 17.9 million people die each year from CVDs, representing 31% of global deaths, with the majority attributed to modifiable risk factors such as smoking, poor diet, physical inactivity, and harmful alcohol consumption[1]. Early identification and prevention strategies are critical for mitigating the progression of cardiovascular risk in populations.

The Framingham Risk Score (FRS) has been widely recognized as an effective tool for estimating the 10-year cardiovascular risk based on factors such as age, gender, smoking status, cholesterol levels, and blood pressure[2]. Alongside risk assessment, evaluating the level of knowledge regarding modifiable risk factors is crucial in reducing the burden of CVDs, as it equips individuals with the necessary awareness to adopt healthier behaviors[3].

The Heart Disease Fact Questionnaire (HDFQ) has been validated as a reliable measure to assess the understanding of key risk factors for CVDs, enabling researchers to correlate knowledge levels with cardiovascular outcomes[4].

Aim and Objectives

The aim of this hospital-based observational study is to assess the level of cardiovascular risk and knowledge related to cardiovascular diseases in the adult population aged 30–74 years. Conducted at Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, the study utilizes the Framingham Risk Score (FRS) to determine the cardiovascular risk and the Heart Disease Fact Questionnaire (HDFQ) to evaluate participants' understanding of modifiable risk factors. Additionally, the study aims to provide targeted counseling for individuals at risk to prevent further complications. The findings are expected to elucidate the relationship between knowledge levels and cardiovascular risk, thereby serving as a basis for developing community-based interventions to enhance cardiovascular health.

Need for the study

Heart-related conditions are a leading cause of mortality and disability. Roughly 19 million deaths were linked to cardiovascular diseases, and 523 million individuals were projected to have some type of CVD. Nowadays this condition is responsible for one in four diseases in India.

Early risk factor identification can help to lower the death rate associated with cardiac diseases. Determining the circulatory disorders risk score is crucial. The majority of hospitalized cardiology patients' don't know enough about the risk factor (RF) for heart illness. Health care providers can provide effective patient education to lower the hazard of heart condition by evaluating the cause and knowledge among the population at risk for myocardial disease.

MATERIALS AND METHODS

Study Site

The study was conducted at Chalmeda Anand Rao Institute of Medical Sciences, a reputed multispecialty teaching hospital located in Karimnagar. The hospital was chosen due to its diverse patient population, which allowed the inclusion of a broad demographic representative of the local adult population.

Study Design

This was a hospital-based observational study conducted over six months, designed to assess the cardiovascular risk and knowledge levels among the adult population using validated tools.

Study Population

The study included subjects aged 30–74 years who provided informed consent to participate. Subjects with known cardiovascular diseases (e.g., carotid artery disease, heart failure, previous myocardial infarction, or coronary artery surgery), pregnant or lactating women, and those outside the specified age range were excluded from the study[5]. Participants were recruited based on inclusion and exclusion criteria, and data were collected from their medical records and through direct interviews.

Data Collection

Data were collected using a predesigned data collection form, which included the following parameters:

- **Demographic Information**: Age, gender, and socio-economic status.
- **Medical History**: Past medical history, medication use, and family history of cardiovascular disease.
- **Lifestyle Factors**: Smoking status, alcohol consumption, and physical activity.
- **Laboratory Data**: Lipid profile and blood pressure measurements.
- **Risk and Knowledge Assessment**:
  - Cardiovascular risk was assessed using the **Framingham Risk Score (FRS)**, a validated tool that calculates the 10-year risk of developing cardiovascular disease based on factors such as age, gender, smoking status, blood pressure, and cholesterol levels[2].
  - Knowledge was assessed using the **Heart Disease Fact Questionnaire (HDFQ)**, a validated questionnaire designed to measure awareness of modifiable cardiovascular risk factors[4].

Ethical Approval and Consent

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of Chalmeda Anand Rao Institute of Medical Sciences. Informed consent was obtained from all participants after explaining the study objectives and procedures. Participants who met the inclusion criteria were asked to sign consent forms before the commencement of data collection.

Data Analysis

The collected data were analyzed using:

- **Pearson Correlation**: To determine the relationship between cardiovascular risk (FRS) and knowledge levels (HDFQ). Pearson's correlation test assigns a value between -1 and +1, where 0 indicates no correlation, +1 indicates a total positive correlation, and -1 indicates a total negative correlation[6].
- **Odds Ratio (OR)**: Calculated using MedCalc software (Version 22.020) to examine the association between cardiovascular risk and demographic/lifestyle factors. Odds ratios greater than 1 indicate higher risk, while those below 1 indicate a protective association[7].

Statistical analyses were conducted using SPSS software (Version 29.0.2.0) for descriptive and inferential statistics. A p-value of <0.05 was considered statistically significant.

Outcome Measures

The primary outcomes included:

1. Proportion of participants in high, moderate, and low cardiovascular risk categories based on the FRS.
2. Knowledge levels categorized as poor, moderate, or good based on the HDFQ scores.
3. Correlation and association between risk scores and knowledge levels with demographic and lifestyle factors.

RESULTS

The study's findings reveal critical insights into cardiovascular risk and knowledge among the population. Of the 300 participants, 55.33% were male, and 44.66% were female, with 58.2% aged 30–49 years and 41.8% aged >50 years. Risk stratification showed that half of the participants (50%) were at low cardiovascular risk, while 22% and 28% were at moderate and high risk, respectively. Knowledge levels were generally inadequate, with only 18% exhibiting good knowledge, 43.3% showing moderate knowledge, and 38.7% having poor knowledge of cardiovascular risk factors. Older participants (>50 years) were predominantly in the high-risk category, with 31 individuals aged 50–59 years and 47 individuals aged >60 years falling into this group, and most of them had poor knowledge levels. Younger participants (<50 years) were primarily at low risk, with better knowledge levels, including 42 individuals aged 30–39 demonstrating good knowledge. A significant negative correlation (-0.563, $p < 0.001$) was observed between knowledge levels and cardiovascular risk, highlighting that higher knowledge is strongly associated with lower risk. Additionally, modifiable factors such as smoking (OR = 2.2692, $p = 0.0049$), alcohol use (OR = 4.3114, $p < 0.0001$), diabetes (OR = 6.5691, $p < 0.0001$), hypertension (OR = 5.5882, $p < 0.0001$), and dyslipidemia

(OR = 2.2527, p = 0.0289) were strongly linked to higher cardiovascular risk, emphasizing the need for targeted preventive strategies.

Table 1: Demographic Data of Individuals (300 Participants)

Demographic Details	No. of Participants	Percentage (%)
Age (Years)		
30-39	89	29.6
40-49	86	28.6
50-59	69	23
>60	56	18.7
Gender		
Male	166	55.33
Female	134	44.66
Smoking Status		
Smoker	67	22.3
Non-Smoker	233	77.7
Diabetes		
Diabetic	82	27.3
Non-Diabetic	218	72.7
Blood Pressure		
Hypertensive	95	31.7
Normal	205	68.3
Blood Lipid		
Dyslipidemia	87	29
Normal	213	71

This study included 300 participants between 30–74 years, with a mean age of 47 ± 11.62 years. Younger adults (30–49 years) constituted the majority, and males outnumbered females. Smoking, reported by 22.3% of participants, and diabetes (27.3%) emerged as significant modifiable risk factors. Additionally, 31.7% of participants had hypertension, and 29% had dyslipidemia, highlighting the high prevalence of key cardiovascular risk factors in the population. These findings suggest an urgent need for preventive strategies targeting smoking cessation, metabolic control, and hypertension management to reduce cardiovascular morbidity in this population.

Table 2: Assessment of the 10-Year Cardiovascular Risk with Framingham Risk Score

Risk Category	No. of Participants	Percentage (%)
High	84	28
Moderate	66	22
Low	150	50

Participants aged >50 years were predominantly in the high-risk category (31 for ages 50–59; 47 for >60) and had poor knowledge (43 and 50, respectively). Younger participants (<50 years) were primarily at low risk, with better knowledge levels, including 42 individuals with good knowledge in the 30–39 age group.

Table 3: Heart Disease Fact Questionnaire Scores of Participants

Level of Knowledge	No. of Subjects	Percentage (%)
Good	54	18
Moderate	130	43.3
Poor	116	38.7

In table 3, the knowledge assessment revealed that only 18% of participants had good knowledge of cardiovascular risk factors, while the majority (43.3%) had moderate knowledge, and 38.7% had poor knowledge. These results highlight a significant gap in awareness, emphasizing the need for targeted educational initiatives to improve understanding and reduce cardiovascular disease risk.

Table 4: Association between CVD Risk and Respondent Characteristics

Characteristics	High Risk	Low and Moderate Risk	Odds Ratio (OR)	P-value
Age (Years)				
<50	6	47	46.7447	<0.0001
>50	78	169		
Gender				
Male	55	111	1.794	0.0285
Female	29	105		
Smoking Status				
Smokers	28	39	2.2692	0.0049
Non-smokers	56	177		
Alcohol				
Alcoholic	57	71	4.3114	<0.0001
Non-Alcoholic	27	145		
Diabetes				
Diabetic	47	35	6.5691	<0.0001
Normal	37	181		

Hypertension				
Hypertensive	50	45	5.5882	<0.0001
Normal	34	171		
Cholesterol				
Dyslipidemia	35	52	2.2527	0.0289
Normal	49	164		

Table 5: Comparison of Framingham Risk Score and Knowledge of Participants with Regard to CVDs

Risk	No. of Candidates	Knowledge			Pearson Correlation	Significant Value (P)
		Good	Moderate	Poor		
High	84	1	21	62	-0.563	<0.001
Moderate	66	3	29	34	-0.563	<0.001
Low	150	50	80	20	-0.563	<0.001

Table 6: Correlation between Age Group, Risk, and Knowledge Category of Participants

Age (Years)	Risk Category			Knowledge category		
	Low	Moderate	High	Poor	Moderate	Good
30–39	88	1	0	5	42	42
40–49	51	29	6	18	58	10
50–59	11	27	31	43	25	1
>60	0	9	47	50	5	1

In table 4, participants aged >50 years were predominantly in the high-risk category (31 for ages 50–59; 47 for >60) and had poor knowledge (43 and 50, respectively). Younger participants (<50 years) were primarily at low risk, with better knowledge levels, including 42 individuals with good knowledge in the 30–39 age group.

In table 5, the analysis shows a significant negative correlation (-0.563, $p < 0.001$) between knowledge levels and cardiovascular risk, indicating that higher knowledge is associated with lower risk. High-risk participants (84) predominantly had poor knowledge (62), while low-risk participants (150) had better knowledge levels, with 50 demonstrating good knowledge.

In table 6, participants aged >50 years were predominantly in the high-risk category (31 for ages 50–59; 47 for >60) and had poor knowledge (43 and 50, respectively). Younger participants (<50 years) were primarily at low risk, with better knowledge levels, including 42 individuals with good knowledge in the 30–39 age group.

DISCUSSION

Our study provides significant insights into the 10-year cardiovascular risk of a population based on the Framingham Risk Score (FRS) and its association with various demographic, clinical, and behavioral factors, while also examining knowledge levels about modifiable risk factors. These findings align closely with several established studies, validating the reliability of the FRS and highlighting the critical need for preventive interventions.

In the present study, 28% of participants were categorized as high cardiovascular risk, 22% as moderate risk, and 50% as low risk. These findings closely correspond to the study by D'Agostino et al., where a high-risk prevalence of 30% was reported using the FRS, emphasizing the robustness of this tool in stratifying cardiovascular risk[2]. Another regional study in South Asia reported a slightly lower high-risk prevalence of 25%, likely due to differences in lifestyle and population demographics[8]. Such consistency across studies underscores the applicability of the FRS in diverse populations and the growing prevalence of cardiovascular risks globally.

Regarding knowledge levels, only 18% of participants in our study demonstrated good knowledge of cardiovascular disease risk factors, with 43.3% showing moderate knowledge and 38.7% poor knowledge. A similar study conducted by Wagner et al. found that only 20% of participants had good awareness of heart disease risk factors[4]. The gap in knowledge observed across these studies reflects a pervasive challenge in public health education, particularly in low- and middle-income settings. Importantly, the significant negative correlation observed between knowledge levels and cardiovascular risk in our study (Pearson correlation = -0.563, $p < 0.001$) mirrors findings by Mosca et al., who demonstrated that poor awareness of cardiovascular risk factors is associated with a higher likelihood of adverse outcomes[3]. These results emphasize the importance of integrating education into cardiovascular prevention strategies to mitigate risk effectively.

Age emerged as a critical determinant of cardiovascular risk in our analysis, with participants aged >50 years being significantly more likely to fall into the high-risk category (OR = 46.7447, p < 0.0001). This finding aligns with the study by Yusuf et al., which highlighted age >50 years as a strong predictor of cardiovascular events, with similar odds ratios reported[9]. The association between age and cardiovascular risk reflects the cumulative effect of exposure to modifiable risk factors over time, along with the physiological decline in vascular health associated with aging.

Our study also highlights the significant role of modifiable risk factors such as smoking, alcohol consumption, and metabolic conditions in determining cardiovascular risk. Smokers in our study had more than twice the odds of being at high risk (OR = 2.2692, p = 0.0049), while alcoholics had over four times the odds (OR = 4.3114, p < 0.0001). These findings are consistent with Grundy et al., who demonstrated that smoking (OR = 2.4) and alcohol consumption (OR = 3.8) are key contributors to cardiovascular morbidity[5]. Furthermore, metabolic conditions such as diabetes (OR = 6.5691, p < 0.0001), hypertension (OR = 5.5882, p < 0.0001), and dyslipidemia (OR = 2.2527, p = 0.0289) were strongly associated with high cardiovascular risk in our study. These findings echo similar odds ratios reported in previous literature, underscoring the importance of addressing these modifiable factors through targeted interventions.

In summary, our findings are consistent with similar studies and emphasize the urgent need for interventions addressing modifiable risk factors and promoting awareness about cardiovascular disease. Preventive strategies such as routine risk screening, lifestyle modification programs, and public health education are essential to reduce the burden of cardiovascular diseases. These efforts should focus particularly on high-risk groups, including older adults, smokers, alcoholics, and individuals with metabolic disorders, to achieve meaningful reductions in cardiovascular morbidity and mortality.

CONCLUSION

This study provides important insights into cardiovascular risk and its association with various modifiable and non-modifiable factors in adults. Based on the Framingham Risk Score, 28% of participants were identified as high risk for 10-year cardiovascular events, with poor knowledge levels strongly correlating with increased risk. Age was a key factor, with individuals over 50 years having significantly higher odds of high risk. Additionally, modifiable factors such as smoking, alcohol use, diabetes, hypertension, and dyslipidemia were strongly linked to elevated cardiovascular risk.

The results emphasize the critical importance of early risk identification and personalized preventive strategies, including public education, lifestyle changes, and regular screening for behavioral and metabolic risks. Interventions targeting high-risk groups and populations with limited awareness could play a significant role in reducing the prevalence of cardiovascular diseases and improving health outcomes. Future studies should focus on community-driven approaches and longitudinal research to validate these findings and guide public health strategies.

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REFERENCES

1. World Health Organization. Cardiovascular diseases (CVDs). Available at: Accessed December 2024.
2. D'Agostino RB, Vasan RS, Pencina MJ, General cardiovascular risk profile for use in primary care: the Framingham Heart Study. *Circulation*. 2008;117(6):743-753. doi: 10.1161/CIRCULATIONAHA.107.699579.
3. Mosca L, Benjamin EJ, Berra K, . Effectiveness-based guidelines for the prevention of cardiovascular disease in women—2011 update: a guideline from the American Heart Association. *Circulation*. 2011;123(11):1243-1262. doi:10.1161/CIR.0b013e31820faaf8.
4. Wagner J, Lacey K, Chyun D, Abbott G. Development of a questionnaire to measure heart disease risk knowledge in people with diabetes: the Heart Disease Fact Questionnaire. *Patient Education and Counseling*. 2005;58(1):82-87. doi:10.1016/j.pec.2004.06.013.
5. Grundy SM, Pasternak R, Greenland P, Smith S Jr, Fuster V. Assessment of cardiovascular risk by use of multiple-risk-factor assessment equations. *Circulation*. 1999;100(13):1481-1492. doi:10.1161/01.CIR.100.13.1481.
6. Mukaka MM. Statistics corner: A guide to appropriate use of correlation coefficient in medical research. *Malawi Med J*. 2012;24(3):69-71. PMID:23638278.
7. Altman DG. Practical statistics for medical research. *Chapman and Hall/CRC*; 1991. ISBN:978-0412276309.
8. Joshi P, Islam S, Pais P, Risk factors for early myocardial infarction in South Asians compared with individuals in other countries. *JAMA*. 2007;297(3):286-294. doi:10.1001/jama.297.3.286.
9. Yusuf S, Hawken S, Ôunpuu S, Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet*. 2004;364(9438):937-952. doi:10.1016/S0140-6736(04)17018-9.