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Cardiovascular Risk Assessment By Using Framingham Scale And Other Risk Factors In A Teritary Care Hospital

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Abstract

Background: *Framingham Risk Score (FRS) is useful in stratifying hypertension risk by considering age, cholesterol, and smoking history, with decreased CVD risk being predicted in low-to-moderate alcohol consumption. Cardiovascular health is affected by alcohol consumption, while FRS assists in the stratification of risk for hypertension. In order to decrease CVD risk and promote cardiovascular health, it is important to recognize and control modifiable factors such as diabetes, alcohol consumption, smoking, obesity, dyslipidemia, hypertension, and inactivity.*

Methodology: *The research included 200 suitable patients through a standardized questionnaire, capturing medical history, demographics, treatments, results of tests, and Framingham risk score for cardiovascular disease risk, taking into account physical activity and family history.*

Result: *For 200 patients in our study, we employed the Framingham risk score to gather data on the patients cardiovascular risk, physical activity level, and family history. Within the Framingham risk categories, the data indicates a balanced distribution of low-, middle-, and high-risk groups. Of the total participants, the low-risk group was comprised of 85 (42.5%) women and thirty (15%) men. 32 (16%) women and 26 (13%) men constitute the 58 (29.0%) intermediate-risk participants. Finally, 57 (28.5%) individuals are in the high-risk group, consisting of 19 (9.5%) women and 38 (19%) men.*

Conclusion : *As a tool for communicating risk, the Framingham Scale is excellent. It provides physicians with the tools to meaningfully and accurately report risk data to patients so they can make educated choices regarding cardiovascular well-being.*

Keywords: *Framingham Risk Score (FRS), Cardiovascular Disease (CVD), Hypertension, Risk Stratification, Physical Activity.*

1. INTRODUCTION

Cardiovascular disease or CVD, the biggest cause of death among adults worldwide today, is responsible for 45% of overall deaths among chronic non-communicable diseases like coronary heart disease, stroke, and peripheral vascular disease[1,2].CVD mortality burden has been mounting and in 2019 it stood at 17.1 million deaths; it will be 24 million by the year 2030 with a huge economic burden.Various genes, physiological, social, and environmental determinants result in the etiology of CVD, thus guiding us towards prevention interventions to limit its impact[3].Age and gender are non-modifiable risk factors, while diabetes, hypertension, and obesity are modifiable and can be controlled to decrease mortality in the wake of advancements in genetics and social justice[4].With an increase in the prevalence of hypertension, along with aging, urbanization, lifestyle change, diet, smoking, obesity, and alcohol intake, these have become the most important risk factors for CVD worldwide[5]. Framingham Risk Score (FRS) is very highly validated tool to predict 10-year risk for coronary artery disease (CAD) using six chief risk factors[6]. Appreciating its value, Ministry of Health advocates the implementation of the methods of risk stratification, viz., Framingham risk score algorithm, at the level of primary care to allow for prognosis and clinical management, i.e., hypertension[7]. Early detection of AH with early management is still a dilemma, and without it, ill cardiovascular events like stroke, acute myocardial infarction, and kidney issues will follow[8].FRS is designed to quantify the risk of CVD in an individual using characteristics such as age, cholesterol, smoking, and diabetes [9].Due to the exceedingly high prevalence of acute heart failure and consequent severe cardiovascular disease burden, assessment of cardiovascular disease risk is key to the deployment of therapeutic interventions [10].According to the Framingham Heart Study, FRS is a stated approximation of an individual's 10-year or lifetime CVD risk [11].Although the Framingham scale is most

commonly applied to predict risk, our research expands its application by incorporating family history and inactivity—neither of which were specifically utilized within the original FRS model. Through the inclusion of these information variables, our research will better evaluate CVD risk and enable more effective prevention and. produced when urea and glycolic acid/glyoxal combine. In a larger sense, compounds that share the ring structure of their parent compounds might be referred to as groupings or classes of compounds, or hydantoins.

2. MATERIAL AND METHODS

2.1 Study Design And Duration Of The Study

The cross-sectional Study was performed between November 2022 and April 2023 at the Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation, an 850-bed tertiary care teaching hospital in Gannavaram, Andhra Pradesh. Ethical approval to carry out the study was given by the institutional ethics committee under the protocol approval granted as PG/893/2023. 200 consecutive patients between the ages of 30-80 years were recruited for the study. Exclusions were patients aged more than 80 years, non-communicative or unresponsive patients, and patients with a known history of cardiovascular disease. Exercise and family history were also assessed. Informed written consent was given in all participants before they were enrolled in the study. Patient information, such as demographic data, medical history, diagnoses, and laboratory results, were entered into the Framingham Risk Score calculator to calculate individual cardiovascular risk.

2.2 Study Tools

Framingham Risk Score is one of the routine 10-year risk for cardiovascular disease scores of the patient that features such critical parameters like sex, age, cholesterol, blood pressure, diabetes, and smoking. Division into three strata based on Ministry of Health criteria is low risk (<10%), intermediate risk (10-19%), and high risk (≥20%). To estimate the risk more accurately, other conditions such as physical activity and family history of the patient were also considered in this study and increased cardiovascular risk assessment was performed.

2.3 Statistical Analysis

Data were analyzed with Microsoft Excel for descriptive statistics and IBM SPSS 21 (TRIVERSION) for the rest of the statistical analysis. Categorical data were reported as frequencies and percentages, while continuous data were reported as means ± standard deviation (S.D.). Parametric tests were employed when the data were normally distributed and non-parametric tests when the data were not normally distributed. A p-value of <0.05 was applied in all the analyses to be statistically significant.

3. RESULTS

As shown in **Table 1** that 41-50 years is most populous in study population with 60 participants followed by 51-60 years with 52 participants. It is 7 participants who constitute the minimum within 71-80 years. Distribution of age within study population as laid out in this table provides high information concerning participants' demographic characteristics.

Table 1: Age Distribution of Study Participants

Age Group	Gender		Total
	Female	Male	
30-40	22(22.0)	28(28.0)	50
41-50	32(32.0)	28(28.0)	60
51-60	24(24.0)	28(28.0)	52
61-70	18(18.0)	13(13.0)	31
71-80	4(4.0)	3(3.0)	7

Total	100	100	200

The sample in the study was also split equally across the two sexes, 100 males and 100 females, 50% of each sex. The ratio of males to females is needed so that the outcome of the study will be applicable to both males and females. Table 2 presents gender distribution and frequency and percentage by gender.

Table 2: Gender Distribution of Study Participants

Gender	**Frequency**	**Percentage**
Male	100	50.0
Female	100	50.0
Total	200	100.0

Framingham Risk Score (FRS) was grouped among female and male respondents so that cardiovascular risk can be ascertained. **Table 3** also reflects that there are more women in low-risk group than there are men in the high-risk group. Chi-square testing was significant statistically when compared with FRS gender distribution, as given by p-value 0.001. It can be noted that there are higher numbers of women who hold a low-risk category than men and, hence, more men who have a high-risk category. This result is consistent with the importance of gender-stratification of cardiovascular risk.

Table 3: Distribution Across Framingham Risk Score (FRS) Categories

FRS	**Gender**		**Total**	**Chi-Square value**	**P value**
	Female	**Male**			
Low	55(55.0)	30(30.0)	85	14.31	0.001
Intermediate	26(26.0)	32(32.0)	58		
High	19(19.0)	38(38.0)	57		
Total	100	100	200		

Table 4 shows the proportion of each of a set of risk factors in the three Framingham Risk Score categories: low, intermediate, and high risk. The proportion of each risk factor (e.g., physical activity, smoking, alcohol use, hypertension, diabetes, and family history) in each FRS category is shown in the table. In all but one instance, the risk factors were statistically associated with the FRS categories at p-values < 0.05, indicating that the risk factors closely correspond to estimated levels of cardiovascular risk by the FRS. The findings acknowledge that some of the risk factors like physical activity, smoking, consumption of alcohol, hypertension, and diabetes dominate the FRS strata. A few of them are more evident in the higher risk strata. Family history, however, was not statistically significant with the FRS categories.

Table 4: Distribution of Risk Factors Across Framingham Risk Score (FRS) Categories

Risk Factor	**Low FRS (n=85)**	**Intermediate FRS (n=58)**	**High FRS (n=57)**	**Total (n=200)**	**Chi-Square Value**	**P Value**
Physical Activity						

Low	2 (2.4%)	7 (12.1%)	13 (22.8%)	22	18.46	0.001
Moderate	69 (81.2%)	38 (65.5%)	30 (52.6%)	137		
High	14(16.5)	13(22.4)	14(24.6)	41		
Smoking						
Yes	8 (9.4%)	18 (31.0%)	27 (47.4%)	53	26.1	<0.001
No	77 (90.6%)	40 (69.0%)	30 (52.6%)	147		
Alcohol						
Yes	8 (9.4%)	18 (31.0%)	23 (40.4%)	49	19.54	<0.001
No	77 (90.6%)	40 (69.0%)	34 (59.6%)	151		
Hypertension (HTN)						
Yes	34 (40.0%)	40 (69.0%)	49 (86.0%)	123	32.37	<0.001
No	51 (60.0%)	18 (31.0%)	8 (14.0%)	77		
Diabetes Mellitus (DM)						
Yes	26 (30.6%)	40 (69.0%)	42 (73.7%)	108	33.22	<0.001
No	59 (69.4%)	18 (31.0%)	15 (26.3%)	92		
Family History						
Yes	51 (60.0%)	38 (65.5%)	37 (64.9%)	126	0.57	0.7
No	34 (40.0%)	20 (34.5%)	20 (35.1%)	74		

Table 5 shows the family history of diabetes, hypertension (HTN), and coronary artery disease (CAD) prevalence rate of the respondents. The finding depicts the number and percentage of respondents with family history for each disease. There were higher numbers of subjects with family history of diabetes (52%), followed by smaller numbers of subjects with family history of hypertension (38%) and coronary artery disease (27%). The finding supports the existence of family history as a cardiovascular risk determinant.

Table 5: Family History Distribution

Risk Factor	Frequency	Percentage
Family History of Diabetes		
Yes	104	52.0%
No	96	48.0%
Family History of Hypertension (HTN)		
Yes	76	38.0%
No	124	62.0%
Family History of Coronary Artery Disease (CAD)		
Yes	54	27.0%
No	146	73.0%

Table 6 displays comparisons of lipid profile test (Total Cholesterol, High-Density Lipoprotein, and Low-Density Lipoprotein) frequency distributions, antihypertensive drug, diabetes mellitus statin prescription (DMSTATIN), and lipid statin prescription among the study sample. Number indicates the frequency and percentage of individuals in a group for an indicator. Statistically significant were differences found in the High-Density Lipoprotein (HDL) value in the p-value 0.01. There were no statistically significant differences in Total Cholesterol (TC), Low-Density Lipoprotein (LDL), Blood Pressure (BP) on treatment, DMSTATIN, or Lipid Statin by p-values > 0.05.

Table 6: Distribution of Lipid Profile and Other Parameters

Risk Factor	Female (n=100)	Male (n=100)	Total (n=200)	Chi-Square Value	P Value
Total Cholesterol (TC)					
<200	45 (45.0%)	49 (49.0%)	94	0.3	0.8
200-239	39 (39.0%)	35 (35.0%)	74		
>240	16 (16.0%)	16 (16.0%)	32		

High-Density Lipoprotein (HDL)					
<40	32 (32.0%)	50 (50.0%)	82	8.85	0.01
40-60	64 (64.0%)	43 (43.0%)	107		
>60	4 (4.0%)	7 (7.0%)	11		
Low-Density Lipoprotein (LDL)					
<100	27 (27.0%)	39 (39.0%)	66	4.15	**0.1**
100-129	31 (31.0%)	21 (21.0%)	52		
>130	42 (42.0%)	40 (40.0%)	82		
Blood Pressure (BP) Treated on Medication					
Yes	59 (59.0%)	54 (54.0%)	113	0.59	0.9
No	41 (41.0%)	46 (46.0%)	87		
Diabetes Mellitus Statin (DMSTATIN)					
Yes	36 (36.0%)	33 (33.0%)	69	2.32	0.6
No	64 (64.0%)	67 (67.0%)	131		
Lipid Statin					
Yes	47 (47.0%)	52 (52.0%)	99	2.32	0.8

Table 7 displays the prevalence of Systolic Blood Pressure (SBP) groups among the population being studied. It provides the number of individuals for every group of SBP in different ranges of blood pressure.

Table 7: Distribution of Systolic Blood Pressure (SBP)

SBP	Gender		Total
	Female	Male	
<120	5(5.0)	1(1.0)	6
120-139	53(53.0)	59(59.0)	112
140-159	34(34.0)	25(25.0)	59
>=160	8(8.0)	15(15.0)	23
Total	100	100	200

Table 8 shows the sample prevalence of Diastolic Blood Pressure (DBP) groups. It gives the sample size in different DBP groups.

Table 8: Distribution of Diastolic Blood Pressure (DBP)

DBP	Gender		Total
	Female	Male	
<80	11(11.0)	7(7.0)	18
80-89	39(39.0)	40(40.0)	79
90-99	49(49.0)	49(49.0)	98
>=100	1(1.0)	4(4.0)	5
Total	100	100	200

4. DISCUSSION

The Framingham Risk Score (FRS) is a known metric for determining the 10-year risk of CAD by measuring blood pressure, smoking status, cholesterol, HDL, and age. Biswas et al.'s[Error! Reference source not found.] 2022 study in 105 Indian patients illustrated that FRS accurately calculates the risk of cardiovascular disease, where 63.8% of the sample were classified as low risk. The research also found considerable differences in risk factors by gender, smoking status, and HDL cholesterol.
The research revealed that 26.5% of the patients smoked tobacco, 24.5% drank alcohol, 53.0% had diabetes, and 56.5% were taking anti-hypertensive drugs. Interestingly, women showed a greater prevalence of being on anti-hypertensive therapy, and men showed increased levels of HDL cholesterol. The research also divided LDL cholesterol into five categories, from optimal to very high levels, among which approximately 33.0% of the participants had optimal LDL levels. These observations indicate the widespread presence of these cardiovascular risk factors and the need for taking them into account in estimating CVD risk among Indians.

5. RISK SCORES

The study confirmed important gender differences in cardiovascular risk, with a higher proportion of men having a higher percentage of subjects in the high-risk group (19%) compared to women (27.5%). Differences were explained by several determinants, including age, history of alcohol consumption, and hypertension. The study population was also 49.5% on lipid-lowering statin therapy and the same percentage had diabetes.
Cardiovascular risk scores were also categorized as low, intermediate, and high risk, with 42.5% of the population at low risk, 29.0% at intermediate risk, and 28.5% at high risk. The relationship of risk factors such as diabetes, hypertension, smoking, alcohol consumption, and physical exercise with the Framingham Risk Score (FRS) was further examined in this research. It found that diabetic patients were at higher risk of contracting cardiovascular disease (CVD), while non-diabetic patients were under lower risk. Active smokers and alcohol users were also shown to be at higher risk.The research also revealed the large contribution of family history to cardiovascular risk, as 63% of the 200 individuals reported family history for CVD, reaffirming the significance of both lifestyle and genetic components in estimating cardiovascular risk. The other important determinant was physical activity, whereby 68.5% of the individuals practiced moderate exercise and 20.5% had high physical activity, reinforcing the significance of lifestyle in managing cardiovascular risk.

6. LIMITATIONS

Our research did not include people under 30 years old since they were not considered within the framework of known cardiovascular disease. Also, psychological states of stress, anxiety, and depression could affect participants' behaviour, possibly their self-reported outcomes and eating habits. All these aspects prove the necessity of a more precise and thorough estimation of cardiovascular risk that would consider these psychological effects.

7. STRENGTHS

Family history is also an important factor in our study, as a family history of heart disease may indicate a genetic predisposition to cardiovascular disease. Hence, including family history in the risk assessment will make the Framingham Risk Score more effective in giving a better and more individualized assessment. Moreover, psychological influences such as stress, anxiety, and depression may affect participant behaviour, self-reported information, and lifestyle decisions, and therefore it is important to perform a more comprehensive evaluation of cardiovascular risk that takes these influences into account for better accuracy.

8. CONCLUSION

In Conclusion Risk estimation tools are crucial in assisting healthcare professionals in evaluating cardiovascular disease (CVD) risk factors and creating proper care plans. These models forecast a person's risk of developing CVD in the next 5-10 years, which helps clinicians to make appropriate treatment decisions. These models identify high-risk patients and suggest lifestyle changes or drugs to manage both modifiable and non-modifiable risk factors. Family history of cardiovascular disease, particularly among first-degree relatives, considerably elevates a person's risk of CVD due to underlying genetic factors, which is generally neglected in most studies. This genetic predisposition is vital in the Framingham risk evaluation, since more than one episode of heart disease among young family members can significantly increase the risk. In this study, the Framingham risk score identified

57.5% of the population as being at high risk, 58.0% as intermediate risk, and 85.5% as low risk. A considerable number of men were at increased or intermediate cardiovascular risk, and so there is a necessity for specific short-term campaigns to encourage heart disease prevention. Of the 200 participants, 85 were low-risk, 27.5% of whom were women. Regular physical activity is an important way to decrease the risk of CVD by enhancing cholesterol levels, reducing blood pressure, and contributing to maintaining ideal weight. Other risk factors, including age, blood pressure, diabetes, and family history, also put a person at risk for heart disease. The Framingham scale is very good for population-level studies, especially for people older than 30, and offers reliable results in determining cardiovascular risk. It is important that the patient understand how crucial it is to modify risky behaviorsin order to lower their risk. Ongoing monitoring by medical professionals and incorporating community health approaches are crucial to lowering the prevalence of CVD. The Framingham risk assessment aids in the classification of patients and informs both preventive and therapeutic approaches while managing cardiovascular outcomes.

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11. Conflicts of Interest

The authors declare that no competing interest exists.

Abbreviations:

CardioVascularDisease(CVD)
Framingham Risk Score(FRS)
Coronary Artery Disease(CAD)
Low Density Lipoproteins (LDL)
High Density Lipoproteins (HDL)

References :

1 1. Sasikumar, M., Oommen, A. M., Mohan, V. R., Gupta, P., Rebekah, G., Abraham, V. J., & George, K. (2023). Recalibration of the Framingham risk score for predicting 10-year risk of cardiovascular events: A non-concurrent rural cohort study from Tamil Nadu. Indian Heart Journal, 75(1), 47–52.

2. Marasciulo, R. C., De Faria Stamm, A. M. N., Garcia, G. T., Marasciulo, A. C. E., Rosa, A. C., De Costa Remor, A. A., & Battistella, C. (2020c). Reliability between Cardiovascular Risk Assessment Tools: A Pilot Study. International Journal of Cardiovascular Sciences, 33, 618-26.

3. Badawy, M. a. E. M. D., Naing, L., Johar, S., Ong, S., Rahman, H. A., Tengah, D. S. N. a. P., Chong, C. L., & Tuah, N. a. A. (2022). Evaluation of cardiovascular diseases risk calculators for CVDs prevention and management: scoping review. BMC Public Health, 22(1).

4. Swaroopa, M.M., Praveen, R., Saheb, S., Rinnisha, S.K., Saranya, P., Teja, D., & Kumar, G.V. (2020). Assessment of 10-year risk of developing a major cardiovascular event in patients attending a hospital for the treatment of other disorders. International Journal of Pharmacy and Pharmaceutical Sciences.

5. Nyiambam, W., Sylverken, A., Owusu, I., Buabeng, K., Boateng, F., & Owusu-Dabo, E. (2020). Cardiovascular disease risk assessment among patients attending two cardiac clinics in the Ashanti Region of Ghana. Ghana Medical Journal, 54(3), 140–145.

6. Jahangiry, L., Farhangi, M. A., & Rezaei, F. (2017). Framingham risk score for estimation of 10-years of cardiovascular diseases risk in patients with metabolic syndrome. Journal of Health Population and Nutrition, 36(1).

7. Kannel, W. B., & McGee, D. L. (1979). Diabetes and cardiovascular risk factors: the Framingham study. Circulation, 59(1), 8–13.

8. Bansal, A., Padappayil, R. P., Gopal, S., Garg, M., & Joshi, R. (2020b). Practice patterns in the management of congestive heart failure and post-discharge quality of life: A hospital-based cross-sectional study. Journal of Family Medicine and Primary Care, 9(11), 5592.

9. Pimenta, H. B., & Caldeira, A. P. (2014). Fatores de risco cardiovascular do Escore de Framingham entre hipertensosassistidospor equipes de Saúde da Família. Ciência&SaúdeColetiva, 19(6), 1731–1739.

10. Moreira, T. R., Toledo, L. V., Mendonça, É. T., Colodette, R. M., Silva, L. S., & Cotta, R. M. M. (2019). Evaluation of cardiovascular risk in hypertensive individuals attending a primary health care center. International Journal of Cardiovascular Sciences.

11. D'Agostino, R. B., Vasan, R. S., Pencina, M. J., Wolf, P. A., Cobain, M., Massaro, J. M., & Kannel, W. B. (2008). General Cardiovascular Risk Profile for use in Primary care. Circulation, 117(6), 743–753.