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Original Article

Evaluation of Risk on Cardiovascular Problem Reoccurrence by Assessing the Prescription and Lifestyle Modifications: A Cross-Sectional Study

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ABSTRACT

Objectives: To determine the risk of reoccurrence in CVD patients based on questionnaire, drug interactions and ejection fraction. **Materials and Methods:** It was a cross-sectional hospital-based observational study. The study questionnaire contains qualitative and quantitative queries. The obtained score decides whether the patient is mild, moderate, or severe. **Results:** Out of 211 patients, according to the questionnaire, six patients (2.84%) had severe risk, 59 individuals (27.9%) were at risk according to the American Heart Association's Ejection Fraction recommendations. Four individuals (1.8%) were more at risk based on the drug interactions. Furthermore, alcohol (OR=5.06, 95% CI=1.03 -24.78), palm oil (OR=13.14, 95% CI=0.9-191.23), sunflower oil (OR=3.53, 95% CI=0.33-37.52), buffalo milk (OR=3.58, 95% CI=0-7,845.56), and a lack of exercise (OR=7.64, 95% CI=2.43-24.04) were the main risk factors for the development of CVD disease. Further smoking (χ^2=17.21, p=0.001), passive smoking (χ^2=6.37, p=0.012), alcohol (χ^2=12.59, p=0.001), cooking oil (χ^2=9.5, p=0.009), junk food (χ^2=7.58, p=0.006), lack of exercise (χ^2=13.65, p=0.001), eating more sodium in foods (χ^2=5.77, p=0.016), and blood cholesterol (χ^2=5.12, p=0.024), have association with risk of CVD. **Conclusion:** Lifestyle modifications need to be followed to reduce the progression of CVD; otherwise, the patients are at risk of developing CVD disease.

Keywords: Cardiovascular disease, Ejection fraction, Lifestyle modifications, Cardiac risk assessment, Potential drug interactions.

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INTRODUCTION

Cardiovascular disease is a leading cause of death worldwide. It comprises a wide range of illnesses often associated with the principal and auxiliary organs of the cardiovascular system. There are various types of cardiovascular diseases, including heart failure, hypertension, ischemic heart disease, angina pectoris, acute coronary syndrome, arrhythmia, venous thromboembolism, stroke, peripheral arterial disease, and cardiomyopathy. Among these, coronary heart disease is the most common type. Several factors can contribute to the development of Cardiovascular Disease (CVD), such as age, gender, poor education, and unhealthy lifestyle choices. Other factors include socioeconomic status, low levels of risk factor awareness, poor treatment adherence, tobacco use, abnormal lipid profiles and the presence of chronic diseases like hypertension, diabetes, metabolic syndrome, and dietary practices. It is essential to target the various risk variables in high-risk groups and community settings to combat CVD. Targeting only one risk factor is ineffective because it is often a combination of several factors that ultimately lead to cardiovascular disease.[1-4]

Nowadays, an unhealthy lifestyle is leading to an increase in premature deaths. Unhealthy lifestyle choices include insufficient exercise, poor diet, smoking, and excess alcohol consumption, which can significantly increase the risk of CVD. Drinking alcohol in moderation has been proven to lower the Risk of CVD, while the increased use of sugar-sweetened beverages has been linked to a dose-dependent increase in CVD risk. Consuming fruits and vegetables are inversely correlated with the Risk of CVD, whereas refined grain consumption indicates an elevated risk of CVD. On the other hand, consuming whole grains is significantly associated with a lower risk of CVD. Marine fish, rich in long-chain omega-3 fatty acids, can lower blood pressure, inflammation, arrhythmias, and thrombosis and improve the lipid profile.

Conversely, a diet high in red meat that has not been processed has been linked to an increased risk of CVD mortality.

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Physical activity is categorized as a class 1B intervention, while exercise-based cardiac rehabilitation is considered a class 1A suggestion. To lower the Risk of CVD, adults should engage in moderate to intense aerobic physical activity at least four times per week for an average of 40 min per session.[5,6] The current study assesses the recurrence risk of cardiovascular problems by analyzing the prescriptions (drug interaction), lifestyle modifications (questionnaire), and ejection fraction.

MATERIALS AND METHODS

Study Design and Site

The study was a cross-sectional observational one that was conducted in a hospital setting. The data was collected by communicating with the patients or their representatives, who were either in the in-patient ward or at the outpatient station of the Department of Cardiology, Santhiram Medical College and General Hospital (SRMC & GH) in Nandyal.

Sampling Technique

The subjects were selected for this study using a simple random probability sampling technique. This method ensures that every individual in the population has an equal chance of being part of the study. The online random number generator was used to select the subjects or to get information from them.

Study duration

The present study was conducted for six months, from November 2022 to April 2023, in the Department of Cardiology of Santhiram Medical College and General Hospital.

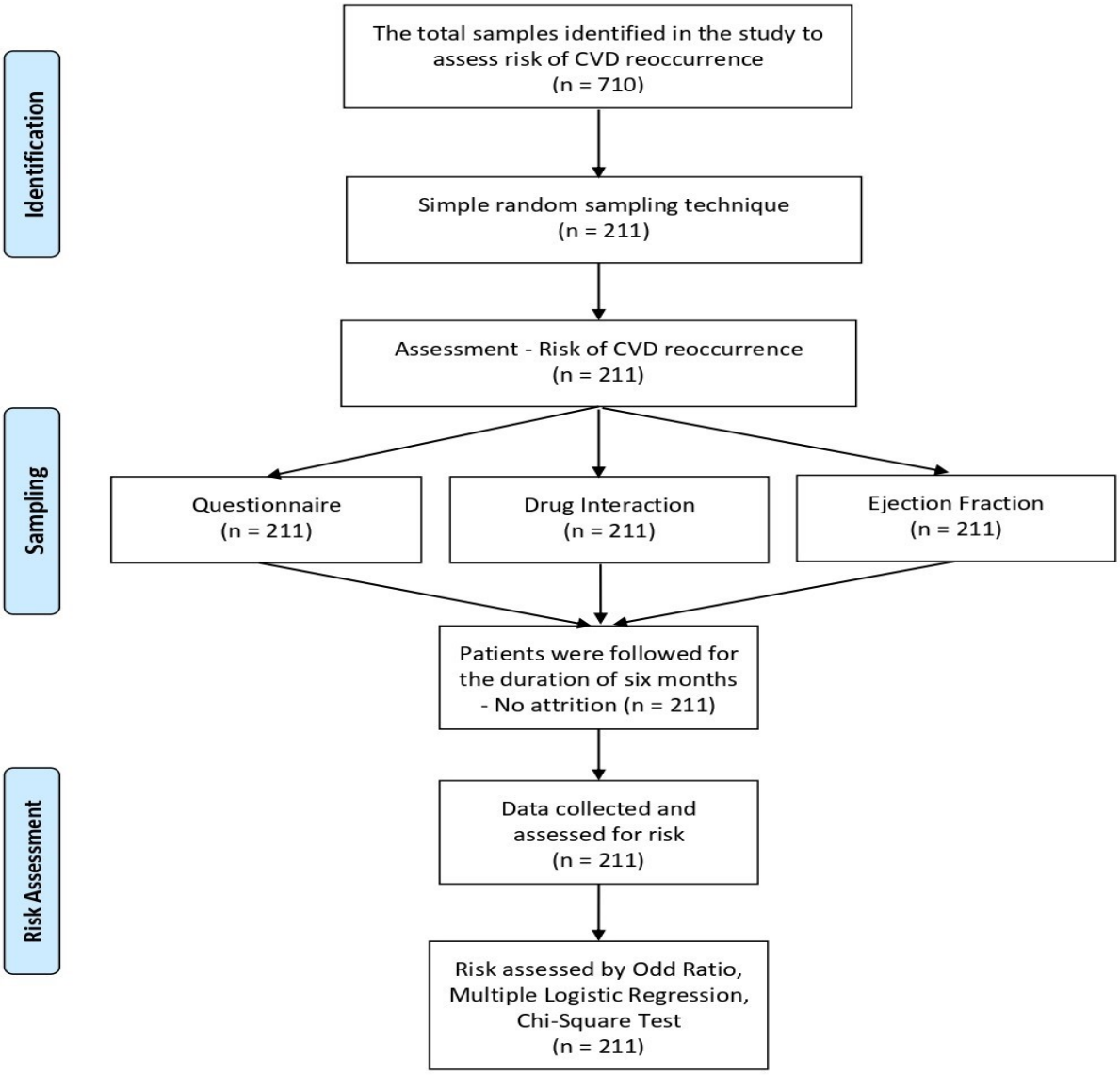

Figure 1: The study flow chart of patient's recruitment and risk assessment.

Inclusion and exclusion criteria

The study included participants who were willing to participate and had provided their written informed consent. Patients who were over 20 years of age and had been diagnosed with cardiovascular diseases were also included. Participants who were unwilling to join the study, pregnant women, patients who were provided with insufficient or incorrect information for data collection, and patients who were in the emergency department were excluded.

Sample size (n)

Over six months, we studied 211 patients based on a proportion of 16.4% found in previous literature. The sample size was determined using the single proportion sample size formula, with a confidence interval of 95%. This formula considers the Z value of 1.96, the proportion value of 16.4%, the Q value of 83.6%, and the precision or absolute error (d^2) of 5%. After substituting these values into the formula, we arrived at a sample size of 211 to conduct the study. The 211 patients were selected based on simple randomized sampling technique and patients were subjected to assessment of risk of CVD re-occurrence. This information is shown in Figure 1.

Ethical Approval

The institutional ethics committee approved the study under the permission number IEC/2022/036. The participants were selected based on inclusion and exclusion criteria and with their consent. After permission, the study participants were chosen upon the patient's consent and through the inclusion and exclusion criteria.

Risk Assessment and Study Questionnaire

The own study questionnaire was designed to evaluate the impact of lifestyle modifications on patients. It includes patient demographic information and a risk assessment questionnaire that covers various aspects of daily habits, such as smoking, alcohol consumption, physical activity, and eating habits. Additionally, the questionnaire records the patient's history of hypertension, diabetes, and sleep duration. We assigned a score to the questionnaire based on the severity of the patient's condition. If a patient's score was between 0 and 10, they were considered to have a mild condition. The patient was categorized as moderate if the score was between 11 and 20. A score between 21 and 30 indicated the patient had a severe condition.

Statistical analysis

All the data obtained was entered into Microsoft Excel 2019. Mean, standard deviation and proportion were calculated based on the data received. Statistical tests such as Chi-Square, multiple logistic regression, and odd ratio were chosen to determine the association and risk of cardiovascular disease and its progression from mild to severe among patients using categorical, dependent, and independent variables. The statistical tests were conducted using DATAtab 2023, the latest version, and the *p*-value was used to accept or reject statements. A p-value<0.05 was considered statistically significant.

RESULTS

Demographic details

Of 211 cases, 66.8% were male and 33.2% were female. The mean age was 59.17±12.17. The youngest patient was 27 years old, and the oldest was 89. In terms of income, 45.5% had an income of up to 1 lakh, 20.85% had an income of up to 2 lakhs, 9.48% had an income of 2-3 lakhs, 9% had an income of 1-2 lakhs, 8.53% had an income of up to 3 lakhs, 2.84% had an income of up to 5 lakhs, 2.37% had an income of 3-4 lakhs, and 1.42% had an income of up to 4 lakhs. Of the 211 patients, 54.5% had previously been diagnosed with CVD, and 45.5% had not. In total, 73.93% were illiterate, and 26.07% were literate. Regarding occupation, 40.76% were farmers, 32.7% were daily workers, 11.37% were homemakers, 8.53% were private employees, 5.21% were government employees, and 1.42% were retired employees. Regarding weight, 45.02% were overweight, 44.08% were healthy, 7.11% were obese, and 3.79% were underweight.

Prescription pattern

Out of 211 cases, 145 (68.7%) were prescribed Aspirin, 109 (51.6%) were prescribed Clopidogrel, 55 (51.6%) were prescribed Heparin, 115 (54.5%) were prescribed Atorvastatin, 68 (32.2%) were prescribed Torsemide, 36 (17%) were prescribed Spironolactone, 156 (73.9%) were prescribed Pantoprozole, 34 (16.1%) were prescribed Metoprolol, 18 (8.53%) were prescribed Ticagrelor, 43 (20.3%) were prescribed Furosemide, 12 (5.6%) were prescribed Ivabradine and Acebrophylline, and 24 (11.3%) were prescribed Isosorbide mononitrate. Among all the prescribed drugs, Pantoprozole had the highest prescription rate, while Aspirin was the second highest. Aspirin is an antiplatelet drug that irreversibly inhibits the cyclo-oxygenase enzyme, which is required to meet the precursors of thromboxane within platelets. These reduce the risk of CVD. Ivabradine and Acebrophylline were the most minor prescribed drugs.

Risk assessment

Risk of CVD reoccurrence based on drug-drug interaction

A total of 22 drug interactions were identified, out of which three were classified as major drug interactions. The remaining 19 drug interactions are considered moderate. All the interactions had a potential risk of recurrence of CVD. This information is presented in Table 1.

Table 1: Risk of CVD reoccurrence through Drug-Drug Interactions.

Sl. No.	Drug-Drug Interactions	Outcome/Justification	Severity	Frequency
1.	Aspirin+Ticagrelor	Higher doses of Aspirin reduce the effectiveness of Ticagrelor.	Moderate	1(3.7%)
2.	(Torsemide+Spironolactone)+Telmisartan	The combination may increase potassium levels in the blood. It leads to hyperkalemia.	Major	3(11.11%)
3.	(Rosuvastatin+ Aspirin+ Clopidogrel)+(Torsemide+ Spironolactone)	Concurrent use of both medications may result in an increased risk of torsemide toxicity.	Moderate	1(3.7%)
4.	(Telmisartan+ Metoprolol succinate)+(Torsemide+ spironolactone)	Concurrent use of both medications may result in an increased risk of hyperkalemia.	Moderate	1(3.7%)
5.	Aspirin+Clopidogrel	Concurrent use of both medications may cause internal bleeding.	Moderate	7(25.92%)
6.	(Aspirin+ Clopidogrel)+Atorvastatin	Concurrent use of both medicines may reduce the effects of Clopidogrel.	Moderate	3(11.11%)
7.	Losartan+Spironolactone	Concurrent use of both medications may result in an increased risk of hyperkalemia.	Moderate	1(3.7%)
8.	Atorvastatin+Clopidogrel	Concurrent use of Atorvastatin and Clopidogrel may reduce the effects of Clopidogrel.	Moderate	1(3.7%)
9.	Furosemide+Hydrocortisone	Coadministration of both drugs may result in hypokalaemia.	Moderate	1(3.7%)
10.	(Torsemide+Spironolactone)+(Telmisartan+ hydrochlorothiazide)	Concurrent use of both medicines may result in an increased risk of hyperkalemia.	Moderate	1(3.7%)
11.	Spironolactone+Telmisartan	Concurrent use of both medications may result in an increased risk of hyperkalemia.	Moderate	1(3.7%)
12.	Torsemide+(Ramipril+ Hydrochlorothiazide)	Concurrent use of both medications may result in postural hypotension.	Moderate	1(3.7%)

Risk of CVD reoccurrence based on a questionnaireA study analyzed the risk of reoccurrence based on lifestyle modifications. The questions were divided into qualitative (11 queries) and dichotomous (19 queries). Out of 211 patients, 126 (59.71%) were unwilling to quit smoking and alcohol, putting them at high risk of CVD. 160 (75.83%) patients did not perform any physical activity, increasing the likelihood of CVD. 163 (77.25%) patients experienced chest pain and discomfort in the jaw, while 106 (50.24%) patients felt weak. 188 (89.18%) patients were exposed to shortness of breath (SOB). Furthermore, 154 (72.9%) patients were not taking their diabetes medications regularly, and 161 (76.3%) patients did not make changes to their eating habits to

Table 2: Risk of CVD reoccurrence through Qualitative data measurement (for 11 scores).

Q	Questions and Responses of Patients
Q1.	About how many cigarettes a day do you now smoke? 10-15 cigarettes per day were consumed by most of the patients. There was a statistically significant relationship between smoking and the Risk of CVD, p=<.001.
Q2.	How many days per week do you do moderate/ physical activities for at least 30 min? (For example, brisk walking, jogging, cycling) Most patients performed moderate physical activity for 3-4 days per week. There was a statistically significant relationship between exercise to control CVD and Risk of CVD, p=<.001
Q3.	What kind of oil do you prefer to use? Out of 211 patients, 147 patients preferred to use sunflower oil, 57 patients preferred to use palm oil, and seven patients preferred to use Groundnut oil. There was a statistically significant relationship between cooking oil and the Risk of CVD, p=.009
Q4.	Which type of milk do you usually prefer to use? Of 211 patients, 209 used buffalo milk, and two used cow milk. There was no statistically significant relationship between milk and Risk of CVD, p=.272.
Q5.	BMI of the patent? Out of all patients, 95 patients were overweight, 93 were healthy individuals, 15 patients were obese, and the remaining patients were underweight, i.e., eight patients. There was no statistically significant relationship between BMI and Risk of CVD, p=.435
Q6.	What is CVD currently suffering? Out of 211 patients, 144 patients were diagnosed with NSTEMI, 20 patients were diagnosed with AWMI, 12 patients were diagnosed with IWMI, and the remaining patients were diagnosed with different types of CVDs.
Q7.	When was the last time you had your blood pressure checked? If yes, for how many years do you have hypertension? Out of 211 patients, almost 40% of patients regularly checked their BP. In our study, most patients have had HTN for 2-3 years.
Q8.	How many hours of sleep do you have on average per night? Most of the patients' sleeping times were 6-7 hr per day.
Q9.	Do you experience any of the following? Snoring, obstructive sleep apnea, and difficulty falling asleep or interrupted sleep. Most of the patients experienced snoring and difficulty falling asleep.
Q10.	Have you experienced any of the following events in the past six months? Death of family member, divorce, major illness /injury/surgery, change in financial state, change of occupation. Out of 211 patients, 25 patients experienced a change in financial state, 10 patients experienced the death of a family member, 14 patients experienced a significant illness, and the remaining patients did not experience any of the following events.
Q11.	Area of residence? Out of the total collected cases, 140 patients were from the village, 66 patients were from the main road, three were from an industrial area, and two were from the city. There was no statistically significant relationship between the area of residency and the Risk of CVD, p=.403.

control diabetes. Additionally, 160 (75.83%) patients consumed a high amount of salt in their food items. All these factors put patients at high risk for CVD, and the information is presented in Tables 2 and 3.

A chi-square test was performed to examine the influence of Gender, Income, CVD, Literate, Smoking, Passive Smoking, Alcohol Consumption, Quitting Smoking and Alcohol, Cooking Oil, Milk, BMI, Currently taking CVD medicines, Taking junk foods, Changing eating habits, Exercise to control CVD, Chest pain/discomfort in the jaw neck, Feeling week lightheaded or faint, swelling of feet and legs, Sudden trouble seeing in eyes, SOB, Sudden trouble walking dizziness or loss of balance, Diabetes, Eating more sodium in foods, Blood cholesterol, Risk score and area of residency. A Chi-square test was performed to determine the association between variables and the risk of CVD. There was a statistically significant relationship between smoking (($\chi2$=17.21, p=<.0001), alcohol consumption ($\chi2$=12.59, p=<0.001), cooking oil ($\chi2$=9.5, p=0.009), taking junk foods ($\chi2$=7.58, p=0.006),

Table 3: Risk of CVD reoccurrence through Yes/No data measurement (for 19 scores).

Q	Questions	YES (%)	NO (%)
Q1	Do you smoke cigarettes?	74(35.07)	137(64.93)
Q2	Do you experience passive smoking?	99(46.92)	112(53.08)
Q3	Do you consume alcohol?	70(33.65)	141(66.35)
Q4	Are you seriously thinking of quitting smoking and alcohol?	85(40.28)	126(59.71)
Q5	Are you currently taking medicines for your CVD?	197(93.36)	14(6.64)
Q6	Are you taking foods like fried foods, sweets, cakes, cheese, and pasta into your diet?	75(35.55)	136(64.45)
Q7	Are you changing your eating habits to help lower or control your CVD?	161(76.30)	50(23.70)
Q8	Are you exercising to help lower or control your CVD?	51(24.17)	160(75.83)
Q9	Do you experience chest pain or discomfort in the jaw, neck, or back?	163(77.25)	48(22.75)
Q10	Do you experience feeling weak, lightheaded, or faint?	106(50.24)	105(49.76)
Q11	Do you experience swelling of the feet and legs?	62(29.38)	149(70.62)
Q12	Do you experience sudden trouble seeing in one or both eyes?	70(33.18)	141(66.82)
Q13	Do you experience shortness of breath?	188(89.18)	23(10.90)
Q14	Do you experience sudden trouble walking, dizziness, or loss of balance?	97(45.97)	114(54.03)
Q15	Do you have diabetes?	62(30.33)	149(69.67)
Q16	Do you take medications regularly?	57(27.01)	154(72.9)
Q17	Are you changing your eating habits to lower or control diabetes?	50(23.6)	161(76.3)
Q18	Can eating foods high in sodium increase your risk of high blood pressure?	160(75.83)	51(24.17)
Q19	Do you check blood cholesterol to follow a heart-healthy diet?	138(65.400	73(34.60)

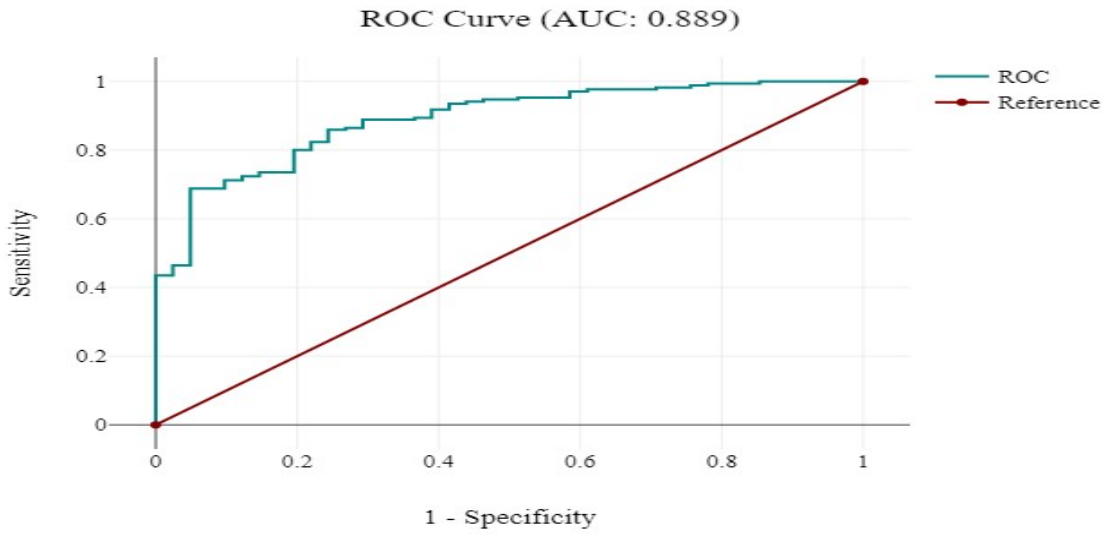

Figure 2: ROC Curve.

exercise to control CVD ($\chi2=13.65$, $p=<.0001$), chest pain/discomfort in the jaw and neck ($\chi2=10.14$, $p=0.001$), feeling week lightheaded or faint ($\chi2=6.99$, $p=0.008$), swelling of feet and legs ($\chi2=17.81$, $p=<0.001$), sudden trouble seeing in eyes ($\chi2=7.89$, $p=0.005$), SOB ($\chi2=6.4$, $p=0.011$), Sudden trouble walking, dizziness/loss of balance ($\chi2=14.34$, $p=<0.001$), eating more sodium in foods ($\chi2=5.77$, $p=<0.016$), blood cholesterol in foods ($\chi2=5.12$, $p=<0.024$), and risk score ($\chi2=162.34$, $p=<0.001$) with Risk of CVD. The calculated i-value was lower than the defined significance level of 5%. The p-value is statistically significant, and the null hypothesis is rejected. The association of variables with Risk of CVD is presented in Table 4.

Table 4: Association of variables with Risk of CVD.

Variables		Risk of CVD		χ^2 value	*p* Value
		Yes	No		
Gender	Male	117	24	1.58	0.209
	Female	53	17		
Income	1-2 Lakhs	13	6	6.45	0.488
	Upto 1 Lakhs	78	18		
	2-3 Lakhs	14	6		
	Upto 2lakhs	38	6		
	Upto 3lakhs	14	4		
	Upto 5lakhs	6	0		
	3-4 Lakhs	4	1		
	Upto 4lakhs	3	0		
CVD previously	No	93	22	0.01	0.904
	Yes	77	19		
Literate	Yes	42	13	0.84	0.359
	No	128	28		
Smoking	No	99	38	17.21	0.001*
	Yes	71	3		
Passive smoking	No	83	29	6.37	0.012*
	Yes	87	12		
Alcohol consumption	Yes	66	4	12.59	0.001*
	No	104	37		
Quitting smoking and alcohol	Yes	152	38	0.39	0.53
	No	18	3		
Cooking oil	Palm Oil	51	6	9.5	0.009*
	Sunflower Oil	116	31		
	Groundnut Oil	3	4		
Milk	Buffalo Milk	169	40	1.21	0.27
	Cow Milk	1	1		
BMI	Overweight	80	15	2.73	0.435
	Healthy	73	23		
	Underweight	5	3		
	Obese	12	3		
Currently taking CVD medicines.	Yes	156	41	3.62	0.057
	No	14	0		
Taking junk foods.	No	102	34	7.58	0.006*
	Yes	68	7		
Changing eating habits.	Yes	126	35	2.31	0.128
	No	44	6		
Exercise to control CVD.	No	138	22	13.65	0.001*
	Yes	32	19		
Chest pain/discomfort in the jaw and neck.	No	31	17	10.14	0.001*
	Yes	139	24		

Variables		Risk of CVD		χ^2 value	*p* Value
		Yes	No		
Feeling weak, lightheaded or faint.	Yes	93	13	6.99	0.008*
	No	77	28		
Swelling of feet and legs.	Yes	61	1	17.81	0.001*
	No	109	40		
Sudden trouble seeing in eyes.	Yes	64	6	7.89	0.005*
	No	106	35		
SOB	Yes	156	32	6.4	0.011*
	No	14	9		
Sudden trouble walking, dizziness or loss of balance.	Yes	89	8	14.34	0.001*
	No	81	33		
Diabetes	No	114	33	2.82	0.093
	Yes	56	8		
Eating more sodium in foods.	Yes	123	37	5.77	0.016*
	No	47	4		
Blood cholesterol	Yes	105	33	5.12	0.024*
	No	65	8		
Risk score	Moderate	161	5	162.34	0.001*
	Mild	3	36		
	Severe	6	0		
Area of residency	Village	109	31	2.93	0.403
	Main Road	57	9		
	Industrial Area	2	1		
	City	2	0		

*Statistically Significant.

Logistic regression analysis was performed to examine the influence of Age, Male, Literate, monetary, Daily worker, Housewife, Farmer, Private employee, Retired employee, No CVD Previously, Non-Smoker, Alcoholic, Palm oil, Sunflower oil, Buffalo milk, Overweight Healthy, Underweight, No Exercise, Non-Diabetic, High Salt taking and Cholesterol High Salt taking and Cholesterol Checking on variable CVD to predict the value "Diseased". Logistic regression analysis shows that the model as a whole is significant ($Chi^2(28)=76.75$, $p<.001$, $n=211$). The coefficient of the variable is b=0 and above, which is positive. This means an increase in the probability that the dependent variable is "Diseased". However, the odds ratio of 1 indicates that one unit increase of the variable increases the odds that the dependent variable is "Diseased" increases by one time. The variables age (OR=1, 95% CI=0.96-1.05), alcoholic (OR=5.06, CI=1.03-24.78), palm oil (OR=13.14, CI=0.9-191.23), sunflower oil (OR=3.53, CI=0.33-37.52), buffalo milk (OR=3.58, CI=0-7,845.56), and No exercise (OR=7.64, CI=2.43-24.04) showed an influence to higher risk in developing CVD The different variables and its risk for the development of CVD is shown in Table 5.

Risk of CVD reoccurrence based on an ejection fraction

When evaluating the likelihood of cardiovascular disease recurrence in patients, the functionality of their heart is a crucial factor to consider. One way to measure this is using the Ejection Fraction recommendations from the American Heart Association. Our findings indicate that out of the patients examined, 59 (27.9%) were classified as being at severe risk, 71 (33.6%) at moderate risk, and 81 (38.3%) at mild risk.

ROC Curve

The area under the ROC curve measures the quality of a diagnostic test in predicting the risk of reoccurrence of Cardiovascular Disease (CVD) in patients. In this study, the test yielded a value of 0.889, displayed in Figure 2.

DISCUSSION

A cross-sectional observational study was conducted in a tertiary care hospital over six months to evaluate the impact of lifestyle modifications on cardiovascular problems. Cardiovascular

Table 5: Variables causing more risk for the development of CVD.

Variable	Coefficient B	Standard error	z	p	Odds Ratio	95% CI
Age	0	0.02	0.16	.872	1	0.96 - 1.05
Male	-0.9	0.63	1.42	.157	0.41	0.12 - 1.41
Literate	-0.13	0.79	0.17	.866	0.88	0.19 - 4.08
1-2 Lakhs	-40.48	24,542.01	0	.999	0	0 - ∞
Upto 1 Lakh	-41.44	24,542.01	0	.999	0	0 - ∞
2-3 Lakhs	-40.5	24,542.01	0	.999	0	0 - ∞
Upto 2 Lakhs	-41.56	24,542.01	0	.999	0	0 - ∞
Upto 3 Lakhs	-41.69	24,542.01	0	.999	0	0 - ∞
Upto 5 Lakhs	-18.9	28,764.82	0	.999	0	0 - ∞
3-4 Lakhs	-40.47	24,542.01	0	.999	0	0 - ∞
Daily Worker	-0.46	1.21	0.38	.702	0.63	0.06 - 6.75
House Wife	-0.58	1.3	0.45	.656	0.56	0.04 - 7.2
Farmer	-0.27	1.24	0.22	.828	0.76	0.07 - 8.67
PE	-0.52	1.31	0.4	.691	0.59	0.05 - 7.77
RE	-22.31	13,225.2	0	.999	0	0 - ∞
NCP	-0.13	0.51	0.26	.796	0.88	0.32 - 2.4
Non-Smoker	-2.25	0.84	2.68	.007	0.11	0.02 - 0.55
Alcoholic	1.62	0.81	2	.045	5.06	1.03 - 24.78
Palm Oil	2.58	1.37	1.88	.059	13.14	0.9 - 191.23
Sunflower Oil	1.26	1.21	1.05	.296	3.53	0.33 - 37.52
Buffalo Milk	1.28	3.92	0.32	.745	3.58	0 - 7,845.56
Overweight	-0.4	1.15	0.35	.725	0.67	0.07 - 6.31
Healthy	-1.27	1.11	1.15	.252	0.28	0.03 - 2.47
Underweight	-1.58	1.33	1.19	.233	0.21	0.02 - 2.77
No Exercise	2.03	0.58	3.48	.001	7.64	2.43 - 24.04
Non-Diabetic	-1.03	0.61	1.69	.091	0.36	0.11 - 1.18
HST	-1.86	0.76	2.45	.014	0.16	0.03 - 0.69
CC	-0.86	0.55	1.58	.114	0.42	0.14 - 1.23
Constant	44.56	24,542.01	0	.999	-	-

Note: PE-Private Employee RE-Retired Employee NCP-No CVD Previously, HST-High Salt Taking, CC-Cholesterol Checking.

Disease (CVD) is one of the leading causes of death worldwide, affecting the main and auxiliary organs of the cardiovascular system, which includes the heart and blood vessels. More than three-quarters of CVD deaths occur in low and middle-income countries for various reasons. In India, CVD is the leading cause of death among all other causes, with the number of deaths per year increasing from 2.26 million in 1990 to 4.77 million in 2016.[2,3]

There are several factors that can contribute to the development of cardiovascular disease, such as age, gender, poor education, and the adoption of unhealthy lifestyles. Additionally, socioeconomic status, low levels of risk factor awareness among the general public, poor treatment adherence, tobacco use, abnormal lipid profiles with high cholesterol levels and the presence of chronic diseases such as hypertension, diabetes, and metabolic syndrome, as well as dietary practices can also increase the risk of CVD. Targeting these risk variables in high-risk groups and community settings has resulted in positive outcomes.[4]

Of 211 patients, 141 males (66.8%) were more affected in the study than 70 females (32.2%). Similar findings were also reported by Prasanna Dahal *et al.*; in their research, males, with 61.54%, were more prone to CVD than females.[7-9] Causes are men tend to have more challenging jobs and stress, excessive smoking, alcohol consumption, and maintaining of estrogen levels up to menopause delays the atherosclerotic diseases in women compared to men. The study also stated that age gradually increases the incidence

of CVD. Similar findings were also reported by Rodgers JL *et al.*, and age is one of the independent risk factors for causing cardiovascular diseases due to physiological changes in the heart and blood vessels and multiple co-morbidities like BP, DM, etc. The American Heart Association (AHA) reports that the incidence of CVD in US men and women was approximately 40% from 40-59 years, approximately 75% from 60-79 years, and approximately 86% in those above the age of 80. The economy of the patients is presented in Table 1, and similar studies by Lemstra M *et al.* stated that household income was strongly and independently associated with heart disease. CVD may be because of poor nutrition, lack of knowledge regarding health and more working hours.[10,11]

Out of 211 patients, Patients previously suffered from CVD's 96 (45.5%), and patients did not have any CVD previously 115 (54.5%). Reason behind this poor knowledge of symptoms and risk factors. In total 211 cases, 156 (73.93%) were illiterates and 55 (26.07%) were literates. Similar findings were also reported by Dahal P *et al.* In their study, out of 91 patients, Illiterates 52(57.14%) is more affected than literates 30(32.96%). This strengthens the fact that there is a lack of awareness regarding health risks.[7] Out of 211 cases, 95 (45.02%) was overweight, 93 (44.08%) was healthy, 15 (7.11%) was obese and 8 (3.79%) were under weight. Similar findings were also reported by the Bishops AC *et al.*; the study concluded that the prevalence of important CVD risk factors in the country is overweight. Dahal P *et al.* concluded that Patients with high BMI (>25 kg/m^2) are associated with an increased risk for CVD.[7,12] Causes of elevated BP, high cholesterol levels, insulin resistance and excess body weight can lead to inflammation and strain on the heart. Out of 211 patients, 86(40.76%) were Farmers, 69(32.7%) were Daily workers, 24(11.37%) were House wives, 18(8.53%) were Private employees, 11(5.21%) were Government employees and 3(1.42%) were Retired employees. The reasons are unhealthy diet, long working hours, pesticide exposure, financial problems, and limited access to health care.

Prescription patterns in cardiovascular disease patients were monitored for medication distribution and rationality. The clinicians adhere to the guidelines and prescribe drugs to the patients; the most commonly prescribed drug categories are antiplatelets, anticoagulants, diuretics, etc. Out of 211 patients, 145(68.7%) were treated with aspirin, 109(51.6%) were treated with clopidogrel, 115(54.5%) were treated with atorvastatin, 35(16.5%) were treated with furosemide. and others. Similar findings were also reported by Raksha MA *et al.* They concluded that out of 1011 patients, 149(14.8%) were treated with Aspirin, 117(11.6%) were treated with Clopidogrel, 108 (10.7%) were treated with Furosemide. In another study by Thomas BR *et al.*, Out of 199 cases, 93 (46.03%) were prescribed Aspirin, and 83(41.40%) were treated with Clopidogrel. Regular monitoring of side effects and effective strategies must be implemented to improve patient compliance and achieve a better outcome. The prescription pattern reveals that physicians followed the guidelines to treat cardiovascular patients to reduce the illness.[13,14]

A total of 22 drug interactions were shown. Out of 22, 3 were significant drug interactions. Among all drug interactions, the majority were between Aspirin and Clopidogrel. Similar findings were also reported by Khan MZ *et al.* A total of 842 pDDIs were identified in 155 patients. Among identified pDDIs, 41.33% are major, and 56.65% are moderate. Most pDDIs were between aspirin-bisoprolol 98(11.64%) and aspirin-clopidogrel 95(11.28%). In Ismail M *et al.* In frequency 100 pDDIs in CVD. Among these, 52 were Moderate, and 40 were major pDDIs in the cardiology ward. Healthcare providers should be quite vigilant about the effects and management of pDDIs. The drug interaction causes ineffective or antagonized other drugs causes' therapy failure, leading to a risk of reoccurrence of CVD. The best example from the study was between aspirin and ticagrelor causes reduce the effectiveness of Ticagrelor. Ticagrelor is an antiplatelet drug that makes the blood flow easily through the blood vessels.[15,16]

The risk of reoccurrence questionnaire is a yes or no type of data measurement questionnaire. Out of 211 patients, 126(59.71%) are unwilling to quitting of smoking and alcohol; these patients are at high risk of CVD. Similar results were found by Khan SS *et al.*, who reported the occurrence of a fatal CVD event as the first presentation of CVD in those who reported smoking compared with those who did not. Out of 211 patients, 99(46.9%) were exposed to passive smoking, and 112(53%) were not exposed to smoking. Similar studies found that Sadeghi M *et al.* stated that the association between second-hand smoke exposure and CVD was distinctly stronger among Chinese than Americans.[17,18]

Out of 211patients, 70(33.1%) were alcoholics and 141(66.8%) were non alcoholics. A similar study was done by Larsson SC *et al.*, which concluded that there is a causal relationship between higher alcohol consumption and increased risk of stroke and peripheral artery disease. 160(75.83%) did not perform any physical activity, so there is a high chance of CVD. 163(77.25%) patients experienced to chest pain and discomfort in the jaw.188(89.18%) patients are exposed to SOB. The same findings were seen in Barnett LA *et al.*, who concluded that modifiable patient characteristics are associated with the experience of chest pain and SOB. Identified symptom trajectories may facilitate tailored care to improve outcomes in patients with CVD. In our study, out of 211 patients, 64(30.3%) were diabetic and 147(69.6%) were non-diabetic. Similar findings were found in that Ivor J. Benjamin *et al.* stated that diabetes acts as an independent risk factor for several forms of CVD. To make matters worse, when a patient with diabetes develops clinical CVD, they sustain a worse prognosis for survival than do CVD patients without diabetes.[18-21] Maahs DM *et al.* This study stated that a two to10 fold increase in rates of CAD and death resulted in type 1 diabetes. Data for adults with diabetes

from the Framingham heart study indicates that CVD mortality is three times higher compared with non-diabetics. In our study, out of 211 patients, 147(69.6%) consumed sunflower oil, 57(27%) consumed palm oil, and 7(3.3%) consumed groundnut oil for cooking purposes. So sunflower oil is preferred over palm oil and ground nut oil because it is low in saturated fat and is high in Mono-Unsaturated Fatty Acid (MUFA) and Polyunsaturated Fatty Acid (PUFA). Similar studies found by Mishra S *et al*. stated that mustard oil and rapeseed oil were preferable compared to other edible oils as they are low in saturated fat and high in MUFA and PUFA.[22,23] 160(75.83%) patients consumed more amount of salt in their food items. Chalbicz M *et al*. also stated that the percentages of the general population's low, moderate, high, and very high CV risk classes are 46.1%, 22.8%,13.5%, and 17.6%, respectively. This suggests that applying general primary prevention principles, including weight loss, diet modification, smoking cessation, and exercise, could produce better results to control CVD.[24] In Negesa LB *et al*., these reports concluded that synchronic counselling, nurse-led lifestyle and educating people about primary CVDs and measures to treat at early stages. And finally, the implementation of innovative interventions to control CVD.[25] Khanam F *et al.* concluded that risk factors such as HTN, DM, obesity, limited physical activity, smoking, extra salt intake, smoking, and sleep deprivation increase CVD prevalence. Out of 211 patients, 75(35.5%) were eating junk food, and 136(64.4%) were not consuming junk food. Similar studies were done by Sigal Eilat-Adar *et al*., and they concluded that the Mediterranean diet and DASH diet, which contains a variety of vegetables, fruits, legumes, and whole grains, and low-fat diet reduce cardiovascular morbidity and mortality in both first and second-degree prevention.[26,27]

The clinical pharmacist can assist the prescriber in prescribing patients with co-morbidity by offering optimum personalized patient management and care. The clinical pharmacist plays an essential role in correcting prescriptions in terms of dosage regimens, medication errors, Drug-drug interactions, appropriateness of medication with the usage of guidelines, and providing patient counselling for proper adherence. The clinical pharmacist could increase the efficacy and safety of the drug to reduce disease and prolong hospitalization. Thus, the clinical pharmacist is the most needful healthcare personnel and stakeholder to improve patient outcomes. The following issues aid in understanding the various risk factors and consequences of increased cost burden in geriatrics.[28-41]

Cross-sectional studies are usually inexpensive and easy to conduct, which is helpful in establishing preliminary evidence when planning a future advanced study. Data on all variables are only collected at one point in time. In our studies, we used both qualitative and quantitative questionnaires, which are suitable for an in-depth understanding of the problem. In quantitative data, the results were precise. In a cross-sectional study, the outcome and exposure variables are measured simultaneously, and it is relatively complex to establish a causal relationship from a cross-sectional study. The weaknesses of cross-sectional study include the inability to assess incidence and study rare diseases.

CONCLUSION

We concluded that according to the questionnaire, six patients (2.84%) had severe risk, 166 patients (78.6%) had moderate risk, and 39 patients (18.48%) had mild risk. Fifty-nine individuals (27.9%) were at risk, according to the American Heart Association's Ejection Fraction recommendations. Furthermore, alcohol, palm oil, sunflower oil, buffalo milk, and a lack of exercise were the main risk factors for the development of CVD disease. Moreover, we found that some pharmacological interactions raised the risk of CVD development due to changes in concentration. The patients were at risk of developing CVD disease. Lifestyle modifications are needed to reduce the progression of CVD. The patients were unable to follow or receive advice from the healthcare professional. Clinical pharmacist intervention assistance is required to improve the quality of life of CVD patients, halt the further progression of the disease, and counsel the patients concerning the same.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

AHA: American Heart Association; **BMI:** Body Mass Index; **CC:** Cholesterol Checking; **CVD:** Cardiovascular disease; **HST:** High Salt Taking; **MUFA:** Mono-unsaturated fatty acid; **NCP:** No CVD Previously; **OR:** Odd ratio, **pDDI:** Potential drug-drug interaction; **PE:** Private Employee **PUFA:** Polyunsaturated fatty acid; **RE:** Retired Employee; **ROC curve:** Receiver operating characteristic curve; **SOB:** Shortness of breath.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Santhiram Medical College institutional ethics committee approved the study under the permission number IEC/2022/036. An informed consent form was obtained from the individuals who wanted to participate in this study before they filled the questionnaire.

SUMMARY

The research study determines the risk of reoccurrence in CVD patients based on questionnaires, drug interactions and ejection fraction. The study was a cross-sectional hospital-based observational study. The study used a questionnaire containing qualitative queries, quantitative queries, and prescription drugs to identify the drug interactions and ejection fraction parameters to determine the risk of reoccurrence of CVD problems in CVD patients. According to the questionnaire, out of 211 patients, six patients (2.84%) had severe risk, and 59 individuals (27.9%) were at risk, according to the American Heart Association's Ejection Fraction recommendations. Four individuals (1.8%) were more at risk based on the drug interactions. Furthermore, alcohol (OR=5.06, 95% CI=1.03 -24.78), palm oil (OR=13.14, 95% CI=0.9-191.23), sunflower oil (OR=3.53, 95% CI=0.33-37.52), buffalo milk (OR=3.58, 95% CI=0-7,845.56), and a lack of exercise (OR=7.64, 95% CI=2.43-24.04) were the main risk factors for the development of reoccurrence of CVD disease. Further smoking (χ^2=17.21, p=0.001), passive smoking (χ^2=6.37, p=0.012), alcohol (χ^2=12.59, p=0.001), cooking oil (χ^2=9.5, p=0.009), junk food (χ^2=7.58, p=0.006), lack of exercise (χ^2=13.65, p=0.001), eating more sodium in foods (χ^2=5.77, p=0.016), and blood cholesterol (χ^2=5.12, p=0.024), have association with risk of CVD. The patients could not follow or receive advice from the healthcare professional concerning lifestyle modifications. For every CVD problem, the patient must understand the risk and avoid what was causing reoccurrence.

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