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ASSESSMENT OF NUTRITIONAL STATUS OF ADULTS WITH CARDIOVASCULAR DISEASES

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ABSTRACT

The study was conducted in 2024 to assess the nutritional status, food habits and management of CVD among adults. A purposive random sampling method was employed to select respondents.Based on the study's objective, a suitable, pre-structured questionnaire was designed to collect information. The questionnaire comprised socio-demographic data, anthropometric data, biochemical parameters, clinical signs and symptoms, dietary data, diagnosis and treatment and management of CVD. Hundred participants residing in Bengaluru, within an age group of 40 to 65 years with cardiovascular complications were included in the research. The data collected was analysed through statistical analysis as a percentage, standard deviation and chi-square test. The majority of the respondents (86%) were of the age group between 40-59 years. The data on the education levels of the respondents revealed that 44 percent of them were graduates and the majority of the respondents (64%) were from the nuclear family. The family history of cardiovascular diseases revealed that 54 percent of respondents were with no family history**.** Most of the respondents (54%) were overweight followed by 22 percent of the respondents who were in the obese class I category indicating a prevalence of obesity among the respondents. Being physically inactive is recognized as one of the most significant risk factors for CVD which strongly supports the results**.** A higher number of the respondents (53%) were non vegetarians and 53 percent and 48 percent of them were with diabetes and hypertension respectively. The elevated levels of triglycerides and LDL with low levels of HDL might be the strong link for the development of CVD**.** Seventy nine percent of the respondents had Coronary Artery Disease (CAD) and heart failure and had undergone angioplasty and Coronary Artery Bypass Grafting (CABG). Non vegetarians (52%) had a maximum occurrence of CAD compared to other types of diet, however, the P value indicated that there was no statistically significant association between the type of diet and occurrence of CVD. The chi-square test indicated that there is no statistically significant association between BMI and CVD (since P is 0.234 > 0.05) even though the obese respondents had a higher percentage of cardiovascular disease.

Keywords: Cardiovascular disease,Lifestyle changes, Management, Nutritional status.

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INTRODUCTION

Non Communicable Diseases (NCD) are one of the main causes of major public health concern. Non Communicable conditions are listed by the World Health Organisation (WHO) as the principal cause of death worldwide. As a result of rapid urbanization and changes in lifestyle; the epidemiological health transition has taken place; which has led to an overall economic rise, but with certain associated flip sides (risk factors) like growing burden of NCDs (WHR, 2023).

Among this, WHO (2024) pointed out that cardiovascular diseases (CVD) accounted for most NCD deaths, or at least 19 million deaths in 2021, followed by cancers (10 million), chronic respiratory diseases (4 million) and diabetes (over 2 million including kidney disease deaths caused by diabetes).

CVD is a class of diseases that affect the heart or blood vessels, which have now become the leading cause of mortality contributing to the global burden of disease among NCDs. The causes of CVD can be attributed to hereditary and acquired risk factors, including the current epidemic pathological risk factors of smoking, diet, physical inactivity and hypertension at both the individual and community level and socio-economic status. Diet, nutrition and physical activity are key modifiable determinants of CVD, potentially influencing the risk of developing the disease by modulating blood pressure, blood levels of lipids, inflammation and fasting glucose as well as functions of the heart (Prabhakaran *et al.,* 2016).

CVDs are the leading cause of mortality and a major contributor to disability. Cardiovascular disease needs a person-centered model of attention that offers primordial and primary prevention in adults older than 40 years and secondary prevention to middle-aged adults. Cardiovascular diseases are now the main causes of death in India, with factors comprising urbanization, lifestyle, diets and improved longevity. The risks to this population are high due to the combined effect of these factors, especially in the middle-aged adult population that ranges from 40 to 65 years. Hence, an attempt had been made with an objective to assess the nutritional status, food habits and management of CVD among adults.

MATERIAL AND METHODS

Based on the objective of the study, a suitable pre-structured questionnaire was designed to collect information. The questionnaire was validated by the experts in the field of Food and Nutrition and by the statistician. The developed questionnaire comprised five different parts, namely, Socio-demographic data, Anthropometric measurements, Biochemical parameters, Food habits, Dietary status and Diagnosis and treatment. The respondents' Socio-demographic information like name, gender, age, education level, employment status, family income and type of family was included. The Anthropometric information included the record of height and weight and BMI was calculated.

The important biochemical markers that assess the absolute status of the heart and cardiovascular risk such as blood pressure, lipid profile (total cholesterol, LDL, HDL, and triglyceride) and blood sugar, were gathered from newly admitted patients from the hospital. Similarly information on dietary habits, consumption frequency of different foods, diet modifications and challenges in maintaining diet were collected. The type of cardiovascular disease faced by the respondents was recorded and questions regarding health-related complaints and challenges faced by the respondents were noted. The information on clinical signs and symptoms, diagnosis and

treatment were also collected using the questionnaire. A purposive random sampling method was used to identify respondents and the data collection was done during the year 2024. The participants who were residing in Bengaluru under an age group of 40 to 65 years with cardiovascular complications were included in the research. The respondents who were younger than 40 years or more than 65 years are excluded from the study as the purpose of the study is to focus on middle-aged individuals. The study was limited to 100 respondents from the hospitals of Bengaluru city. The samples were selected by obtaining prior permission from the respective hospital authorities and respondents' consent. The data was collected through appropriate methods and collected data was compiled and statistically analyzed using frequency, percentage and chi-square methods.

RESULTS AND DISCUSSION

Table 1 depicted the demographic data of the respondents, the majority of the respondents (86%) belonged to the age group between 40-59 years, with female respondents as 54 percent and male respondents as 46 percent. Regarding education levels of the respondents, 44 percent of them were graduates, 25 percent were Intermediate and

Table1.Socio-demographic profile of the respondents

n=100

Socio-demographic parameters		No.of respondents(n)	Percentage(%)
Age	40-49 years	41	41.0
	50-59 years	45	45.0
	60-64 years	14	14.0
Gender	Male	46	46.0
	Female	54	54.0
Education level	Illiterate	4	4.0
	Up to 10^{th}	14	14.0
	12^{th}	25	25.0
	Graduate	44	44.0
	Post-graduate & above	13	13.0
Employment status	Employed	50	50.0
	Homemaker	39	39.0
	Retired	4	4.0
	Others	7	7.0
Type of family	Joint family	36	36.0
	Nuclearfamily	64	64.0
Family history of cardiovascular disease	Yes	46	46.0
	No	54	54.0

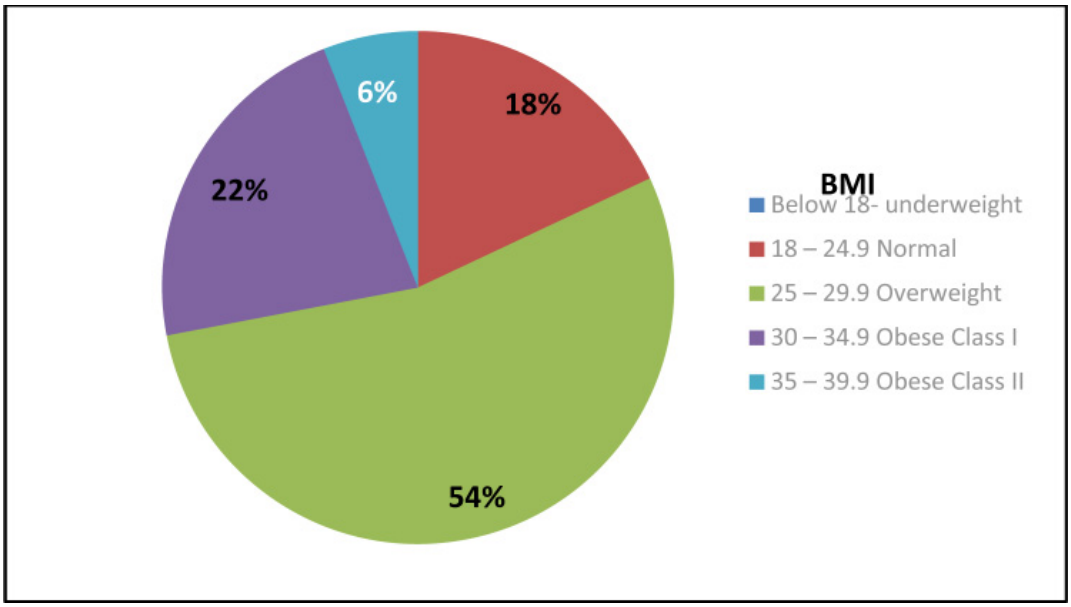

Fig. 1. BMI of the respondents(n=100)

the least percent were illiterates. Fifty percent of the respondents were employed, whereas 39 per cent were homemakers. The majority of the respondents (64%) were from the nuclear family whereas 36 percent of them stayed in a joint family. The family history of cardiovascular diseases revealed that 54 per cent of respondents had no family history and 46 percent of the respondents had a family history. Contradictory to the present study, Kundu and Kundu (2022) revealed that the risk of having CVD was 0.5 times less among individuals without a family history of CVD.

The present study revealed that with aging, there is an incremental acquisition of several CVD risk factors in an individual's lifespan. The results showed that more than half of the subjects didn't have a family history of CVD, which indicated the prevalence of CVD among the subjects was due to changes in lifestyle, which may have led to occurrence of CVD.

Fig. 1 dipicts the BMI data of the respondents. The mean height of the respondents was found to be 160.48 cm and the mean body weight of the respondents was 72.370 kg, with a relatively higher variability, reflected by an SD of 12.491 kg. Most of the respondents (54%) were overweight followed by 22 percent of the respondents who were in the obese class I category indicating a prevalence of obesity among the respondents. It showed 82 percent of the respondents were having higher BMI than normal. Among the respondents, no one belonged to the category of underweight. Highest prevalence risk factor for CVD was reported as central obesity (78.2%), followed by 23.9% of overweight and obesity (Behera *et al.,* 2024). prevalence of obesity and overweight was 60% and 20%, respectively among 30-45 years aged CVD patients (Prasad *et al.,* 2024).

Being physically inactive is recognized as one of the most significant modifiable risk factors for cardiovascular morbidity and mortality. Loss of weight by the obese results in a considerable reduction in the work of the heart because the basal metabolism is at a lower level. Slowing down of the heart rate, a drop in blood pressure and thereby improving cardiac efficiency leads to lower incidence of CVD.

Table 2. Medical history of the respondents

n=100

Medical history		Number of respondents(n)	Percentage(%)
Diabetes	Yes	53	53.0
	No	47	47.0
Hypertension	Yes	48	48.0
	No	52	52.0

Table 2 provides the medical history of the respondents; 53% of the respondents were diabetic and 48% of the respondents had a history of hypertension. Most of the studies indicated that the individuals with a medical history of hypertension and diabetes were more likely to develop CVD themselves.In the present study, only half of the respondents were with medical history of either hypertension or diabetes, showed the presence of other risk factors which compounded for CVD. Kundu and Kundu (2022) found that physical inactivity was a major cause of CVD whereas diabetes and high cholesterol had a stronger association with CVD among older adults. Sverre *et al.,* (2021) concluded that hypertension is one of the strongest risk factors for almost all different cardiovascular diseases including coronary artery disease, stroke, heart diseaseand arrhythmia acquired during life. People with metabolic disorders, such as insulin resistance, diabetes and cardiometabolic syndrome, often exhibit a significant prevalence of hypertension, which is a strong contributor to the risk of CVDs (Zakir *et al.,* 2022).

The biochemical parameters of the respondents depicted in Table 3. The mean value of total cholesterol is 179.38 mg/dL which was within the normal range (less than 200 mg/dL). The mean value of triglycerides and low-density lipoprotein (LDL) were 178.498 mg/dL and 113.974 mg/dL respectively which were higher than the normal ranges (Triglycerides-below 150 mg/dL, LDL- below 100 mg/dL) whereas the mean value for high-density lipoprotein (HDL) is 37.370 mg/dL which was lesser than the normal range.

According to a survey in Punjab, 27% of adults have high levels of cholesterol or TGs. Specifically, 9.8% have high cholesterol levels and 21.6% have high TG levels. (Tripathy *et al.,* 2017). The development of Congenital Heart Disease (CHD) is significantly influenced by lipid dysfunctions such as elevated levels of total cholesterol, LDL, Very LDL (VLDL) cholesterol and triglycerides (TGs), as well as decreased levels of HDL cholesterol (HDL-C). In particular, an increase in LDL cholesterol is

Table 3. Bio chemical parameters of the respondents

n=100

Parameters	Mean± SD
Totalcholesterol (mg/dL)	179.38± 47.4
Triglycerides(mg/dL)	178.498± 152.7
LDL(mg/dL)	113.974± 39.8
HDL(mg/dL)	37.370± 9.3

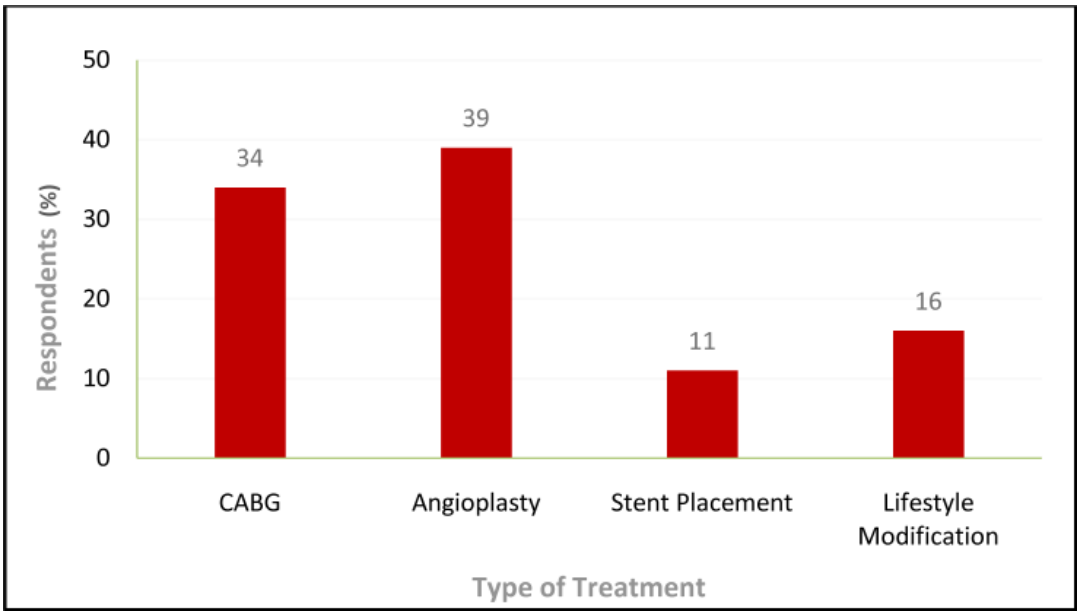

Fig. 2. Diagnosis of cardiovascular disease of the respondents (n=100)

strongly linked to the onset and advancement of CVD (WHO, 2018).

The elevated levels of triglycerides and LDL with low levels of HDL might be the strong link for the development of CVD.

Fig. 2 represented the data on the diagnosis of different types of CVD among respondents, The majority of the respondents (41%) were diagnosed with coronary artery disease followed by 38 percent of the respondents who were with heart failure and 12 percent of the respondents diagnosed with arrhythmia. The least percent of the

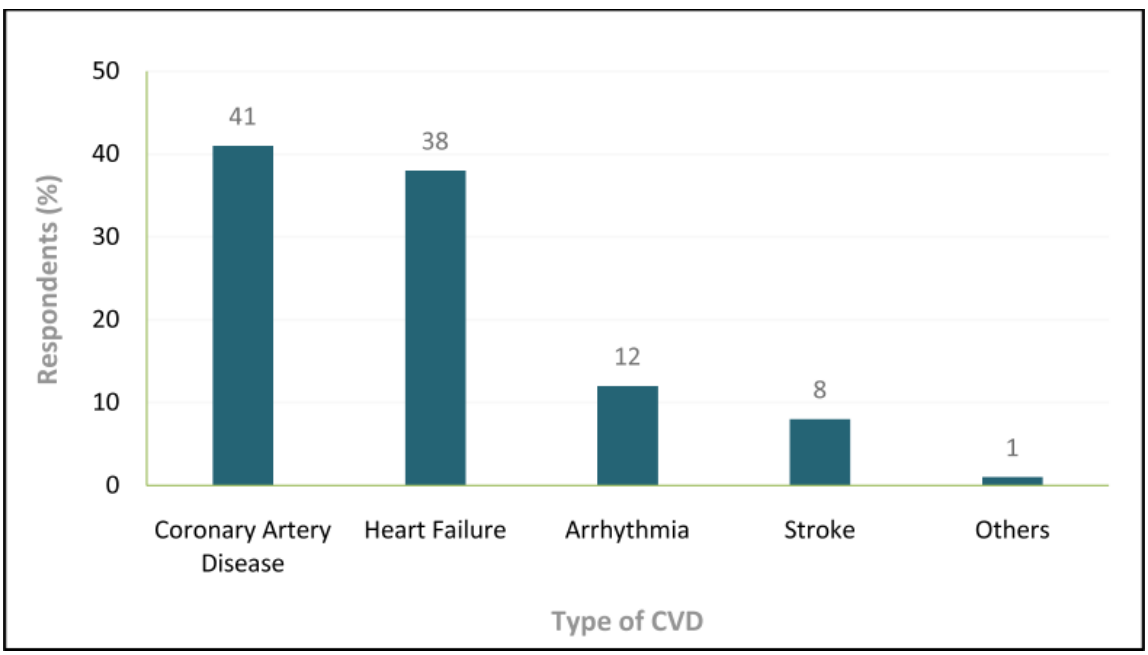

Fig. 3. Treatment for cardiovascular diseases of the respondents (n=100)

respondents (9 %) were diagnosed with stroke.

Fig. 3 described the treatment for cardiovascular disease undergone by the respondents. 39 percent of respondents have been treated with angioplasty, 34 percent of the respondents have done Coronary ArteryBypass Grafting (CABG), whereas 16 percent of the respondents were treated with lifestyle modification and medication. Eleven percent (11%) of the respondents had stent placements.

Table 4 revealed the dietary habits of the respondents. A maximum number of respondents (53%) were non-vegetarians followed by 32 percent vegetarians and ovo-vegetarians were of 15 percent. Forty one percent of non-vegetarian respondents used

Table 4.Dietary habits of the respondents

n=100

Dietaryhabits		No.of respondents(n)	Percentage(%)
Dietary pattern	Vegetarian	32	32.0
	Non-vegetarian	53	53.0
	Ovo-vegetarian	15	15.0
	Lacto-ovovegetarian	0	0
Frequency of Non veg consumption	Never	47	47.0
	Oncea week	8	8.0
	Thriceaweek	41	41.0
	Occasional	4	4.0
Meals consumed/ day	2 meals	15	15.0
	3-4meals	83	83.0
	Morethan 4 meals	2	2.0
Smoking	Yes	42	42.0
	No	58	58.0
Frequency of smoking	1-3sticks/day	24	24.0
	4-7sticks/day	17	17.0
	Morethan8 sticks/day	1	1.0
	Never	58	58.0
Alcohol	Yes	28	28.0
	No	72	72.0
Frequency of alcohol consumption	Daily	2	2.0
	Weekly	9	9.0
	Monthly	12	12.0
	Occasionally	5	5.0
	Never	72	72.0

to consume non veg thrice a week and 8 percent of them had a habit of consuming non veg once a week. Maximum number of respondents (83%) used to have 3 meals a day. The smoking habit was found among 42 percent of the respondents with 3-4 sticks per day as the frequency of smoking. Smoking is one of the leading risk factors for coronary heart disease, heart attack and stroke. Smoking causes a build-up of a fatty substance (plaque) in the arteries, which eventually leads to a hardening of the arteries (Zakir *et al.,* 2022). Alcohol consumption was not a regular habit among the respondents, only 28 percent of them used to drink with a frequency of once in a month (12%). Kaur *et al.,* (2019) found that smoking was one of the main risk factors for CVD among men, which was associated with a 1.6-fold increased risk whereas alcohol consumption was associated with a 1.7-fold increased risk however it was not significant.

Thus, World Health Organization recommends 5 portions of fruits and vegetables a day, whole grains and nuts, less than 10% of total energy intake from free sugars, less than 30% of total energy intake from fats (less saturated and trans-fats) and less than 5 g of iodized salt every day (WHO, 2018) for cardiovascular health along with physical activity of moderate intensity for at least 150 minutes in a week.

Table 5 depicted the association between BMI and the occurrence of CVD. The occurrence of Coronary artery disease (CAD) was found majorly (41.0%) followed by heart failure (38.0%) and arrhythmia (12.0%) irrespective of the range of BMI. The overweight and obese class I category together had the maximum percentage of occurrence of CAD, heart failure, arrhythmia and stroke. However, the P value indicated that there was no statistically significant association between BMI and the occurrence of CVD. Xue *et al.,* (2024) revealed that the coexistence of central obesity and high BMI exhibited a significant correlation with CVD incidence, encompassing both heart disease and stroke, exhibiting a stronger association than either central obesity with normal BMI or normal waist circumference with high BMI.

Table 6 presents the association between Diet and CVD. The occurrence of CAD was found majorly (41.0%) followed by heart failure (38.0%) and arrhythmia (12.0%) irrespective of the type of diet. Non vegetarians had a maximum occurrence of CAD compared to other types of diet and a similar trend was observed concerning the occurrence of heart failure, arrhythmia and stroke. However, the P value indicated that there was no statistically significant association between the type of diet and the occurrence

Table 5. Association between BMI and occurrence of Cardiovascular Disease (CVD)

BMI	CVD				P Value
	CAD n (%)	Heart failure n(%)	Arrhythmia n(%)	Stroken (%)	
18 – 24.9	10(24.4%)	7(18.4%)	0 (0.0%)	1(12.5%)	**0.234**
25 – 29.9	19(46.3%)	20(52.6%)	10 (83.3%)	5(62.5%)	
30–34.9	11(26.8%)	6(15.8%)	2(16.7%)	2(25.0%)	
35–39.9	1(2.4%)	5(13.2%)	0 (0.0%)	1(0.0%)	
Total	41 (41%)	38 (38%)	12(12.0%)	9(9.0%)	

Table 6. Association between Diet and CVD

Diet	CVD				P Value
	CAD n (%)	Heart failure n(%)	Arrhythmia n (%)	Stroke n(%)	
Vegetarian	14(34.1%)	14 (36.8%)	2 (16.70%)	2(22.2%)	**0.949**
Non-vegetarian	21(51.2%)	18 (47.4%)	8 (66.7%)	5(55.5%)	
Ovo-vegetarian	6 (14.6%)	6 (15.8%)	2 (16.7%)	1(11.1%)	
Total	41 (41.0%)	38(38.0%)	12(12.0%)	9(9.0%)	

of CVD. This was supported by Vinay *et al.,* (2020) who concluded that vegetarians found a beneficial association with coronary heart disease risk factors compared to omnivores. Khatun *et al.,* 2021 revealed that consumption of junk foods is associated with a significantly higher risk of coronary artery diseases. On the contrary, the consumption of fish, fruits, fresh vegetables and fat-free yogurt has protective effects on CAD while beef and eggs have a role in increasing the risk of CAD. There is no one-size-fits-all approach to improving cardiovascular health globally. Every population is susceptible to different risk factors based on where they live and their lifestyles (WHR, 2023). Lifestyle changes like smoking cessation, healthy eating, restricted fat intake, exercise and managing diabetes, blood pressure and stress, can greatly reduce the chance of CVD.

Table 7indicates the association between triglyceride levels and the occurrence of CVD. The maximum median value of triglycerides level was found with heart failure (156 mg/dL) with interquartile ranges from 114 mg/dL to 190 mg/dL, whereas the median value of CAD was found to be144 mg/dL with interquartile ranges from 95.25 mg/dL to 178.50 mg/dL. The lowest median value of 122 mg/dL was in stroke with interquartile ranges from 100 mg/dL to 374 mg/dL. However, the P value is 0.155, indicating that there is no statistically significant association between CVD and triglycerides.

Similar results were obtained by Khatun *et al*. (2021) found that cardiovascular risk factors, such as total cholesterol, triglycerides, LDL, HDL and high blood pressure were strongly related to CAD and concluded that Hypertriglyceridemia and high levels of LDL-cholesterol were prevalent in most CHD patients (99%) while half of the control patients showed hypertriglyceridemia and one-fifth had high concentrations of LDL-cholesterol. Another study by Deshmukh and Chavan (2020) concluded that patients with ischemic heart disease are associated with significantly

Table 7. Association between Triglycerides and CVD

Triglycerides (mg/dL)	CVD				P Value
	CAD	Heartfailure	Arrhythmia	Stroke	
Median	144	156	211	122	**0.155**
IQR	95.25-178.50	114 -190	100-374	97.75-207	

higher levels of serum Total Cholesterol, Total Triglycerides and LDL-Cholesterol. Another study conducted by Behera *et al.,* 2024 revealed that the highest prevalent risk factor for cardiovascular diseases was reported to be central obesity followed by overweight/ obesity, oral contraceptive use, raised blood pressure, raised blood sugar and tobacco use.

CONCLUSION

The present study revealed that the majority of the respondents (82%) were overweight to obese, most of the respondents (53%) were non vegetarians and fifty percent of them had diabetes and hypertension. A higher number of the respondents (79%) had CAD and heart failure and had undergone angioplasty and CABG treatment. The obese respondents had a higher percentage of CVD and non- vegetarians had a higher occurrence of CVD, though the associations were non-significant.

A higher prevalence of overweight and obesity added with other non-communicable diseases are the major risk factors among middle-aged and older respondents. This manifests alarming public health concerns and threat to a healthy future. Identifying and managing these risk factors with proper diet and health care can significantly reduce the incidence of CVD and enhance the quality of life, especially for middle-aged and older adults in India. Nutrition education, health promotion activities, early diagnosis and initiatives to manage CVD and related complications can play a key role in controlling and managing Cardiovascular Diseases.

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