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A CROSS-SECTIONAL STUDY OF SEVERITY OF CAD AND DIETARY PATTERNS IN A TERTIARY MEDICAL COLLEGE HOSPITAL IN GOA

Medicine	
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ABSTRACT

Background: Cardiovascular Diseases are the major killers globally. There is a significant relation between modern day lifestyle and some of the risk factors of Cardiovascular Diseases, dietary patterns and food habits are intrinsic to this. Objectives: To study the association between dietary factors and coronary artery disease. Material & Methods: Nine hundred and seventy eight patients who presented to Department of Cardiology, Goa Medical College for coronary angiography were interviewed by trained medical interns using a semi-structured questionnaire. The data was analysed in SPSS for windows, version 22, and presented as proportions. Chi-square test at 95% confidence level was used to test if the difference between proportions was statistically significant. Results: Majority of the patients followed a non-vegetarian diet and the patterns of CAD as diagnosed by coronary angiography did not differ significantly between the vegetarians and non-vegetarians. A statistically significant association was observed between consumption of artificially sweetened carbonated beverages, red meat and outdoor snacking; and the severity of CAD. Those who consumed these items more frequently were more likely to have a severe CAD on coronary angiography. The statistical association between the frequency of consumption of major meals outdoors, chicken and pork was not statistically significant. Conclusion: Excessive consumption of artificially sweetened carbonated drinks, red meat and outdoor snacking has a negative influence on cardiac health. In the light of potential bias due to other confounding variables, indirect associations, recall and temporality of association the findings may be interpreted with caution.

KEYWORDS

Coronary artery disease, dietary pattern

INTRODUCTION

Cardiovascular Diseases, of which Coronary Artery Disease is the main component and associated atherosclerotic diseases are the number one killers globally. Chronic Stable angina, Acute Myocardial Infarction or Ischaemic cardiomyopathy resulting into chronic Heart Failure are clinical Manifestations of Coronary Artery Disease. It is the chief cause of death, disability and suffering worldwide. [1] Diabetes Mellitus, Hypertension, Family History, Smoking, Dyslipidaemia, Metabolic Syndrome and Obesity are recognised as conventional Risk factors for developing Ischaemic Heart Disease. The Modifiable Risk factors have relation to Individual's Lifestyle and habits. Among various Lifestyle related factors, lack of exercise and Food habits are most relevant. It is obvious that, the consumption of food is closely linked to the control of Diabetes Mellitus and Hypertension and has direct relation to obesity and Dyslipidaemia.

India is already recognised as the Diabetic capital of the World. Coronary Artery Disease is the leading cause of Death in India too. With Rapid Globalisation, there is a significant change in the food habits of the Indian Population. There are not too many studies showing relation between food habits and Coronary Artery Disease in the Indian population. Certain food Habits like incorporating Green Leafy Vegetables and consumption of Mustard Oil has been found to have favourable effect on the Cardiac Health of Individuals in India. [2] Ultra processed foods also have linkage to Obesity and Metabolic Syndrome. Whether this linkage is primarily due to the Nutrient content of the food or just the process of ultra processing, needs to be studied further.

The consumption of processed foods began in the western countries, this trend and tendency has spilled over into middle to low income countriesas well, which has affected traditional eating patterns and behaviours. [3] Certain occupations like professional Drivers, spend time away from home and have to consume readymade and reasonably

economical food.[4]

In this paper we attempt to look at the relationship between food habits including frequency of outdoor meals and snacking, and the severity of coronary artery disease in patients undergoing coronary angiography at a tertiary care centre in Goa, India.

MATERIALS AND METHODS

Study Design: Cross-sectional Study

Study Setting: Department of Cardiology, Goa Medical College- the only government tertiary medical institution in Goa

Study Period: July 2018 to February 2019

Study population: All the patients with an Ischemic Heart Disease who reported to the department for a coronary angiography were included in the study.

Sample Size: Nine hundred and seventy eight consecutive individuals fulfilling the inclusion criteria

Data Collection: data collection was done by trained medical interns using a semi-structured questionnaire which invited for the following details-

1) Socio demographic profile: It comprised of information such as age, sex, residence, religion, marital status, education, occupation,per capita income.

2) Dietary pattern questionnaire: This broadly included calorie intake per day, percentage of carbohydrates, protein and fat in the diet, frequency of outdoor meals consumed per week and frequency of various food items consumed.

3) Clinical Details: Diabetes, hypertension, dyslipidemia, obesity, compliance with medications, and the details of the coronary angiography

4) Laboratory Details: information was collected on relevant laboratory parameters like haemoglobin, blood glucose levels, serum cholesterol and its sub-types, triglycerides, serum creatinine and glycosylated haemoglobin.

The study was approved by the institutional ethics committee of Goa Medical College, Bambolim-Goa.

Data Analysis: The data was entered in Epi Info Entry Client and was analysed using the Statistical Package for Social Sciences for Windows, SPSS version 23. The results are described as percentages. Statistical significance of the difference in percentages was estimated by using Chi Square test at 5% level of significance.

RESULTS

A total of 978 patients in the age group 28 to 89 years participated in the study, average age being 59.28 ± 10.41 years. Table 1 presents the agesex distribution of the study participants, and the background clinicalsocial characteristics are presented in Table 2. The proportion of patients taking a pure vegetarian diet was 2.7%. Table 3 presents the severity of CAD in the study populationbased on the type of diet, frequency of outdoor major meals and frequency of outdoor snacking. Correlation of CAD with specific food items is presented in Table 4.

Table 3 shows the distribution of severity of coronary artery disease in the study population. Majority of patients had single vessel disease -332 (33.94%) while about the samepercentage of the study group had either normal coronaries, double vessel disease or triple vessel disease (212, 210 and 224 respectively). For the purpose of this study we have defined mild CAD as those having either normal coronaries or a single vessel disease pathology on coronary angiography, while moderate to severe CAD covers the range of population who suffer a double or triple vessel disease pathology angiographically (Table 3). Table 4, 5, 6 and 7 present the severity of CAD with dietary patterns and frequency of outdoor foods and consumption of specific food items.

It was observed that irrespective of a vegetarian or a non-vegetarian diet, 526 (55.25%) non vegetarians and 16 (61.53%) vegetarians had mild CAD, while 424 (44.93%) and 10 (38.46%) had moderate to severe CAD. However, this finding was statistically not significant (2= 0.3902, p = 0.53222). It was seen that among the patients who reported never eating out on any given day of the week, a majority of them had mild CAD on angiography (Table 5). Most of the patients who reported eating out 1-4times had a predominance of mild CAD, while on the contrarythose eating 4-6 times per week suffered a moderate to severe CAD. While those who ate out daily had double vessel disease on coronary angiography. The result was statistically significant(2 = 8.0426, p = 0.04514). The segment of the population eating more frequently than others i.e. 4-7 days a week showed a significantly higher incidence of moderate to severe CAD (54.80%). Consequently, a majority those who indulged in snacking outdoors 1-3 days a week or occasionally only suffered mild CAD - 64.81% and 53.30% respectively (Table 6). Expectedly, amongst individuals who never snacked outdoors, 14 (63.63%) had mild CAD and 8 (36.36%) had moderate to severe CAD.

Table 7 demonstrates a detailed comparison of various food products consumed by the study population and its correlation with severity of CAD. Amongst those who consume soft drinks, frequent consumers had an exact equal (50% each) incidence of mild and moderate-severe CAD, while those who consumed these carbonated drinks less than 3 times/week(58.62%), occasionally(54.24%) or never at all (64.00%) showed a perceptible inclination to suffer from mild CAD. These results however, were statistically insignificant. ($^2 = 4.1247$. The p value = 0.248306). On drawing a comparison of foods eaten by nonvegetarians, specifically consumption of chicken vs red meats like pork and beef-it was noted that although moderate to severe CAD was less common among chicken consumers irrespective of the frequency of consumption, its incidence was highest when consumed less frequently than most (less than 3 times a week). A similar trend was also appreciated among pork eaters with maximum incidence of mild CAD predominating in those who never consume pork. These negative trends however were statistically insignificant. On the contrary, of the large majority of people who never eat beef (732),424 (57.92%) had

mild CAD on angiography while 308 (42.07%) had angiographically moderate to severe CAD. Comparatively, occasional beef consumers had an elevated incidence of moderate to severe CAD and those eating beef less than 3 times/week had mild CAD at par with those having moderate to severe CAD. These results were statistically significant - (2 =6.2969, p-value = 0.042919).

Discussion:

Many studies have been published in literature outlining the various implications of eating habits on coronary heart disease, obesity and type 2 diabetes mellitus. Our study shows an increasing severity of coronary heart disease with an increasing number of outdoor meals consumed. A positive correlation was also seen when severity of CAD was compared to frequency of snacking outdoors, besides the regular 3 meals per day. However, a study conducted by Leah E Cahill, Stephanie E. Chiuve et al showed no association between snacking outside of 3 major meals and risk of coronary heart disease.[5] The Lyon Heart Study has shown that adopting a Mediterranean diet results in a significant reduction in acute coronary events.[6] Barberesko and colleagues have shown that adopting a meat based and western diet results in higher levels of C reactive protein which signals low grade inflammation which is known to play some role in the pathogenesis of acute coronary events. [7] This result was also corroborated by F. Centritto and colleagues which examined dietary patterns, cardiovascular risk factors and C- reactive protein in a healthy Italian population.[8] Work conducted by Teresa T. Fung, Walter C. Willett et al. showed that individual who consumed a predominant western diet had a higher risk of acute myocardial infarction. The western diet included high fat, red and processed meat, eggs, butter and refined grains, contained less folate and vitamin supplements, and less fiber.[9] A study conducted by Theresa A. Nicklas which looked into snacking patterns, diet quality, and cardiovascular risk factors interestingly found higher energy intake in those who consumed snacks outside the three major meals[10,11] but no association of any snacking patterns with cardiovascular risk factors.[10] The authors explained this finding by postulating that poor snacking choices were compensated with healthier food and beverage choices made at other meals. A study conducted in Greece evaluated the presence of metabolic syndrome and cardiovascular risk factors in adolescents and University students according to different levels of snack consumption. While the authors found no relation between snack consumption and metabolic syndrome risk factors and cardiorespiratory fitness, university students who snacked outside their major meals were 15.36 times more likely to develop risk factors for metabolic syndrome, higher LDL cholesterol levels and higher total cholesterol to HDL cholesterol levels.[11] NamitaMahalle and colleagues have shown that severity of triple vessel and double vessel disease increased with increase in number of metabolic abnormalities.[12] Although this research paper did not delve into the specific outdoor snacks consumed, frequent outdoor snacks especially in the Indian setting results in increased consumption of food which is deep fried and high in saturated fats. A study conducted in India showed that individuals consuming vanaspati oil (hydrogenated vegetable oil) were at a higher risk of developing ischemic heart disease than those who did not.

An increasing severity of CAD with outdoor snacking shown in our study may be related to two factorsPoor Quality of snacks and foods consumed (High in saturated fat and cholesterol Lack of Green leafy vegetables, fruits and salads in the fast foods in general.[5,6]

Our study showed correlation between Beef consumption and Severity of Coronary Artery Disease but no correlation between, Meat consumption in general (Non-Vegetarianism) and CAD. Also, there was no significant benefit of vegetarian food preference. Red Meat, is known to have higher saturated and cholesterol content, which results into Dyslipidemia. The Iron content of the Red Meats, the preservatives used and its impact on the Gut flora are also linked to the CVD Risk. However, whether Red Meat consumption within recommended limits causes Heart Disease or not is being debated.[13]

CONCLUSION

Given the long natural history of chronic disorders correlation between chronic diseases and dietary patterns is always hazed with a recall bias and confusions pertaining to temporality of association. With the help of trained medical interns we tried to conduct a detailed interview of these patients with no past history of CAD in an attempt to reveal this association. The study shows a significant association between

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frequency of outdoor snacking and severity of coronary artery disease. The quality of outdoor meals may be the cause behind this. The outdoor snacks tend to be fatty and thus could be high in saturated fat. With individuals having varied lifestyles, occupations and standard of living, it might be impractical to suggest complete elimination of outdoor snacks from one's diet. Rather it is prudent that we encourage individuals to improve the quality of snacks consumed. This may prevent over-eating at major meals and prevent individuals from exceeding their daily calorie requirement thereby keeping many noncommunicable diseases at bay.

Tables:

Table 1: Age Sex distribution of the study population

Age- Group	Sex		Total
	Male	Female	
30 or less	0	2 (100%)	2 (0.2%)
31-40	46 (92%)	4 (8%)	50(5.1%)
41-50	108(79.4%)	28(20.6%)	136(13.9%)
51-60	238(72.6%)	90(27.4%)	328(33.5%)
61-70	228(67.9%)	108(32.1%)	336(34.4%)
>70	98(77.6%)	28(22.4%)	126(12.9%)
Total	718(73.4%)	260(26.6%)	978

Table 2: Background characteristics of the study population

Religion Hindu 682(69.5%) Catholic 220(22.5%) Muslim 76(8%) Residence	Characteristics	Ν
Hindu $682(69.5\%)$ Catholic $220(22.5\%)$ Muslim $76(8\%)$ Residence U Urban $358(36.6\%)$ Marrial $620(53.4\%)$ Marrial Status $896(91.6\%)$ Mon-married $82(8.4\%)$ Education U Lliterate $74(7.6\%)$ Primary $86(8.8\%)$ Up to Tenth $500(51.1\%)$ Graduate $318(32.5\%)$ Hypertension W Yes $662(67.7\%)$ No $316(32.3\%)$ Dyslipidemia W Yes $262(26.8\%)$ No $716(73.2\%)$ Tobacco W Yes $212(21.7\%)$ No $766(78.3\%)$ No $756(78.3\%)$ Alcohol W Yes $446(45.6\%)$ No $532(54.4\%)$ Non-Exercise Activity Thermogenesis M Mostly Stiting $454(46.4\%)$ Mostly Standing $164(16.8\%)$ Mostly walking <	Religion	
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Muslim 76(8%) Residence	Catholic	220(22.5%)
Residence	Muslim	76(8%)
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Overweight 112(11.5%) Obese 540(55.2%)	Normal	262(26.8%)
Obese 540(55.2%)	Overweight	112(11.5%)
	Obese	540(55.2%)

ABLE 3: SEVERITY OF CORONARY ARTERY DISEASE IN STUDY POPULATION

Severity of coronary artery disease		N (%)	
Non obstructive	MILD	212 (21.67%)	544
coronaries	CORONARY		(55.61%)
	ARTERY		
	DISEASE		
Single vessel disease		332 (33.94%)	
Double vessel disease	MODERATE TO	210 (21.47%)	434
	SEVERE		(44.37%)
	CORONARY		
	ARTERY		
	DISEASE		
Triple vessel disease		224 (22.90%)	
Total	978		

 TABLE 4: TYPE OF DIET VS SEVERITY OF CORONARY

 ARTERY DISEASE

	Severity of Coronary Artery Disease			
Diet	MILD	MODERATE- SEVERE	TOTAL	
Non-Vegetarian	526 (55.25)	424 (44.93)	952	
Vegetarian	16 (61.53)	10 (38.46)	26	
	544 (55.62)	434 (44.37)	978	

TABLE 5: FREQUENCY OF EATING OUT AND SEVERITY OF CORONARYARTERY DISEASE

	Severity of Coronary Artery Disease			
Weekly Frequency of	MILD	MODERATE-	TOTAL	
Outdoor Major Meal		SEVERE		
0	322 (56.49%)	248 (43.50%)	570 (100%)	
1 to 4	152 (59.37%)	104 (40.62%)	256 (100%)	
5 to 10	62 (44.92%)	76 (44.23%)	138 (100%)	
More than 10	8 (57.14%)	6 (42.85%)	14 (100%)	
	544 (55.62%)	434 (44.37%)	978 (100%)	

TABLE 6: FREQUENCY OF OUTDOOR SNACKING VS SEVERITY OF CORONARY ARTERY DISEASE

Frequency of Outdoor	Severity of Coronary Artery Disease			
Snacks	MILD	MODERATE-	TOTAL	
		SEVERE		
4-7 days	94 (45.19%)	114 (54.80%)	208 (100%)	
1-3 days	210	114 (35.18%)	324 (100%)	
	(64.81%)			
Occasional	226	198 (46.68%)	424 (100%)	
	(53.30%)			
Never	14 (63.63%)	8 (36.36%)	22 (100%)	
	544	434 (44.37%)	978 (100%)	
	(55.62%)			

X²=8.0426, p=0.04514

TABLE 7: COMPARISON OF CONSUMPTION OF SPECIFIC FOODS WITH SEVERITY OF CAD

Frequency of consumption of,	Severity of Coronary Artery Disease		
Soft Drinks	MILD	MODERATE- SEVERE	TOTAL
4-7 days	48 (50.00)	48 (50.00)	96 (100)
1-3 days	170 (58.62)	120 (41.37)	290 (100)
Occasional	294 (54.24)	248 (45.75)	542 (100)
Never	32 (64.00)	18 (36.00)	50 (100)
TOTAL	544 (55.62)	434 (44.37)	978 (100)
Chicken			
4-7 days	26 (56.52)	20 (43.47)	46 (100)
1-3 days	304 (57.35)	226 (42.64)	530 (100)
Occasional	186 (52.84)	166 (47.15)	352 (100)
Never	28 (56.00)	22 (44.00)	50 (100)
TOTAL	544 (55.62)	434 (44.37)	978 (100)
Pork			
1-3 days	26 (54.16)	22 (45.83)	48 (100)

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66 (51.56)	62 (48.43)	128 (100)
452 (56.35)	350 (43.64)	802 (100)
544 (55.62)	434 (44.37)	978 (100)
36 (50.00)	36 (50.00)	72 (100)
84 (48.27)	90 (51.72)	174 (100)
424 (57.92)	308 (42.07)	732 (100)
544 (55.62)	434 (44.37)	978 (100)
	66 (51.56) 452 (56.35) 544 (55.62) 36 (50.00) 84 (48.27) 424 (57.92) 544 (55.62)	66 (51.56) 62 (48.43) 452 (56.35) 350 (43.64) 544 (55.62) 434 (44.37) 36 (50.00) 36 (50.00) 84 (48.27) 90 (51.72) 424 (57.92) 308 (42.07) 544 (55.62) 434 (44.37)

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