

Study on the Association of Dietary Habits with Cardiovascular Disease in South-Eastern Rajasthan

Hemlata Sharma¹, Varun Kumar Saini², Mayank Sarawag³, Jitendra Ahuja⁴

¹Associate Professor, Department of Anatomy, Jhalawar Medical College, Jhalawar, Rajasthan

²Associate Professor, Department of Anaesthesia, RUHS CMS, Jaipur, Rajasthan

³Professor, Department of Cardiology, Jhalawar Medical College, Jhalawar, Rajasthan

⁴Professor, Department of Biochemistry, RUHS CMS, Jaipur, Rajasthan

Received: 06-11-2021 / Revised: 19-12-2021 / Accepted: 28-12-2021

Corresponding author: Dr. Jitendra Ahuja

Conflict of interest: Nil

Abstract

Introduction: Unhealthy Dietary patterns have an important role-playing factor in rapidly progressing cardiovascular incidences. Regional differences, nutrition accessibility, and lifestyle factors can lead to differences among the dietary intake of populations. This research focuses to establish a clear relationship between the type of nutrient & cardiovascular disease in the population of southeastern Rajasthan.

Materials & Methods: 200 patients (30-80 yrs) with an established CVD or related symptoms who were admitted in the IPD were included in this study. Using Semiquantitative food frequency Questionnaire Socio-demographic variables, cardiovascular events, and dietary information(carbohydrate and fat uptake), history of smoking tobacco & chronic alcohol use was collected.

Results: A total of 189 patients (131 males and 58 females) were included in the study. Out of these 131 were males(69.%) and 58 were females (30.7%). The mean and standard deviation for the age was 58.62 ± 12.49 years. 81% of the patients had below-normal energy uptake from carbohydrates (i.e. below normal lower limit & up to 500 kCal) with a mean of 714.68 kCal/day. 80% of the patients had a higher dietary fat intake with a mean of 62.01 grams/day. 52.3% (out of 109) hypertensives,74.2% (out of 62) of chronic tobacco smokers & 81% (out of 21) experienced MI incidences.

Conclusion: To the best of our knowledge this cross-sectional study is the first of its kind to evaluate the association between dietary habits and cardiovascular disease in South-eastern Rajasthan. The intake of fats was higher and that of carbohydrates was low-normal in maximum patients, implying that there is an association between higher fat intake and cardiovascular disease but the causal association is unknown. Strikingly, carbohydrates intake was not found to be associated with cardiovascular disease. Low carbohydrate consumption is probably related to the poor socio-demographic structure of the study population.

Keywords: IPD, CVD, MI

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium provided original work is properly credited.

Introduction

Cardiovascular diseases (CVD) are the leading cause of death globally. An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths, out of which 85% accountability goes to heart attack and stroke. CVD has also become the leading cause of mortality in India [1]. Major risk factors for CVD include hypertension, diabetes, smoking, excessive alcohol intake, unhealthy dietary patterns & obesity. [2]

Diet has a very important role-playing factor in many cardiovascular incidences and dietary risks have a significant impact on cardiovascular deaths [3]. A healthy diet helps in preventing the risk of major non-communicable diseases such as heart disease, diabetes, and stroke [4]. Various randomised controlled clinical trials & meta-analyses have suggested low sodium intake, high intake of fiber, legumes, fruits & vegetables which leads to lower levels of inflammation, improved lipid profiles, decreased blood glucose levels & decreased blood pressure & obesity. Thus, leading to the prevention of CVD incidences in the population.[5]

Prospective Urban Rural Epidemiology (PURE) trials are conducted worldwide to bring to light the effects of type of nutrients on cardiovascular diseases and to check the fidelity of the current facts of nutrient intake association with cardiovascular health and diseases. It provides a unique opportunity to establish a relationship between dietary intake and cardiovascular disease in a setting where poverty levels are high and under-nutrition is widespread. The relation between macronutrients and cardiovascular disease and mortality is controversial.[6] Regional differences, nutrition accessibility, and lifestyle factors can lead to differences among the dietary intake of populations.

Today's scenario relates to a low-fat diet, reducing the total fat intake to less than 30% of the total energy intake and

reducing the intake of saturated fats to less than 10% of the total energy intake [4], for lower cardiovascular disease.

There is no sufficient evidence to describe the relationship between dietary habits and risk of cardiovascular diseases in Rajasthan; hence this cross-sectional study was conducted to assess the dietary pattern of patients with established cardiovascular disease in the population of Southeastern Rajasthan, India. This study was conducted with the primary objectives to compare the effect of fats and carbohydrates on CVD, to inspect the validity of the currently established dogma of nutritional facts concerning CVD, and to assess the relationship between risk factors like hypertension, smoking, and alcohol intake with the occurrence of Myocardial infarction (Transmural MI).

Materials and Methods

Study Design And Participants

This cross-sectional study (observational study) was done at a hospital-based setting after the approval of the concerned Institutional Ethics Committee (IEC).

A total of 200 participants were recruited in 2 months after obtaining prior written consent with explained elements and purpose of the research study.

Data Collection

A total of 200 patients (30-80 yrs) with an established CVD or related symptoms were included in this study who were admitted in the IPD to the hospital. Data of the participants were collected using a Questionnaire consisting of Socio-demographic variables, cardiovascular events and dietary information, and personal history of smoking tobacco & chronic alcohol use. Out of them, 11 patients (5.5% of the study sample) were excluded. The reasons for exclusion were patients too sick (n=4) to answer the questionnaire form, and discharged (n=7) before the interviews could be done. Data

of the remaining 189 patients (131 males and 58 females) were included in the study.

Resting Blood pressure (rest of ≥ 10 minutes) of the individuals was measured in both arms using the Omron HEM 7120

Fully Automatic Digital Blood Pressure Monitor and the average of the two measurements was considered as the final blood pressure of the individual. The patient's statements about the disease were cross-checked based on his/her diagnosis.

Table 1: Main operational definitions

Variables	Criterion
Atherosclerotic Cardiovascular disease, MI(Transmural), ACS NSTEMI,USAP,CSAP Subclinical CAD CAD equivalent, ICMF	CVD diseases were defined as per 2018 American college of cardiology (ACC) /American Heart Association (AHA) guidelines
Hypertension Hypertensive	Systolic blood pressure is found to be ≥ 130 mmHg or the diastolic blood pressure ≥ 80 mmHg (according to ACC/AHA 2017 hypertension guidelines and BP treatment goals) [11]. Patients on antihypertensive therapy were automatically considered hypertensive.
Tobacco Smoking No User Chronic User	More than 100 pack-years
Alcohol No User Chronic User	Chronic alcohol use is defined as per the international classification of diseases.

Dietary Assessment

For assessing the dietary intake of the individuals, a semi-quantitative food frequency questionnaire was used. The standard portion size was stated on the food list & patients were asked to report the frequency of intake in the terms of standard portion sizes.

Carbohydrate intake was assessed by the per day consumption of Chapattis, Potatoes, and Rice which were the major sources of carbohydrates in the study area.

It was interpreted by the energy consumed by carbohydrate sources in kCal/day. Recommended carbohydrate intake should be 50-65% of the estimated average requirement (EAR).

Men ≥ 60 years 850 – 1105 kCal/day,
Women ≥ 60 years 750 – 975 kCal/day
Adult Male 1355 – 1761.5 kCal/day

Adult Female 1065 – 1384.5 kCal/day

Values above the upper limit are considered high. Values below the lower limit and up to 500 kCal/day are considered as Low-normal.

(According to ICMR recommended dietary allowances (RDA) & nutrient requirements & for Indians 2020).

Fat intake was assessed by the per day consumption of ghee, oil. It was interpreted by the total amount of fat (in grams) consumed per day.

Statistical Analysis

All the relevant data was collected & tabulated using MS Excel worksheet. The data was statistically analysed using SPSS 20.0 Trial version. Descriptive data analysis methods including frequency tables, bar charts to summarise the demographics & key variables, and

summary statistics (means and standard deviations) were used.

these 131 were males(69.%) and 58 were females (30.7%).

Results

The mean and standard deviation for the age was 58.62 ± 12.49 years.

A total of 189 patients (131 males and 58 females) were included in the study. Out of

Table 2: Socio-demographic variables of the study subjects

		N	N %
Area of Residence	Urban	76	40.2%
	Rural	113	59.8%
Age	30-40 Years	21	11.1%
	41-50 Years	29	15.3%
	51-60 Years	58	30.7%
	61-70 Years	53	28.0%
	71-80 Years	28	14.8%

Table 3: Carbohydrate intake by study subjects in kCal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	high	6	3.2	3.2	3.2
	normal	30	15.9	15.9	100.0
	Low-normal	153	81.0	81.0	84.1
	Total	189	100.0	100.0	

Table 4: Fat intake by study subjects (gm/day)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	high	155	82.0	82.0	82.0
	Normal	34	18.0	18.0	100.0
	Total	189	100.0	100.0	

Table 5: MI incidences in Hypertensive patients

		MI		Total	Chi sq	P-value
		Yes	No			
HTN history	Yes	57	52	109	6.017	0.014*
		52.3%	47.7%	100.0%		
	No	56	24	80		
		70.0%	30.0%	100.0%		
Total		113	76	189		
		59.8%	40.2%	100.0%		

* Denotes significant p value. P value <0.05 were considered significant.

Table 6: MI incidences in Tobacco smokers

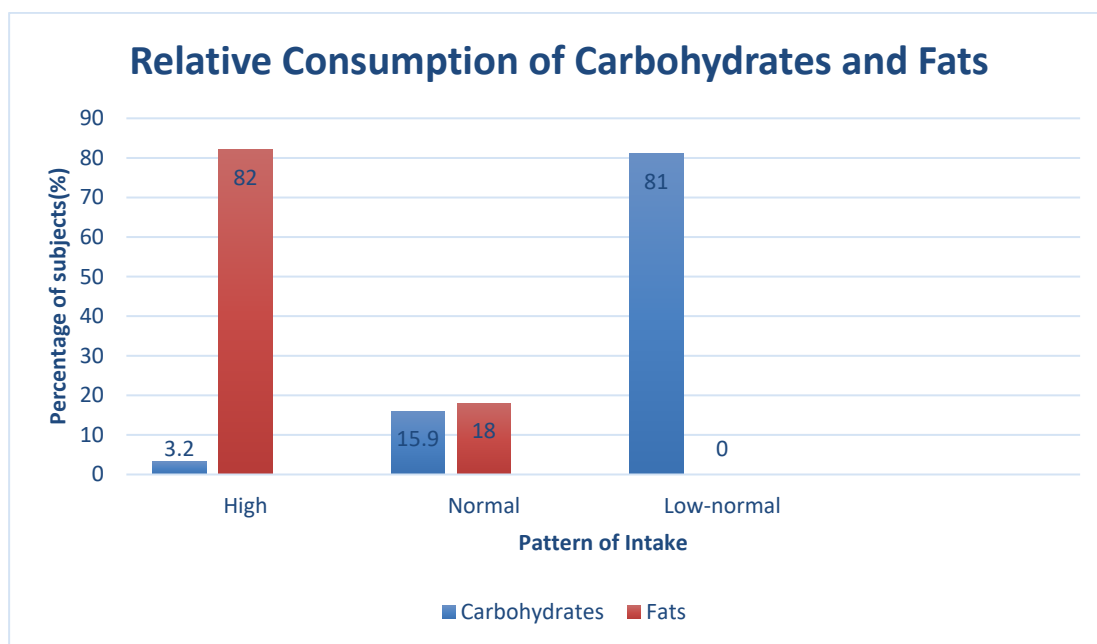
		MI		Total	Chi sq	P-value
		Yes	No			
Tobacco smokers	No User	67	60	127	7.964	0.005*
		52.8%	47.2%	100.0%		
	chronic User	46	16	62		
		74.2%	25.8%	100.0%		
Total		113	76	189		
		59.8%	40.2%	100.0%		

* Denotes significant p value. P value <0.05 are considered significant.

Table 7: MI incidences in Chronic alcohol users

		MI		Total	Chi sq	P-value
		Yes	No			
Alcohol	No User	96	72	168	6.017	0.014*
		57.1%	42.9%	100.0%		
	chronic User	17	4	21		
		81.0%	19.0%	100.0%		
Total		113	76	189		
		59.8%	40.2%	100.0%		

* Denotes significant p value. P value <0.05 are considered significant.



Graph 1: Relative consumption of Carbohydrates and Fats

Discussion

The past two decades in India show a transition with the shifting of the disease burden from communicable diseases to non-communicable diseases (CVD, diabetes). [7] The Indian burden of non-

communicable ischemic diseases is on a rise. Indians are developing CVD at around < 40 yrs of age. This is a significant observation as it not only imposes a much economic burden but also marks a loss of many productive years along with social, physical &

psychological trauma to the patients & their dependents. [7] Indians are witnessing a steady rise in BP levels, cholesterol levels, glucose levels, body mass index, sedentary lifestyles, and unhealthy dietary patterns which catalyses the incidences of cardiovascular diseases. Despite wide variation in the prevalence of risk factors across different geographic areas, CVD is the leading cause of death in urban as well as rural areas.[8]

Pan India awareness should be created with regards to the modifiable risk factors. A balanced diet has much to do in this regard. A cross-sectional study conducted by Livingstone & Mc Naughton in 2018 on 2121 individuals concluded that a diet with a higher intake of wholegrain cereals was associated with lower cardiometabolic risk [9]. Another cross-sectional study conducted by Kapoor et al in 2018 showed that participants with Indian dietary patterns were less likely to have a history of cardiovascular diseases, where Indian diet included frequent intakes of refined grains (white rice) and low intake of whole grains (whole wheat flour-based chapattis) [10].

A systematic analysis for the Global Burden of Disease Study 2017 [11] done across 195 countries, evaluated the consumption and quantified the impact of suboptimal intake of major foods and nutrients on CVD mortality and morbidity. Variations were noted on the impact of individual dietary factors but non-optimal intake of three dietary factors (whole grains, fruits, and sodium) accounted for more than 50% of deaths and 66% of disability-associated life-years attributable to diet. Suboptimal diet showed to be responsible for more deaths than tobacco smoking, highlighting the urgent need for improving human diet. The study also highlights diets high in sodium, low in whole grains, low in fruit, low in nuts and seeds, low in vegetables, and low in omega-3 fatty acids; each accounting for more than 2% of global deaths. Thus dietary policies should focus on promoting

the intake of diet ingredients for which current intake is less than the optimal level. Highlighting the promotion, distribution & consumption of such foods would have a greater effect than only targeting the reduction of sugars & fats.

This present study is the first of its kind to evaluate the association between dietary habits and cardiovascular disease in South-eastern Rajasthan.

In the present study, 81% of the patients had below-normal energy uptake from carbohydrates (i.e. below normal lower limit & up to 500 kCal) with a mean of 714.68 kCal/day. Jenkins et al, 2021 concluded that a diet with a high glycemic index (high carbohydrate intake) accompanies an increased risk of cardiovascular disease and death[12]. This is in contrast with the present study. The possible reason for such a pattern could be the advised dietary pattern to the patients of established cardiovascular disease, and consumption of small meals, multiple times a day leading to reduced carbohydrate consumption. Deghan et al 2018 reported that higher carbohydrate intake was related to increased total mortality but did not have a significant association with cardiovascular disease or mortality[6].

In the present study, 80% of the patients had a higher dietary fat intake with a mean of 62.01 grams/day. Deghan et al 2018 in reported that the total fat was not significantly associated with myocardial infarction or cardiovascular disease mortality[6]. Hooper et al 2011 concluded that the risk of cardiovascular events can be reduced by 14% if saturated fats are reduced. The findings suggest a small but important reduction in cardiovascular risk on modification of dietary fat, but not reduction of total fat, in long-term trials. Lifestyle modifications are advised to all at risk of CVD.[13]

In the present study, out of 109 hypertensive patients, 52.3% of the patients experienced MI incidences. This

can be explained by the fact that hypertensives have more severe atherosclerosis, endothelial damage, insulin resistance, ventricular hypertrophy and ventricular arrhythmias [14], and atrial fibrillation. This explains the observed significant mortality of AMI in hypertensives ranging between 7.7% to 19.2% across the globe. Hypertension accelerates atherogenesis primarily dependent on cholesterol. Coronary artery atherosclerotic disease is 2 to 3 fold more prevalent among hypertensive individuals in contrast to that in normotensive people [15]. The number of the risk factors increases the risk of CVD events. Early Diagnosis & prevention of risk factors can lead to healthy & life longevity. [16].

In the present study, 74.2% of chronic tobacco smokers experienced MI incidences. This is in accordance with the study done by Bahall et al in 2018 [2], which concluded 31.8% of cases to be chronic smokers who experienced acute myocardial infarction. A study on the World Health Organization (WHO) data found that cardiovascular risk factors like hypertension and smoking were associated with angina [17]. In the present study also, there is a significant association between important risk factors like hypertension and smoking tobacco with cardiovascular disease and related events.

The Dietary Approach to Stop Hypertension (DASH) diet, which suggests a reduced intake of total fat and refined carbohydrates, was concluded as an effective nutritional strategy to prevent cardiovascular diseases [18].

It is also recommended by physicians to reduce hypertension and cardiovascular events. This could be the probable reason for the observed dietary findings in the study participant.

Conclusion

To the best of our knowledge, this cross-sectional study is the first to evaluate the association between dietary habits and

cardiovascular disease in South-eastern Rajasthan. The main findings are that intake of fats was higher and that of carbohydrates was low-normal in maximum patients, implying that there is an association between higher fat intake and cardiovascular disease but the causal association is unknown. Strikingly, carbohydrates were not associated with cardiovascular disease. A possible reason for such pattern could be the advised dietary pattern to the patients of established cardiovascular disease, as most of our participants were assessed during follow-ups and consumption of small meals, multiple times a day leading to reduced carbohydrate consumption. Low carbohydrate consumption is probably related to the poor socio-demographic structure of the study population.

Limitations

It is an observational or so-called cross-sectional study. Inherent biases and confounders cannot be ruled out. Large cohort and follow-up studies need to be done to draw causal relationships and firm association, to have enough statistical power for the design.

References

1. Prabhakaran, D., Jeemon, P. and Roy, A., 2016. Cardiovascular Diseases in India. *Circulation*, 133(16), pp.1605-1620.
2. Bahall M, Seemungal T, Legall G. Risk factors for first-time acute myocardial infarction patients in Trinidad. *BMC Public Health*. 2018;18(1).
3. Afshin A, Sur P, Fay K, Cornaby L, Ferrara G, Salama J et al. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*. 2019;393(10184):1958-1972.
4. World Health Organization Healthy diet. *Who.int*. 2021 [cited 28 November 2021]. Available from:

- <https://www.who.int/publications/m/item/healthy-diet-factsheet394>
5. Gulati M, Bairey-Merz CN. Cardiovascular disease in women. In: Zipes DP, Libby P, Bonow RO, Mann DL, Tomaselli GF, editors. Braunwald's heart disease: a textbook of cardiovascular medicine. eleventh ed. New York: Elsevier; 2019. p. 1767–79.
 6. Dehghan M, Mente A, Yusuf S. Associations of fats and carbohydrates with cardiovascular disease and mortality—PURE and simple? *The Lancet*. 2018;391(10131):1681-1682.
 7. Institute of Health Metrics and Evaluation. GBD Profile: India. http://www.healthdata.org/sites/default/files/files/country_profiles/GBD/ihme_gbd_country_report_india.pdf. Accessed April 30, 2014.
 8. Kar SS, Thakur JS, Viridi NK, Jain S, Kumar R. Risk factors for cardiovascular diseases: is the social gradient reversing in northern India? *Natl Med J India*. 2010;23:206–209.
 9. Livingstone K, McNaughton S. Association between diet quality, dietary patterns and cardiometabolic health in Australian adults: a cross-sectional study. *Nutrition Journal*. 2018;17(1).
 10. Kapoor D., Iqbal R., Singh K et al,(2018). Association of dietary patterns and dietary diversity with cardiometabolic disease risk factors among adults in South Asia: The CARRS study. *Asia Pacific Journal of clinical nutrition*, 27(6), 1332–1343.
 11. Cardiovascular Diseases in India Current Epidemiology and Future Directions Dorairaj Prabhakaran, Panniyammakal Jeemon; Ambuj Roy *Circulation*. 2016;133:1605–1620.
 12. Jenkins D, Dehghan M, Mente A, Bangdiwala S, Rangarajan S, Srichaikul K et al. Glycemic Index, Glycemic Load, and Cardiovascular Disease and Mortality. *New England Journal of Medicine*. 2021;384(14):1312-1322.
 13. Lee Hooper, Asmaa Abdelhamid, Helen J Moore, Wayne Douthwaite, C Murray Skeaff, Carolyn D Summerbell. Effect of reducing total fat intake on body weight: systematic review and meta-analysis of randomised controlled trials and cohort studies *BMJ* 2012; 345 (Published 06 December 2012) Cite this as: *BMJ* 2012;345:e7666
 14. O'Neil A, Scovelle AJ, Milner AJ, Kavanagh A. Gender/sex as a social determinant of cardiovascular risk. *Circulation* 2018;137(8):854–64.
 15. Dhillon PK, Jeemon P, Arora NK, Mathur P, Maskey M, Sukirna RD, Prabhakaran D. Status of epidemiology in the WHO South-East Asia region: burden of disease, determinants of health and epidemiological research, workforce and training capacity. *Int J Epidemiol*. 2012;41:847–860.
 16. Pednekar MS, Gupta R, Gupta PC. Association of blood pressure and cardiovascular mortality in India: Mumbai cohort study. *Am J Hypertens*. 2009;22:1076–1084. doi: 10.1038/ajh.2009.131
 17. Chopra H, Ram C. Recent Guidelines for Hypertension. *Circulation Research* .2019;124(7):984-986
 18. Challa HJ, Ameer MA, Uppaluri KR. DASH Diet To Stop Hypertension. [Updated 2021 May 19]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021