ORIGINAL ARTICLE

RELATIONSHIP OF LIFESTYLE AND DIETARY HABITS OF SOUTH-EAST ASIAN (PAKISTANI) POPULATION WITH CARDIOVASCULAR DISEASES: A CASE-CONTROL STUDY

Syed Muhammad Ashraf Jahangeer[1], Areeba Ikram[1], Anmol[1], Muhammad Nawaz Lashari[2], Kainat Kataria[1], Eamaan Turk[1], Maryam Rehan[1]

[1]Dow University of Health Science, Karachi, Pakistan, [2]Dr. Ruth K. M. Pfau, Civil Hospital Karachi

Objectives: Cardiovascular disease (CVDs) is the leading cause of deaths globally. Apart from traditional risks, multiple indigenous factors are implicated to impact disease courses. Lifestyle factors distinct to South Asians may predispose to disease or serve a protective effect. Our study objective was to determine the Relationship of lifestyle and dietary habits of South-east Asian (Pakistani) population with cardiovascular diseases.

Methodology: A case-control study was conducted from April to October 2021 in a two-thousand bedded university teaching hospital in Karachi, Pakistan. Out of 400 participants, 189 were cases with a documented cardiovascular event and 211 were controls. Participants >18 years were included whereas pregnant females and patients with congenital heart defects were excluded. A structured questionnaire was designed and implemented, and anthropometrics were recorded. Chi-square test, independent sample t-test and multivariate analysis were utilized via SPSSv23. P-value <0.05 was considered significant.

Results: From 400 participants, 189 cases and 211 controls were identified. 53.4% of the people consuming open spices had CVDs while 46.6% did not. While only 37% of people using home cooked spices had CVDs with an OR= 0.51(0.3-0.84, 95% CI, p=0.08). Our results showed an inverse or no relationship of high BMI with CVDs. No statistically significant results were observed of diabetes and hypertension with CVDs.

Conclusion: Based on our results, home grounded condiments have a protective effects on CVD than open spices. With reference to CVD, poor lifestyle habits and anthropometric profiles of our controls indicate a need for urgent preventive measures at population level.

Keywords: cardiovascular diseases, indigenous, risk factors, BMI, spices

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INTRODUCTION

Cardiovascular diseases (CVDs) are a group of diseases related to the heart and the blood vessels. CVDs are on the rise around the world making them the leading cause of deaths globally. More people die annually from CVDs than from any other cause and over three quarters of these deaths take place in low and middle-income countries. According to the estimation of the World Health Organization, in 2016, 17.9 million people died from CVDs representing 31% of all global deaths.[1] Furthermore, as per the World Health Organization - Noncommunicable Diseases (NCD) Country Profiles 2016, non-communicable diseases are estimated to account for about 58% of all deaths that occur in Pakistan and 29% of these are accounted for by cardiovascular diseases. Noncommunicable diseases (NCDs) kill 41 million people each year, equivalent to 71% of all deaths globally. Cardiovascular diseases account for most NCD deaths, or 17.9 million people annually, followed by cancers (9.3 million), respiratory diseases (4.1 million), and diabetes (1.5 million). [2]

A multitude of modifiable and non-modifiable risk markers for CVDs are well established, such as smoking, alcohol, age, sex etc. Localized and indigenous risk factors for CVDs have been a topic of discussion for quite some time now. Much research has been conducted with the aim of finding racial and/or genetic components to these factors. Among South Asians (SA) living in the US, implementing a vegetarian diet reduces the risk factors of cardiometabolic diseases.[3] Significant differences exist between cardiovascular risk factors even among SA populations like Pakistanis, Indians, and Bangladeshis.[4] Prediabetes is generally considered to

have a significant relationship with the development of coronary artery disease; although it is prevalent in SA, it does not have a significant relation with cardiovascular diseases. SA also tend to have a higher diastolic blood pressure contributing to their increased risk for CVDs. Compared to Europeans, SA have a higher Total Cholesterol to High density lipoprotein ratio.[5] Due to the greater disease burden of CVD in Pakistan, the need arises to identify relevant risk factors specific to our population and to adapt preventative measures.

There are many published studies which have tried to explain some link between lifestyle of SA and CVDs, but most of them failed to specify any factors which might be the cause of increasing CVD risk in this population.[6] A case control study that was conducted in 2012 to investigate dietary patterns implicated in early-onset ischemic heart diseases in Lahore, Pakistan found that many animal-derived products were significant risk factors for CVD.[7] With our study we aim to do an updated and precise assessment of the various lifestyle and dietary factors which predispose our local population to CVDs both directly and indirectly. The dietary factors include consumption of spices, canned/processed food, coffee, tea, dairy items, and method of cooking with a special focus on food additives particular to the products sold in the local markets. The lifestyle factors we aim on assessing mainly reflect the role of psychosocial stresses, which might be precipitated by the low socio-economic standing of the local population and should be considered crucial during cardiac care.[8] In addition, our study will focus on few other miscellaneous factors such as frequent usage of some common drugs, for example: analgesics (diclofenac, paracetamol, ibuprofen), anti-hypertensive drugs, anti-arthritic drugs (glucosamine supplements) etc. and common tobacco products used by SA, for example: paan, naswar and tobacco gum.
Multiple studies have shown variance in the prevalence of cardiovascular disease and its complications among different ethnic groups and in different geographic regions of the world. For instance, since the beneficial effects of the Mediterranean diet are widely reported, it also merits reporting of the South-east Asian (SEA) dietary effects on health. This study may help endorse both good and bad effects of SEA dietary habits as to improve the dietary practices. Therefore, our study objective was to determine the relationship of lifestyle and dietary habits of the South-east Asian (Pakistani) population with cardiovascular diseases.

METHODOLOGY

This case control study was conducted from April 2021 to October 2021 at a two-thousand bedded University teaching hospital, Dr. Ruth K. M. Pfau, Civil Hospital in Karachi, Pakistan. This study was duly approved by the institutional review board (Ref: IRB-1476/DUHS/Approval/2020/). Necessary administrative permissions to collect data from the inpatient department and to interview patients was also obtained. A written informed consent was obtained from all the study participants. The research was conducted in accordance with the Declaration of Helsinki.

The study participants were adult patients of either gender, age 18 years and above who were being treated in the University Hospital and its accommodating medical facilities. Based on the clinical records pregnant females were excluded as well as patients with congenital heart defects.

The cases were patients who had a documented cardiovascular event (at least one) such as myocardial infarction, and angina. Patients with a documented history of coronary artery disease and heart failure were also included as cases. The controls were also drawn from the same hospital population, they were mostly patients from the general medicine ward, and they were ascertained for the CVD using the same clinical protocol. It was made sure that their previous medical record regarding any CVD was clear. We selected 189 cases and 211 controls.

A structured questionnaire was administered which was developed based on the literature search and after discussion with the experts and including all the relevant variables that could affect the health. We translated our questionnaire into local languages, Urdu, and Sindhi. Two independent native local language speakers reviewed and validated the proforma. The questionnaire had three distinct sections. The first section was about socioeconomic, demographic and anthropometric information of the study participants. The second section retrieved information on the current illness and comorbidities of the patients. The last section explored the dietary habits and lifestyle of the participants. The questions included in this section were about tobacco habits, both smoked and smokeless (chewed), consumption of meat and meat products, use of vegetables and fruits, staple diet and choice of grain, the choice of spices and condiments in their usual food cooking methods, use of dairy products, type of drinking water (tap, filtered, bottled), food cooking habits such as freezing, thawing, and reusing after reheating, exercise routine

and hobbies, and self-reported stress levels and coping habits.

To avoid bias five trained data collectors administered the questionnaire and recorded the anthropometric measurements. It was filled by asking each question separately from the subjects themselves. An analogue type weighing scale was used to assess the body weight. The weighing scale was calibrated daily to avoid systematic errors in the ascertainment. A designated wall marked with a height scale was used to measure the height of the study participants both in the in-patient and outpatient departments of the study site.

The main source of data were interviews with the patients; however, disease and co-morbidities related information was retrieved from the patient's medical records. Sensitive information like substance abuse, alcohol and contraceptives was retrieved after building rapport with the patients.

Based on the Hashemian et al study 2019, 64% of the population were consuming turmeric in their diet keeping a protective effect of turmeric on CVDs i.e., 0.5 Odds Ratio (OR), power at 80% confidence level at 95% with 1:1 case to control ratio.[9] The required sample size was 146 participants in each case and control group using Fleiss continuity correction method.

Quantitative variables such as age, height, weight, Body Mass Index (BMI) were reported as mean and standard deviation, median with interquartile range was also reported where the data was not normally distributed. Qualitative variables were presented with absolute frequencies and relevant percentages. The mean values were compared between groups using an independent-sample t-test while a chi-squared test was used for comparing categorical variables. The ORs were calculated at 95% Confidence Interval (CI) for relevant association observed in the study. Before the analysis the data file was checked for errors and omissions, missing data, and normality. Records where the data was missing substantially were removed from the analysis. Cases which had substantial missing data were not included in the analysis. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp. Released 2015 was used for data analysis. We used multivariable Logistic regression analysis to identify the associated factors of CVD while adjusting for other variables. The final selected model was achieved after an iterative process of considering all variables in the univariate analysis at P value of <0.25. Variables which did not add to the R square value were not included in the final model and the resultant effect was studied. We consider 0.05 P-value for statistical significance. Adjusted odds ratios (ORs) and their 95% confidence intervals (CIs) were used for interpretation of the final results.

RESULTS

The socio-demographic details of the study participants are mentioned in Table 1.

Table 1: Socio-demographic characteristics of the participants

	Control (No CVD)	Cases (CVD)	P-value
Age mean (SD)	47.6 (13.5)	51.8 (11.8)	0.001
Gender			
Female	153 (72.5)	126 (66.7)	0.204
Male	58 (27.5)	63 (33.3)	
Ethnicity			
Urdu	70 (33.2)	67 (35.4)	0.358
Sindhi	35 (16.6)	26 (13.8)	
Balochi	15 (7.1)	18 (9.5)	
Pashto	43 (20.4)	25 (13.2)	
Punjabi	22 (10.4)	25 (13.2)	
Others	26 (12.3)	28 (14.8)	
Education			
None	86 (40.8)	74 (39.2)	0.151
Under-matric	81 (38.4)	67 (35.4)	
Matric	23 (10.9)	37 (19.6)	
Intermediate	12 (5.7)	8 (4.2)	
Under-graduate	3 (1.4)	1 (0.5)	
Graduate/Professional	6 (2.8)	2 (1.1)	
Occupation			
Unemployed	146 (69.2)	131 (69.3)	0.897
Student	1 (0.5)	1 (0.5)	
Office job	11 (5.2)	8 (4.2)	
Laborer	29 (13.7)	24 (12.7)	
Farmer	1 (0.5)	0 (0)	
Other	23 (10.9)	25 (13.2)	
Income per month (PKR)			
Up to 15000	108 (51.2)	89 (47.1)	0.913
15001-30000	70 (33.2)	62 (32.8)	
30,001-45,000	20 (9.5)	24 (12.7)	
45,000-60,000	9 (4.3)	8 (4.2)	
60,000 and above	4 (1.9)	6 (3.2)	

CVD= cardiovascular diseases

Majority of the participants in our study reported frequent use of open spices rather than the packed or home cooked ones. Among the people who consume open spices bought from the market, 53.4% have CVDs while 46.6% do not, while those who use home cooked spices had less CVDs (cases= 37% vs. controls 63%) with an OR= 0.51(0.3-0.84, 95% CI, p=0.08).

There is a comparable proportion of cases and controls consuming yogurt (47% v 53%), honey (53% vs. 47%), vinegar (44% vs. 56%), filtered water (48% vs. 52%), alcohol (50% vs. 50%), fish (46% vs. 54%), and eggs (45% vs. 55%) (Table 2).

Of the total, 49 (12%) participants had the habit of adding salt on the served food. Among most of the sample wheat was the predominant staple diet (84%) while 18% of the sample was consuming both rice and wheat in their staple diet.

There was an approximately similar consumption of meat (49% vs. 51%), vegetables (44% vs. 56%) and pulses (52% vs. 48%) in both cases and controls.

Table 2: Dietary Patterns of Participants

Value	Control	Case	Crude OR (95% CI)	P-value
Staple diet				
Roti	141 (51.1)	135 (48.9)	0.97 (0.53-1.75)	0.912
Rice	27 (51.9)	25 (48.1)		
Most consumed food				
Pulses	63 (48.5)	67 (51.5)	0.91 (0.51-1.63)	0.761
Meat	36 (50.7)	35 (49.3)		
Most consumed food				
Veg	112 (56.3)	87 (43.7)	0.8 (0.46-1.38)	0.418
Meat	36 (50.7)	35 (49.3)		
Spice type				
Open	108 (46.6)	124 (53.4)	0.51 (0.3-0.84)	0.08
HD	55 (63.2)	32 (36.8)		
Spice type				
Packed	48 (59.3)	33 (40.7)	0.85 (0.46-1.58)	0.599
HD	55 (63.2)	32 (36.8)		
Turmeric				
Yes	193 (52.6)	174 (47.4)	1.08 (0.53-2.2)	0.829
No	18 (54.5)	15 (45.5)		
Beef				
No	68 (45.9)	80 (54.1)	0.65 (0.43-0.98)	0.037
Yes	143 (56.7)	109 (43.3)		
Fish				
Yes	147 (54.4)	123 (45.6)	0.81 (0.53-1.23)	0.328
No	64 (49.2)	66 (50.8)		
Eggs				
Yes	153 (55.2)	124 (44.8)	1.38 (1.0-2.12)	0.135
No	58 (47.2)	65 (52.8)		
Yogurt				
Use	176 (52.7)	158 (47.3)	1.0 (0.58-1.67)	0.96
Not use	35 (53)	31 (47)		
Honey				
Use	30 (46.9)	34 (53.1)	0.76 (0.44-1.29)	0.304
Not use	181 (53.9)	155 (46.1)		
Vinegar				
Use	46 (56.1)	36 (43.9)	1.18 (0.73-1.93)	0.496
Not use	165 (51.9)	153 (48.1)		
Extra salt				
No	183 (52.1)	168 (47.9)	1.22 (0.67-2.24)	0.511
Yes	28 (57.1)	21 (42.9)		
Reheat Frequency				
No	91 (47.9)	99 (52.1)	0.7 (0.46-1.02)	0.064
Yes	120 (57.1)	90 (42.9)		
Water				
Filtered	83 (51.6)	78 (48.4)	0.92 (0.62-1.38)	0.694
UF	128 (53.6)	111 (46.4)		
Fizzy Drinks				
Not use	87 (52.7)	78 (47.3)	1.0 (0.67-1.49)	0.994
Use	124 (52.8)	111 (47.2)		
Tea				
Yes	200(52.5)	181(47.5)	1.24 (0.5-3.16)	0.645
No	11(57.9)	8(42.1)		

OR=odds ratio, CI=confidence interval, HD=homemade, Veg= vegetables, UF=Unfiltered

Table 3 summarizes the lifestyle habits, comorbidities, and medication history of the study population. Among all the females, 15% were smokers while 39% of the males were smokers. Stress levels were measured in the participants using a scale from 0-10, 0 being the highest while 10 being the lowest stress level. Both the cases and the controls reported higher levels of stress (mean: 2.79 and 2.82 respectively). This study found a higher proportion of controls than cases with obesity (65% vs. 35%) consuming red meat i.e., beef (57% vs. 43%), having GI problems (62% vs. 38%), and doing self-medication when they are under stress (92% vs. 8%). These findings are statistically significant and indicate the poor lifestyle habits among controls (Table 3).

Cases compared to controls (54% vs. 46%) had higher odds of consuming aspirin (1.08-2.4, 95% CI, p=0.018). This finding remained consistent when a sub-group analysis was performed on the sample aged 40 years and above. Of the overall sample, 20% were consuming vitamin supplements. Controls (60%) were taking vitamin supplements more than the cases (40%). The distribution of diabetics and hypertensives was found to be more in controls (60%; OR=1.007 and 59%; OR=1.5 respectively). The prevalence of family history was slightly more in cases (53%) than controls (47%).

Table 3: Lifestyle factors and comorbidities among cases and control

Value	Control	Case	Crude OR (95% CI)	P-value
BMI				
Mean ± SD	27.3(6.05)	25.7 (5.8)	-	0.006
Obesity				
No	136 (47.7)	149 (52.3)	0.5 (0.3-0.76)	0.002
Yes	75 (65.2)	40 (34.8)		
Addiction				
No	202(53.2)	178(46.8)	1.4 (0.56-3.42)	0.476
Yes	9(45.0)	11(55.0)		

Alcohol				
No	206 (52.8)	184 (47.2)	1.12 (0.32-3.93)	0.86
Yes	5 (50)	5 (50)		
Smoking				
No	164(52.9)	146(47.1)	1.03 (0.64-1.64)	0.909
Yes	47(52.2)	43(47.8)		
Exercise				
Yes	38 (51.4)	36 (48.6)	0.93 (0.56-1.55)	0.79
No	173 (53.1)	153 (46.9)		
Stress levels				
Mean ± SD	2.82 (0.89)	2.79 (0.94)	-	0.819
Self-medicate				
Yes	12(92.3)	1(7.7)	0.09 (0.01-0.68)	0.004
No	199(51.4)	188(48.6)		
Family CVD history				
No	154(55.4)	124(44.6)	1.42 (0.92-2.17)	0.11
Yes	57(46.7)	65(53.3)		
Hypertension*				
No	45(68.2)	21(31.8)	1.51 (0.86-2.67)	0.154
Yes	166(58.7)	117(41.3)		
Diabetes*				
No	112(60.5)	73(39.5)	1.007 (0.65-1.55)	0.973
Yes	99(60.4)	65(39.6)		
Gastrointestinal (GI) issues				
No	145(49.5)	148(50.5)	0.61 (0.4 -0.96)	0.031
Yes	66(61.7)	41(38.3)		
Gynecological				
No	142 (54.2)	120 (45.8)	0.65 (0.23-1.8)	0.313
Yes	11 (64.7)	6 (35.3)		
Mental illness				
No	195(51.6)	183(48.4)	0.4 (0.15-1.04)	0.054
Yes	16(72.7)	6(27.3)		
Vitamins				
Yes	49(60.5)	32(39.5)	1.48 (0.9 -2.44)	0.118
No	162(50.8)	157(49.2)		
Pain killers				
Yes	152 (59.6)	103 (40.3)	0.46 (0.31-0.7)	<0.001
No	59 (40.7)	86(59.3)		
Anti-hypertensive				
No	61(49.6)	62(50.4)	0.83 (0.54 -1.27)	0.399
Yes	150(54.2)	127(45.8)		
Antacids				
Yes	55(55.0)	45(45.0)	0.9 (0.56-1.4)	0.603
No	156(52.0)	144(48.0)		
Aspirin				
Yes	79(45.9)	93(54.1)	1.62 (1.08-2.4)	0.018
No	132(57.9)	96(42.1)		

OR=odds ratio, CI=confidence interval, BMI=body mass index, SD=standard deviation, CVD=cardiovascular diseases
**Cases here refer to patients having only ischemic heart disease*

The final multivariate logistic regression model is represented in table 4. Our multivariable analysis after adjusting for all other variables in the model, showed that age (adjusted OR= 1.03; p=0.00), home grounded spices/condiments (adjusted OR= 0.59; p=0.04), painkillers (adjusted OR= 2.16; p=0.001) and self-medication (adjusted OR= 0.09; p=0.024) were independently associated with CVD. The overall r-squared value explained the model up to 13%.

Table 4. Multivariable logistic regression analysis showing indigenous factors of CVDs among participants

	Unadjusted		Adjusted	
	OR (95% CI)	**P value**	**OR (95% CI)**	**P value**
Age	NA		1.03 (1.02-1.05)	<0.001
HD Spice	0.51 (0.30-0.84)		0.59 (0.35-0.98)	0.04
Pain killers	0.465 (0.31-0.70)	0	2.16 (1.40-3.34)	0.001
Self-medicate when stressed	0.088 (0.01-0.68)	0.004	0.09 (0.01-0.73)	0.024

OR=odds ratio, CI=confidence interval, HD=homemade

DISCUSSION

Consistent with the current evidence increasing age was a strong predictor of CVDs in our sample.[10] Our results showed an inverse or no relationship of high BMI with CVDs. This could be conflicting with the existing literature; however, Tomiyama and colleagues in their evaluation of the National Health and Nutrition Examination Survey data, conducted in the United States from 2005-2012, had a similar finding. Based on this survey data, Tomiyama and colleagues highlighted that individuals on higher ends of BMI can have normal metabolic profiles. This observation also brings up an important discussion on weight stigma and disease progression of any kind. Since our results showed no positive correlation between obesity and prevalence of cardiovascular disease, we can discuss here the historic overemphasis of obesity as a risk factor for cardiovascular disease. During the National Health and Nutrition Examination Survey, conducted in the United States from 2005-2012, markers of cardiovascular health such as triglyceride levels, C-reactive protein, cholesterol, and insulin resistance were stratified by BMI. This study showed that nearly half of overweight subjects were metabolically healthy, and over 30% of subjects having weight in the normal range were found to be cardio metabolically unhealthy as per those health markers studied in this article.[11] Often, the association between obesity and lack of physical activity (a sedentary lifestyle) is overemphasized and oversimplified.

Owing to the high cholesterol levels and the great amount of saturated fats found in red meat, it is

associated with increased risk of cardiovascular disease and several studies support this result. 56.7% patients from the control group reported beef consumption. However, since the exact amount of beef consumed per day was not recorded, we cannot establish a clear link between CVDs and beef consumption. Only 43.3% of the cases reported consuming beef in their regular diets. This could be explained by the lifestyle changes the cases may have adapted after getting a diagnosis of CVD. According to a study by Romaina Iqbal et al which was a multinational prospective study, no clear link was found between consumption of unprocessed red meat and risk of major CVDs. This study supports the results from our study.[12] According to a meta-analysis by Dagfinn Aune et al it was reported that vegetable consumption is in fact associated with decreased risk of cardiovascular diseases and overall mortality as well.[13] Our results are in line with these findings though they lack statistical significance due to insufficient power of the study.

This study's subjects from the control group showed higher rates of egg consumption, so our study aligns with the hypothesis that eggs are protective against forms of cardiovascular disease. In an updated meta-analysis done,[14] moderate egg consumption (up to one egg consumed daily) was associated "with a slightly lower cardiovascular disease risk among Asian cohorts." This publication included a prospective cohort study that took place in the United States. Asians as a demographic in the US include a larger proportion of East Asians than our study obviously does, with our sample demographics almost entirely composed of South Asians. But this study also published findings after running a meta-analysis of prospective cohorts and found that "An increase of one egg per day" was associated with a lower risk of cardiovascular disease among studies conducted in Asia.

Our study found that members of the control group (non-cardiac patients) consumed more fish than cases of cardiovascular disease. Although this finding wasn't statistically significant, this observed trend supports existing data that fish consumption is protective against cardiovascular disease. Fish contain omega-3-fatty acids, specifically Eicosapentaenoic acid (EPA) and Docosahexaenoic acid (DHA), which have been proven to have positive effects on the lipid profile. According to this study on Omega-3-fatty acid's effects, DHA and EPA enhanced LPL activity, accelerating triglyceride clearance from VLDL. Omega 3 fatty acids increase beta oxidation of hepatic FA. Omega 3 Fatty acid inhibits Triglyceride synthesis by halting the final step.[15] Since hypertriglyceridemia is a risk factor for atherosclerosis, omega 3 fatty acids are therefore protective against cardiovascular diseases as classified in our study. EPA has a role in stabilizing atherosclerotic plaques, thereby preventing cerebrovascular disease.[16]

Diet is an important factor contributing to the occurrence of CVD. There is sufficient evidence supporting the protective effect of a Mediterranean diet on CVD.[17] The role of South Asian-style diets and their effect on CVD have not been well studied. However there have been studies which show a cardioprotective effect of Asian spices like turmeric and curcumin.[18] Our results indicate that home-grounded spices have a protective effect on CVD. One of the possible explanations of this finding could be that home-ground spices are free from adulteration, additives, toxic contaminants, and are hygienic.[19] The other proposed explanation is related to the food preparing habits in these households. People still preferring home-prepared spices over market-available spices depicts their overall concern of health and hygiene.

Evidence from several studies have established a significant relationship between extra salt consumption and increased blood pressure, which is the biggest risk factor for cardiovascular diseases. Increase in salt consumption by 5g per day is linked to a 17% increased risk of cardiovascular disease.[20] A study by Pasquale Strazzullo et al also makes a link between increased salt consumption and overall risk of cardiovascular disease.[21] However due to the inaccurate measurement and reporting of salt amounts these results can be difficult to interpret and may be highly underestimated which can explain why only 49 patients out of 400 patients reported use of extra salt in our study.

We classified exercise (physical activity) and its types as risk factors in our study. While our results for any association between exercise and exercise were not significant, it is important to mention here because many cardiometabolic factors associated with obesity can be improved independent of weight loss, with exercise training, physical activity and improved cardiorespiratory fitness.[22] Furthermore, a systematic review based on thirty-six studies concluded that fitness and physical activity diminishes any relationship between fatness and both cardiovascular disease and cardiovascular mortality.[23]

In our study we found that 42.8% of participants with diabetes also had concomitant CVDs. This observation is supported by the idea that cardiovascular diseases are often linked to diabetes, both diseases having multiple risk factors in common as found by a study

done in 2015. And as per a global literature review conducted over a decade (2007-2017),[24] it was concluded that "CVD affects approximately 32.2% of all persons with T2DM. CVD is a major cause of mortality among people with T2DM." Apart from this understood connection, that observed patients included in our study's control group, patients presenting to the cardiology outpatient department to obtain prescriptions for both hypertension and diabetes can be explained that hypertension (both alone and a risk factor for cardiovascular disease) and diabetes are comorbid among themselves.[25] The subgroup analysis shows an element of referral bias where it was sensed that there was an under representation of exposed cases in the sample. A simple stratified analysis helped neutralize these effects.

In this study more controls than cases reported GI symptoms. Though many times GI symptoms mimic those of heart diseases, as a result many patients end up in cardiac OPDs but when screened they are found to be free of CVDs. 41 (21.7%) patients in our sample who had CVDs also had current or past diagnosed GI diseases. Our study is among the very few research available that assesses the local risk factors of CVDs in our population. Despite having an appropriately calculated large sample size we could not find enough power for analyzing certain associations such as relationship of vegetable consumption, stress levels and self-medication when stressed with CVDs. This study faced data collection issues during COVID-19 times, and it took longer for us to fulfill the estimated sample size. Although this study was conducted in a large 2000 bedded teaching hospital, the majority of the population visiting Civil Hospital Karachi comes from a poor socioeconomic background hence these results may not be extrapolated to higher socioeconomic groups. We recommend that future studies on similar topics be conducted in a multicenter setting including participants from a variety of backgrounds with more robust methodology.

CONCLUSION

Based on our results home-grounded condiments besides the known factor of younger age have more protective effects on CVD than the open spices available from the market. With reference to CVD the poor lifestyle habits and anthropometric profile of our control participants indicates a need for urgent and appropriate preventive measures at population level.

AUTHORS' CONTRIBUTION: SMAJ and MR: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. AI, A, MNL, KK, and ET: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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Address for Correspondence:

Dr. S M Ashraf Jahangeer, Dow University of Health Sciences; Baba-E-Urdu Road; Karachi 74200; Pakistan.
Email: ashraf.jahangeer@duhs.edu.pk