

## ASSOCIATION OF DIETARY HABITS AND LIFE STYLE BEHAVIORS WITH CARDIOVASCULAR RISK FACTORS AMONG PATIENTS WITH CORONARY ARTERY DISEASES

Muhammad Imran<sup>1</sup>, Muhammad Aqeel Kunwar<sup>2</sup>, Mehwish Zeeshan<sup>3</sup>,  
Muhammad Nauman Khan<sup>4</sup>, Najia Aslam Soomro<sup>5</sup>, Tariq Ashraf<sup>4</sup>, Musa Karim<sup>4</sup>, Saira Yahya<sup>6</sup>, Rashida Qasim<sup>7</sup>

1. Dow University of Health Sciences, Karachi, Pakistan

2. National Heart Institute, Kuala Lumpur, MYS

3. Ziauddin University, Karachi, Pakistan

4. National Institute of Cardiovascular Diseases, Karachi, Pakistan

5. Liaquat National Hospital, Karachi, Pakistan

6. Shaheed Zulfikar Ali Bhutto Institute of Science and Technology, Karachi, Pakistan

7. Sindh Institute of Urology & Transplantation, Karachi, Pakistan

### Address for Correspondence:

Dr. Muhammad Nauman Khan

Assistant Professor of Cardiology, National Institute of Cardiovascular Diseases, Karachi, Pakistan

Email: nkhan116@yahoo.com

### Contribution

MI conceived the idea and designed the study. Data collection and manuscript writing was done by MI, MAK, MZ, MNK, NAS, TA, MK, SY, and RQ. All the authors contributed equally to the submitted manuscript.

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## ABSTRACT

**Objectives:** To determine the association of dietary habits and lifestyle behaviors with cardiovascular diseases risk factors.

**Methodology:** It is a cross-sectional study of a total of 200 cardiovascular disease patients. Data related to age, gender, demographic characteristics, clinical history, dietary habits, lifestyle behaviors, smoking were collected with the help of a questionnaire. Anthropometric measurements like height, weight, BMI, waist circumference (WC) and biochemical parameters like fasting blood glucose, total cholesterol, triglycerides, HDL-C, and LDL-C were analyzed by standardized methods. Data were analyzed by means of SPSS software version 21. Results having p-value  $\leq 0.05$  were considered as statistically significant.

**Results:** The mean age of the 200 participants was  $59.5 \pm 11.0$  years. The commonly observed modifiable CVD risk factors were smoking (39.5%), abnormal WC (77%), abnormal systolic blood pressure (83.5%), abnormal fasting blood glucose (82%), abnormal cholesterol (51.5%), and abnormal triglycerides (84.5%). Frequency of weekly red meat consumption was 66%, similarly, vegetables and fruits, chicken, and fast food consumption was 64.5%, 52.5%, and 76.5% respectively. Nearly one third (31%) of the participants had sedentary lifestyle. The results of the study evaluated that bakery products found to be significantly associated with an increased WC with odds ratio (OR) of 2.18 [1.06 - 4.47];  $p=0.034$ . Surprisingly, use of chicken was found to be lesser associated with SBP  $> 130$  mmHg with OR of 0.19 [0.04 - 0.91];  $p=0.037$  and use of vegetables and fruits was found to be associated with increased incidence of LDL  $> 100$  mg/dl with OR of 2.34 [1.09 - 5.04];  $p=0.029$  respectively.

**Conclusion:** Dietary habits are significantly associated with cardiovascular risk factors than lifestyle behaviors.

**Key Words:** Cardiovascular Diseases, Dietary habits, Life Style Behaviors, Risk Factors.

## INTRODUCTION

Cardiovascular disease (CVD) is a challenging and common health issue that significantly increases the morbidity and mortality rate throughout the world. Unhealthy diet, physical inactivity or sedentary lifestyle, consumption of alcohol, smoking, obesity, hypertension, diabetes, and hyperlipidemia are the major modifiable cardio-metabolic risk factors that cause cardiovascular diseases.<sup>1,2</sup> Approximately 13 million deaths are accredited due to cardiovascular diseases and it is predicted that their associated mortality will rise up to 25 million next to the year 2030.<sup>3</sup> As per World Health Organization (WHO), per year 2 million deaths happen due to unhealthy dietary habits and altered lifestyle behaviors such as physical inactivity or sedentary lifestyle. Prevention of diet and lifestyle related to cardiovascular diseases have become a major health challenge worldwide.<sup>4</sup> Sarebanhassanabadi study results revealed Dietary behaviors are significantly linked with the cardiovascular risk factors, therefore modifications in lifestyle behavior, especially improving the dietary protocols are suggested.<sup>5</sup> In addition, Oguoma study found that increased consumption of alcohol in addition to intake of the unhealthy diet improved the prevalence of cardiovascular disease indications in Nigerian population.<sup>6</sup> The study of Afshin results showed that in 11 countries diet was the most predisposing risk factor for the mortality related to cardio-metabolic deases (CMD). Individual patterns of diet, limited intake of fruits and whole grains may cause cardio-metabolic deases (CMD) death.<sup>7</sup> The findings of the studies reported that cardiovascular diseases are significantly associated with physical inactivity, smoking, adverse effects of psychosocial factors and clustering of two or three lifestyle patterns.<sup>8,9</sup> The association of the lifestyle behavior and diet pattern with cardiovascular disease event is very important because both factors are responsible to enhance the risk of cardiovascular factors such as hypertension, low HDL, high TG, and central obesity.<sup>10</sup>

Presently the consumption of different dietary components has got attention because of their synergistic and inter related effects. Although, biomolecules of nutrients, single unit food and complex food groups are very useful to detect interrelation of diet and disease.<sup>11</sup> Single diet use is useful for helath but when used in combination it can be precursor to develop the non communicable diseases.<sup>12</sup> World wide diet uses pattern is different, some nations use single unit diets but most of the underdeveloped countries use complex unhealthy diet, in the results of CVD risk factors increased.<sup>13</sup> Due to diversity of the culture and dietary pattern, to assess adherence to dietary patterns is important to create independently dietary guidelines.<sup>14</sup> The USA developed their Healthy Eating Index (HEI) to promote healthy society and to prevent chronic disease.<sup>15</sup> Hence, in the developing country

particularly in south asia there is not any specific HEI.<sup>16</sup> Along with diet the physical inactivity is also considered and may be one of important modifiable risk factors for chronic diseases such as diabetes and CVD. It has been suggested that low physical activity is associated with increased risks of CVD and its related mortality.<sup>17</sup> Physically active indivisulas could reduce the risk of CVD through prevention of obesity, hypertension, dyslipidemia, and glycemic control.<sup>18</sup> The objective of this study is to evaluate the dietary pattern, lifestyle factors and their association with CVD risk factors among patients with coronary artery diseases. It will help to reduce the risk of cardiovascular disease in our population by modification of dietary and life style habits.

## METHODOLOGY

This is a cross-sectional study, conducted during February, 2019 till May, 2019 at adult cardiology department of a tertiary care cardiac center. The data were collected from conveniently selected 100 male and female patients each. Adult patients diagnosed with coronary artery diseases, between 31 to 80 years of age were included from both inpatient and outpatient department. Whereas, subjects who do not have cardiovascular disease, pregnant and lactating women were excluded from study.

A questionnaire was designed to collect information from the patients regarding demographic status, personnel medical history, smoking, tobacco use, height (cm), weight (kg), dietary habits such as foods and beverages, red meat, processed meat poultry, fish, legumes, vegetables, fruits and physical activities includes moderate and vigorous etc. Anthropometric measurements include weight (kg), height (cm), body mass Index (BMI in kg/m<sup>2</sup>), waist circumference (WC in cm), and systolic and diastolic blood pressure (mmHg) were measured.

Lifestyle of the patients was categorized as low physical activity, moderate physical activity, vigorous physical activity, and sedentary lifestyle using the yale physical activity survey (YPAS) method.<sup>19</sup>

Whole blood sample of the patients was collected by using standard venipuncture technique, the 12 – 14 hours fasting was recommended before collection of blood samples. After blood sample collection, the sample was transferred into distinct labeled collection tubes i.e. for glucose estimation 2ml in sodium fluoride potassium oxalate tube and 6 ml gel tube for the lipid profile . These samples of blood transported within 2-4 hours in the cold boxes filled with ice to the clinical laboratory. The sample collecting tubes were centrifuged for 15 minutes at a speed of 2500–3000 rpm and then separate plasma from sodium fluoride-potassium oxalate tube and serum from gel tube by transferring into separate aliquots. These aliquots were

analyzed for biochemical parameters by using analyzer Microlab 300. The biochemical investigations comprising on fasting plasmablucoseconcentratio, cholesterol, triglycerides, high density lipoprotein-cholesterol (HDL-C),

and low density lipoprotein-cholesterol (LDL-C) were estimated by enzymatic methods.

Data was examined by using statistical SPSS Software version 21. Descriptive statistics were used to describe

**Table 1: Demographic characteristics of cardiovascular disease patients stratified by gender**

Characteristics	Male	Female	Total	p-value
<b>Demographic characteristics</b>				
<b>Marital Status</b>				
Married	89 (89%)	81 (81%)	170 (85.0%)	0.114
Single	6 (6%)	15 (15%)	21 (10.5%)	
Widow/widower	5 (5%)	4 (4%)	9 (4.5%)	
<b>Education</b>				
Illiterate	13 (13%)	18 (18%)	31 (15.5%)	0.831
Matric	26 (26%)	23 (23%)	49 (24.5%)	
Intermediate	32 (32%)	30 (30%)	62 (31.0%)	
Undergraduate	24 (24%)	22 (22%)	46 (23.0%)	
Graduate	5 (5%)	7 (7%)	12 (6.0%)	
<b>Ethnicity</b>				
Punjabi's	6 (6%)	10 (10%)	16 (8.0%)	0.54
Sindhi's	5 (5%)	2 (2%)	07 (3.5%)	
Balochi's	4 (4%)	2 (2%)	06 (3.0%)	
Pashtun's	12 (12%)	8 (8%)	20 (10.0%)	
Muhajir's	66 (66%)	69 (69%)	135 (67.5%)	
Others	7 (7%)	9 (9%)	16 (8.0%)	
<b>Incidence of Diabetes</b>				
Previously Diagnose	45 (45%)	40 (40%)	85 (42.5%)	0.773
Recently Diagnose	30 (30%)	33 (33%)	63 (31.5%)	
No history of Diabetes	25 (25%)	27 (27%)	52 (26.0%)	
<b>Incidence of Hypertension</b>				
Previously Diagnose	28 (28%)	33 (33%)	61 (30.5%)	0.698
Recently Diagnose	54 (54%)	52 (52%)	106 (53.0%)	
No history of HTN	18 (18%)	15 (15%)	33 (16.5%)	
<b>Smoking</b>				
Often	19 (19%)	5 (5%)	24 (12.0%)	<0.001
Chain Smoker	25 (25%)	12 (12%)	37 (18.5%)	
Ex-Smoker	16 (16%)	2 (2%)	18 (9.0%)	
No smoking	40 (40%)	81 (81%)	121 (60.5%)	
<b>Tobacco Chew</b>				
Yes	55 (55%)	29 (29%)	84 (42.0%)	<0.001
No	45 (45%)	71 (71%)	116 (58.0%)	

dietary habits, life style behaviors, and CVD risk factors. Continuous variables are mentioned as mean and standard deviation, categorical variables are shown as percentages. The chi-square and t-test applied to calculate the male and female comparison of different variables. The multivariate binary logistic regression used to identify the association among individual dietary habits and physical activity with CVD risk factor and odds ratio (OR) and 95% confidence intervals were reported. Statistical significance value was set as  $p \leq 0.05$ .

## RESULTS

For the present study, 200 cardiovascular patients (100 male and 100 female) were selected. The age range of selected cardiovascular patients was 31 years to 80 years. The results show that 85% were married, 15.5% were illiterate, more than 55% had either matriculation or intermediate education, and only 6% were graduates. The majority (53%) of patients were recently diagnosed with hypertension (HTN), while, 30.5% had previous history of hypertension, whereas, 42.5% of the patients had previous history of diabetes and 31.5% were recently diagnosed. A majority (60.5%) of the patients were non-smokers and 42% of patients chew tobacco. The demographic characteristics of cardiovascular disease patients are mentioned in Table 1.

The results of cardiometabolic risk factors presented that BMI (more than 30 Kg/m<sup>2</sup>), increased waist circumference (greater than 90 cm in male and greater than 80 cm in female), increased systolic blood pressure (more than 130 mmHg), high level of fasting blood glucose (more than 100 mg/dl), raised level of triglyceride (greater than 150 mg/dl), and reduced HDL – cholesterol were equally prevalent in both male and female patients. Anthropometric measurements and biochemical characteristics of cardiovascular disease patients are presented in Table 2.

Distribution of dietary habits and life style behaviors of cardiovascular disease patients are presented in Table 3. The results indicated that most of the cardiovascular patients i.e., 76.5% intake fast food per week, red meat was also a significant dietary item as 66.% of the patients mostly consumed red meat per week. Other dietary habits included sweet beverages (67.5%), vegetables and fruits (64.5%), chicken (52.2%), dairy products (37.0%), nuts and legumes (25.%), and fish (22.%). Dietary habits and life style behaviors of male patients are not any different from that of female patients, except consumption of red meat, regular consumption of which was found to be more common among male patients as compared to female patients ( $p=0.048$ ).

Table 4. shows the multivariate binary logistic regression analysis for the cardiovascular risk factors such

as BMI > 30 Kg/m<sup>2</sup>, WC > 90/80 cm in male/female, SBP > 130 mmHg, DBP > 85 mmHg, FBS > 100 mg/dl, triglycerides > 150 mg/dl, HDL < 40/50 in male/female, cholesterol > 200 mg/dl, and LDL > 100 mg/dl taking dietary habits and lifestyle as independent variables. The results of the regression analysis show that use of bakery products was found to be significantly associated with an increased WC with OR of 2.18 [1.06 - 4.47];  $p=0.034$ . Surprisingly, use of chicken was found to be lesser associated with SBP > 130 mmHg with OR of 0.19 [0.04 - 0.91];  $p=0.037$  and use of vegetables and fruits was found to be associated with increased incidence of LDL > 100 mg/dl with OR of 2.34 [1.09 - 5.04];  $p=0.029$ .

## DISCUSSION

Cardiovascular disease is the most common non-communicable disease around the world. Modifications in dietary behavior and lifestyle pattern are unique modifiable cardio-metabolic risk factors to prevent cardiovascular diseases.

The result of demographic characteristics indicated that most of the cardiovascular disease patients were males. The majority (53%) of the cardiovascular patients were recently diagnosed with hypertension while 30.5% of patients had a previous history of hypertension. When these demographic characteristics were compared with other studies, similar results were found in Tamil and Iranian population.<sup>20,21</sup> Only 18.5% of cardiovascular patients identified in this study were chain smokers, among them males were dominant (12.5%) than females (6%). While 42% of cardiovascular patients chewed tobacco because of the majority of males i.e., 27.5% as compared to females (14.5%). In a study the heavy ever smokers were 17%, along with most of the smokers were with cardiovascular disease,<sup>22</sup> it is proved that tobacco use enhanced the CVD factors.<sup>23</sup>

The mean BMI ( $30.5 \pm 6.5$  kg/m<sup>2</sup>) was significantly higher ( $p < 0.05$ ) in cardiovascular patients. Our results show that males had high waist circumference ( $103.5 \pm 17.4$  cm) than females ( $94.8 \pm 19.5$  cm). The similar results were noted by Baranwal et al, the BMI was noted higher among the males as compared to females.<sup>24</sup> The blood pressure record signifies that mean systolic blood pressure is considerably high ( $p < 0.05$ ) in cardiovascular disease patients ( $155.5 \pm 19.2$  mm Hg). When the result of present study compare with the study of China (Shenzhen City) i.e., the mean age of study participants is  $71.1 \pm 5.8$ , which is higher from our study age group ( $59.5 \pm 11$ ) and means of BMI was  $71.1 \pm 5.8$  kg/m<sup>2</sup>, waist circumference was  $84.4 \pm 18.4$  cm, systolic blood pressure was  $84.4 \pm 18.4$  mmHg, diastolic blood pressure was  $77.1 \pm 10.9$  mmHg, these values are low in comparison to the results of this

**Table 2: Anthropometric measurements and biochemical characteristics of cardiovascular disease patients stratified by gender**

<b>Risk Factors</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>	<b>P-value</b>
<b>Age</b>	60.0 ± 11.0	59.0 ± 11.0	59.5 ± 11.0	0.521
31- 40 years	5 (5%)	5 (5%)	10 (5.0%)	
41- 50 years	13 (13%)	27 (27%)	40 (20.0%)	
51 – 60 years	34 (34%)	21 (21%)	55 (27.5%)	0.083
61 – 70 years	32 (32%)	29 (29%)	61 (30.5%)	
71 – 80 years	16 (16%)	18 (18%)	34 (17.0%)	
<b>Body Mass Index (BMI) (Kg / m<sup>2</sup>)</b>	30.0 ± 5.0	31.0 ± 8.0	30.5 ± 6.5	0.29
> 30 Kg/m <sup>2</sup>	56 (56%)	65 (65%)	132 (66.0%)	0.193
< 30 Kg/m <sup>2</sup>	44 (44%)	35 (35%)	64 (32.0%)	
<b>Waist Circumference (cm)</b>	103.5 ± 17.4	94.8 ± 19.5	99.1 ± 18.4	0.001
> 90 cm in male &> 80 cm in female	72 (72%)	82 (82%)	154 (77.0%)	0.093
< 90 cm in male &< 80 cm in female	28 (28%)	18 (18%)	46 (23.0%)	
<b>Systolic Blood Pressure (mmHg)</b>	160.0 ± 17.0	151.0 ± 21.5	155.5 ± 19.2	0.001
> 130 mmHg	87 (87%)	80 (80%)	164 (83.5%)	0.182
< 130 mmHg	13 (13%)	20 (20%)	33 (16.5%)	
<b>Diastolic Blood Pressure (mmHg)</b>	102.2 ± 7.6	106.1 ± 14.6	104.1 ± 11.1	0.019
> 85 mmHg	88 (88%)	83 (83%)	135 (67.5%)	0.315
< 85 mmHg	12 (12%)	17 (17%)	46 (23.0%)	
<b>Fasting Blood Glucose (mg/dl)</b>	133.0 ± 41.0	138.0 ± 63.0	135.5 ± 52.0	0.507
> 100 mg/dl	89 (89%)	75 (75%)	164 (82.0%)	0.101
< 100 mg/dl	11 (11%)	25 (25%)	36 (18.0%)	
<b>Fasting Cholesterol (mg/dl)</b>	201.0 ± 39.3	207.0 ± 46.0	204.0 ± 42.6	0.323
> 200 mg/dl	44 (44%)	59 (59%)	103 (51.5%)	0.034
< 200 mg/dl	56 (56%)	41 (41%)	97 (48.5%)	
<b>Triglycerides (mg/dl)</b>	184.0 ± 52.0	200.0 ± 59.0	192.0 ± 55.5	0.043
> 150 mg/dl	80 (80%)	89 (89%)	169 (84.5%)	0.079
< 150 mg/dl	20 (20%)	11 (11%)	31 (15.5%)	
<b>HDL - C (mg/dl)</b>	30.7 ± 6.6	31.5 ± 6.4	31.1 ± 6.5	0.385
> 40 mg/dl in male &> 50 mg/dl in female	19 (19%)	21 (21%)	40 (20.0%)	0.724
< 40 mg/dl in male &< 50 mg/dl in female	81 (81%)	79 (79%)	160 (80.0%)	
<b>LDL – C (mg/dl)</b>	127.4 ± 37.0	130.0 ± 34.3	128.7 ± 35.6	0.607
> 100 mg/dl	72 (72%)	77 (77%)	149 (74.5%)	0.417
< 100 mg/dl	28 (28%)	23 (23%)	51 (25.5%)	

**Table 3: Dietary habits and life style behaviors of cardiovascular disease patients stratified by gender.** study.<sup>25</sup>

<b>Dietary Habits</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>	<b>P-value</b>
<b>Vegetables and Fruits per week</b>				
Mostly	60 (60%)	69 (69%)	129 (64.5%)	0.125
Rarely	38 (38%)	26 (26%)	64 (32.0%)	
No intake	2 (2%)	5 (5%)	07 (3.5%)	
<b>Dairy Products per week</b>				
Mostly	36 (36%)	38 (38%)	74 (37.0%)	0.697
Rarely	39 (39%)	42 (42%)	81 (40.5%)	
No intake	25 (25%)	20 (20%)	45 (22.5%)	
<b>Red Meat per week</b>				
Mostly	72 (72%)	60 (60%)	132 (66.0%)	0.048
Rarely	28 (28%)	36 (36%)	64 (32.0%)	
No intake	0 (0%)	4 (4%)	04 (2.0%)	
<b>Chicken per week</b>				
Mostly	55 (55%)	50 (50%)	105 (52.5%)	0.469
Rarely	30 (30%)	38 (38%)	68 (34.0%)	
No intake	15 (15%)	12 (12%)	27 (13.5%)	
<b>Fish per week</b>				
Mostly	24 (24%)	20 (20%)	44 (22.0%)	0.476
Rarely	46 (46%)	42 (42%)	88 (44.0%)	
No intake	30 (30%)	38 (38%)	68 (34.0%)	
<b>Nuts &amp; Legumes per week</b>				
Mostly	26 (26%)	24 (24%)	50 (25.0%)	0.587
Rarely	40 (40%)	35 (35%)	75 (37.5%)	
No intake	34 (34%)	41 (41%)	75 (37.5)	
<b>Fast Food per week</b>				
Mostly	78 (78%)	75 (75%)	153 (76.5%)	0.617
Rarely	22 (22%)	25 (25%)	47 (23.5%)	
No intake	0 (0%)	0 (0%)	0.0 (0.0%)	
<b>Sweet Beverages per week</b>				
Mostly	70 (70%)	65 (65%)	135 (67.5%)	0.24
Rarely	24 (24%)	22 (22%)	46 (23.0%)	
No intake	6 (6%)	13 (13%)	19 (9.5%)	
<b>Physical Activity Level</b>				
Low Physical Activity	30 (30%)	25 (25%)	55 (27.5%)	0.36
Moderate Physical Activity	20 (20%)	31 (31%)	51 (25.5%)	
Vigorous Physical Activity	17 (17%)	15 (15%)	32 (16.0%)	
Sedentary Lifestyle	33 (33%)	29 (29%)	62 (31.0%)	

TABLE 4: Association of Dietary Habits, Life Style Behavior with Cardiovascular Risk Factors in CVD Patients

	OR [95% CI]	P-value	OR [95% CI]	P-value	OR [95% CI]	P-value
	<b>BMI &gt; 30 Kg/m<sup>2</sup></b>		<b>DBP &gt; 85 mmHg</b>		<b>Triglycerides &gt; 150 mg/dl</b>	
Vegetables & Fruits	1.12 [0.56 - 2.25]	0.753	4.25 [1.69 - 10.67]	0.002	0.38 [0.15 - 0.96]	0.041
Bakery Products	0.76 [0.41 - 1.4]	0.379	0.53 [0.2 - 1.37]	0.190	0.99 [0.49 - 1.98]	0.968
Red Meat	0.67 [0.36 - 1.24]	0.201	1.47 [0.59 - 3.65]	0.406	0.97 [0.48 - 1.97]	0.929
Chicken	0.88 [0.44 - 1.75]	0.717	0.68 [0.23 - 1.99]	0.482	0.81 [0.36 - 1.81]	0.604
Fish	0.93 [0.48 - 1.8]	0.822	1.65 [0.66 - 4.15]	0.288	0.59 [0.26 - 1.34]	0.208
Nuts & Legumes	1.39 [0.74 - 2.62]	0.307	0.6 [0.23 - 1.52]	0.281	1.73 [0.83 - 3.59]	0.143
Sedentary Lifestyle	0.92 [0.49 - 1.72]	0.789	2.37 [0.83 - 6.79]	0.109	0.95 [0.46 - 1.97]	0.896
	<b>WC &gt; 90/80 cm in male/female</b>		<b>FBS &gt; 100 mg/dl</b>		<b>HDL &lt; 40/50 in male/female</b>	
Vegetables & Fruits	0.5 [0.2 - 1.28]	0.149	1.54 [0.65 - 3.63]	0.329	0.22 [0.03 - 1.8]	0.156
Bakery Products	2.18 [1.06 - 4.47]	0.034*	0.67 [0.3 - 1.52]	0.342	0.64 [0.18 - 2.3]	0.495
Red Meat	0.77 [0.36 - 1.63]	0.494	0.76 [0.33 - 1.75]	0.517	0.85 [0.24 - 3.02]	0.806
Chicken	0.72 [0.31 - 1.7]	0.457	0.59 [0.22 - 1.58]	0.292	0.53 [0.11 - 2.57]	0.427
Fish	1.24 [0.57 - 2.71]	0.582	1.46 [0.63 - 3.36]	0.376	0.92 [0.23 - 3.68]	0.904
Nuts & Legumes	0.7 [0.33 - 1.51]	0.368	1.15 [0.5 - 2.62]	0.746	1.83 [0.52 - 6.47]	0.351
Sedentary Lifestyle	1 [0.47 - 2.11]	0.994	0.79 [0.35 - 1.76]	0.557	0.94 [0.26 - 3.42]	0.926
	<b>SBP &gt; 130 mmHg</b>		<b>Cholesterol &gt; 200 mg/dl</b>		<b>LDL &gt; 100 mg/dl</b>	
Vegetables & Fruits	2.15 [0.81 - 5.68]	0.124	1.03 [0.51 - 2.08]	0.924	2.34 [1.09 - 5.04]	0.029*
Bakery Products	0.48 [0.18 - 1.29]	0.148	0.56 [0.31 - 1.04]	0.066	1.31 [0.66 - 2.62]	0.441
Red Meat	1.37 [0.54 - 3.49]	0.506	1.05 [0.57 - 1.95]	0.868	1.39 [0.69 - 2.81]	0.363
Chicken	0.19 [0.04 - 0.91]	0.037*	1.17 [0.59 - 2.31]	0.649	0.81 [0.36 - 1.81]	0.603
Fish	1.53 [0.58 - 4.03]	0.385	0.89 [0.46 - 1.72]	0.732	0.89 [0.41 - 1.91]	0.759
Nuts & Legumes	0.98 [0.38 - 2.53]	0.971	1.33 [0.71 - 2.51]	0.375	0.87 [0.42 - 1.81]	0.702
Sedentary Lifestyle	1.24 [0.47 - 3.28]	0.660	0.98 [0.52 - 1.83]	0.939	0.67 [0.33 - 1.36]	0.267

OR = odds ratio, CI = confidence interval, BMI = body mass index, WC = waist circumference, FBS = fasting blood glucose. Significance level: p < 0.05

\*

The mean fasting blood glucose level of cardiovascular disease patients was significantly high  $135.5 \pm 52.0$  mg/dl. Similarly the higher fasting level was noted by Bancks et al in his study.<sup>26</sup> The mean total cholesterol of cardiovascular disease patients ( $204.0 \pm 42.6$  mg/dl) indicate significantly higher ( $p = <0.05$ ) value. The serum high density lipoprotein – Cholesterol (HDL-C) concentration showed significant lower levels ( $p < 0.05$ ) among cardiovascular disease patients ( $31.1 \pm 6.5$  mg/dl). The mean low density lipoprotein – Cholesterol (LDL-C) was high ( $p = <0.05$ ) in cardiovascular disease patients ( $128.7 \pm 35.6$  mg/dl). Similar finding was reported by Wang and Peng et al stated that, the characteristic of obesity is dyslipidemia and hyperlipidemia.<sup>27</sup> In Africa, Tylor et al. (2010) observed that obesity is significantly associated ( $p < 0.05$ ) with low values of HDL – C and higher values of triglycerides and LDL – C in 55 – 74 years of age group (ranging from 35 – 74 years of age).<sup>28</sup>

The results of the dietary habits stated that the intake of fast food and red meat per week is significantly associated ( $p < 0.05$ ) in cardiovascular disease patients, including males and females. Drinking of sweet beverages, dairy products, nuts and legumes, and fishes are mostly ingested per week, but they have no significance difference ( $p > 0.05$ ). Sun et al results revealed four models of dietary pattern developed named as “traditional food pattern,” containing of vegetables, fruits, rices, porksmeat, and fishes; a “fast and processed food pattern” comprising of fast food or a processed cane food products, artificial sugar, and sweet; a “soybean, grain, and flour food pattern”; or “dairy, animal liver, and other animal food pattern.” The results revealed that, intake of dietary patterns especially ingestion of “traditional Chinese food” is significantly associated with decreased blood pressure and cholesterol level and dietary habit of sayabean and grain decrease the risk of cardiovascular diseases by lowering triglycerides, fasting blood glucose (mg/dl), waist circumference (cm), and increased intake of dairy and any type of animal meat intake, it is signinfactly associated with high level of BMI.<sup>29</sup>

The results of the study noted that sedentary lifestyle has the highest frequency followed by low physical activity, moderate physical activity, and vigorous physical activity, males are more common to spent sedentary lifestyle and perform low physical activity than females, whereas moderate and vigorous physical activities are frequently seen in females than males. Brugnara et al suggested that prevalence of sedentary lifestyle was in 32.3% males and 39% females ( $p < 0.0001$ ). Low physical activity was significantly seen in individuals that were known to have diabetes, prediabetes and normal glucose regulation ( $p = 0.0014$ ), The result of the study stated that the overall prevalence of cardiovascular risk factors is significant ( $p = <0.05$ ) in 61 – 70 years of age group.<sup>30</sup>

The results of cardiometabolic risk factors showed that BMI (more than 30 Kg/m<sup>2</sup>), increased waist circumference (greater than 90 cm in men and greater than 80 in women), increased systolic blood pressure (more than 130 mmHg), high level of fasting blood glucose (greater than 100 mg/dl), raised level of triglyceride (mcholesterlore than 150 mg/dl), and reduced igh density lipoprotein cholesterol (HDL – C) are significant ( $p < 0.05$ ) with both male and female in cardiovascular disease patients While, age (years), diastolic blood pressure (mmHg), Fasting cholesterol mg/dl), and low density lipoprotein low density lipoprotein cholesterol, low density lipoprotein –cholesterol (LDL-C) has no significant difference ( $p > 0.05$ ) in both men and women. Comparatively, the results of a Malaysia studydescribed the CVD risk factors are more common in 48 – 50 years of age group. The results of BMI have high significance. The cardiometabolic risk factor in males were increased due to high frequency of smoking, increased systolic blood pressure, reduced level of HDL-C, and greater frequency of diabetics among than females.<sup>31</sup> Similarly, Khetan et al (stated that people live in West Bengal (India) may suffered from the major cardiovascular risk factors that include 18.3% hypertensive patients ( $n=650$ ), 9.0% diabetics ( $n=317$ ) and 14.1% smokers ( $n=500$ ).<sup>32</sup> The multivariate binary logistic regression analysis showed that the use of bakery products found to be significantly associated with an increased WC, in Eastern India, Verma et al reported that junk foods and sweat dishes increases CVD risk.<sup>33</sup> Surprisingly, use of chicken was found to be lesser associated with SBP  $> 130$  mmHg with and use of vegetables and fruits was found to be associated with inceased incidence of LDL  $> 100$  mg/dl respectively. The vegitables reduced the risk of CVD events due to its micrfonutrients valus but in our study the association with LDL is infact due to deep cooking with the help of saturated faty oils.It is proved that chicken have some benefit compounds to reduced the hypertension.<sup>34</sup>

Sedentary lifestyle behaviors such as sedentary lifestyle has no significant difference with any risk factor of cardiovascular diseases. Similar results are observed by Htun et al in Japanese adults. They evaluated the association between food intake and CVD rish factors, Intake of meat and fat was connected with incesed WC, body mass index, blood pressure and lipid profile levels in both males and females.<sup>35</sup>

## CONCLUSION

The outcomes of this study indicated that diety habbits are potentially associated with the CVD risk factors such as high coloric diet, bakery items, and surprisingly fruits and vegitables. Use of chicken was noted to be very weak associated with hypertension, along with the sedentary lifestyle which have not shown any strong association with

the CVD risk factors. Furthermore, it is need to evaluate the copping pattern of the vegetables and effects on the CVD risk factors, also, it is important to develop a culturally appropriate healthy eating index to monitor the healthy diet pattern in order to reduce the CVD risk in our population.

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