



Prevalence of Cardiovascular Disease Risk Factors among People in Hail City, Saudi Arabia

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Cardiovascular diseases (CVDs) are the number one cause of death globally, and representing 31% of all global deaths according to WHO. So, this study may be useful to detect the risk factors of CVDs and how to prevent them to help in reducing the rate of deaths due to these diseases.

Aim: To estimate the prevalence of CVD risk factors in Hail region, Saudi Arabia (KSA).

Methods: The study was carried out through an observational cross-sectional study on 300 participants from Hail region including both genders (females 231 [77%] & males 69 [23%]) with age group range from 18 years-old and above. The study was conducted using an electronic questionnaire, and the data was analyzed using Software Statistical Package for the Social Science (SPSS) version 23.

Results: The highest risk factor for CVDs was obesity, the total number of overweight, obese and extremely obese was 171 (57%) which was more pronounced with peoples at the age of 31-45

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years old. Other risk factors that were found in our participants were hypertension (8.3%), diabetes mellitus (DM, 7.3%), family history of diseases (80.4%), consuming insufficient amounts of fruits and vegetables (62.7%), always drinking coffee (60.9%), physical inactivity (34.7%), consuming fast foods more than one time per week (32.4%) and smoking 10.3%. We can conclude that many risk factors for CVDs were prevalent among Hail population either non modifiable (family history of diseases) or modifiable (obesity, physical inactivity, fast foods, insufficient amounts of fruits and vegetables) showed a considerable percentage which needs awareness programs for Hail population.

Keywords: CVD; Diabetes Mellitus (DM); hypertension; smoking; obesity; heart diseases; prevalence; Hail; Saudi Arabia.

1. INTRODUCTION

Cardiovascular diseases include coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis, and pulmonary embolism [1,2]. Cardiovascular diseases (CVDs) are the first cause of death globally, taking an estimated 17.9 million people died from CVDs in 2016, representing 31% of all global deaths; the majority of these deaths occur in low- and middle-income countries. Individuals at risk of CVD may demonstrate raised blood pressure, glucose, and lipids as well as overweight and obesity. People with cardiac diseases who are physically fit live longer and have fewer heart attacks than cardiac patients who aren't physically fit [3]. In Saudi Arabia, the leading cause of death between 1990- 2017 was cardiovascular disease, according to the Global Burden of Disease (GBD) compare website [4]. According to the WHO and Ministry of Health (MOH) Statistical Yearbook, CVDs are the cause of 42 % of the Kingdom's non-communicable diseases deaths in 2010 [5]. Although a significant proportion of extrinsic risk factors for CVD (such as cigarette smoking, unhealthy diet, and physical inactivity) are preventable, the incidence of CVDs continues to increase because of inadequate prevention measures [1,6]. Globally, > 23 million people are projected to die annually from CVD by 2030 [7,8]. An increase in sedentary behavior is likely to be an important driver of CVDs in the KSA [9]. Studies in Saudi Arabia estimated that the prevalence of hypertension is around 49%; while coronary heart disease is between 5–6% [10].

At least 68 percent of people aged 65 or older with diabetes die because of heart disease, and adults with diabetes are two to four times more likely to die from heart disease than adults without diabetes, in addition to that, the American Heart Association considers diabetes to be one

of the seven major controllable risk factors for cardiovascular disease [11,12]. Primary prevention is an important focus of most of the cardiovascular prevention guidelines around the world. Therefore, our goal in this study is to assess the prevalence of CVD risk factors of developing cardiovascular disease events and thus raise awareness and prevent these events among people in Hail region.

2. SUBJECTS AND METHODS

2.1 Study Design

The study was carried out in February 2021 for two weeks through an observational cross-sectional study on 300 of participants from Hail region (300 from 403 participants after exclusion of persons who are not from Hail or less than 18 years-old) including both genders with age group range from 18 years old and above. The study was conducted using an electronic questionnaire, voluntary participation and it included multiple choice questions (17 questions) about Socio-demographic characteristics such as gender, age, height, weight, Nationality, region of residence, social status and occupational status. Other questions about the following risk factors of CVDs including family history, personal history, smoking, physical activity and diet.

2.2 Statistical Analysis

The data were collected using Google forms service, coded and processed using Microsoft Excel and SPSS version 23 program. Descriptive statistics including frequencies and percentages were used to describe the items and the study variables. As the variables are nominal data, the Chi square was conducted to test the significant differences and relationship based on the study objectives. The *p* values at 0.05 were considered statistically significant. For body mass index

(BMI) of participants, it was calculated by SPSS through the following equation: $W/(H*H) *1000$, where W refers to weight, H refers to height. BMI for adult was categorized according to CDC (Centres of Diseases Control and prevention) as the following: the person is called to be underweight if the BMI was below 18.5, the normal or healthy weight is ranged between 18.5- 24.9, overweight (25- 29.9), obese (30 - 34.9) and finally BMI equal or more than 35 is considered extremely obese [13].

3. RESULTS

In this research, Table 1 showed the number of participants were 300 people from Hail region; most of them were females 231 (77%), while the male contributors were 69 (23%). The age groups were divided into three groups, the first age group included people from the age 18-30 years old was 161 (53%) and those were the majority of the study sample. The other age group was those with age range from 31-45 years old 97 (32%) of the sample. The last group was for people with age above 45 years old, 42 (14%) of the study sample. Also, the social status of the participants was divided into single, married, widowed and divorced. The majority of the study sample were single, with 154 participants (51.3%). Married group 133 (44.3%), Widow group were only 6 (2%) and the divorced group were 7 (2.3%) of the total sample. This study showed that employment status was categorized into Employee 105 (35%), unemployed 70 (23.3%) and students 125 (41.7%). The fields of participants in this study were: Government field (13.3%), educational field (15.3%), private field (5%), free field (3%) and either military field or medical field (2%).

Table 2 showed the prevalence of diseases among our participants were hypertension only 6 (2.0%), and the prevalence hypertension with other diseases like diabetes mellitus, high cholesterol, obesity was 25 (8.3%). The prevalence of DM only was 3 (1%), but as total with other diseases it was 22 (7.3%), some participants had diabetes and obesity 13 (4.3%). and some of them had DM in addition to hypertension, obesity and high cholesterol 2 (0.7%).

Table 3 showed that BMI of participants 24 (8%) who were underweight, while normal weight 105 (35%), overweight 72 (24%), obese 50 (17%) and extremely obese 49 (16%), with a total number of the last 3 categories was 171 (57%) so, the majority of the study sample indicates a

high percentage of obesity. Also, it showed that there was a significant association between the study variables and BMI. First, between gender and BMI, 44.9% of male with normal BMI, while 36.4% of female were obese ($p<0.05$). Second, between age and BMI, 49.7% of 18-30 years-old were normal BMI, while 52.4% of >45 years-old were obese ($p<0.001$), these results indicate that weight increased with age. Third, between marital status and BMI, 49.4% of single were normal, while 48.1% of married were obese ($p<0.001$). Fourth, between employment status and BMI, 53.6% of students were normal, while about 43% of employee and unemployed were obese ($p<0.001$). Fifth, between getting Hypertension and BMI, 36% of non-hypertensive patients were normal, while 68% of hypertensive patients were obese ($p<0.01$). Sixth, between DM and BMI, 36.7% of non-diabetic participants were normal BMI, while 68.2% of diabetic patients were obese ($p<0.05$). Seventh, between getting high blood cholesterol level and BMI, 37.5% of participants with normal cholesterol were normal BMI, while 76% of those who had high cholesterol level were obese ($p<0.001$).

Table 4 showed the non-modifiable risk factor which was family history of the diseases among our participants such as hypertension 156 (52%), heart disease 112(37.3%), obesity 92(30.6%), high cholesterol 90(30%), diabetes mellitus 32 (10.6%) and heart attack 29 (9.6%). Statistical analysis showed a significant association between our participants who had or others who had not family history of different diseases that mentioned above such as heart disease, obesity, high cholesterol, DM, and heart attack at ($p<0.001$), while hypertension showed no significant association (Fig. 1).

Fig. 2 showed the modifiable risk factor which was physical inactivity, it was found that 68% of participants were fully perform the daily activities, 22.7% found some difficulty, and 6.7% found more difficult to perform the daily activities. Fig. 3 showed another modifiable risk factor (insufficient fruits and vegetables consuming), it was found that 34.7% of participants sometimes consume fruits and vegetables, while 28% rarely, 22% frequently and 15.3% always consume fruits and vegetables.

Fig. 4 showed another modifiable risk factor (fast foods consuming), it was found that 31% of participants sometimes consume fast food, (28.7%) rarely consume, (20.7%) consumed it 1-2 times per week, and (11.7%) consumed more than three times per week.

Fig. 5 showed another modifiable risk factor which were daily coffee and salts consuming. It was found that the majority of the population in this study 69.3%, 24.3% and 4.7% of our participants consuming daily salts in a rate of moderate, sometimes and high respectively. Regarding drinking coffee, 60.1%, 16.7% and 12% of our participants drinking coffee in a rate of high, moderate and sometimes respectively. Most of the participants are non-smokers 269 (89.7%), while only 10.3% were smokers and most of them from males (not mentioned in tables or figures).

4. DISCUSSION

The leading cause of death in KSA several years was cardiovascular disease, according to the GBD compare website [4]. The risk factors for CVD either non-modifiable and modifiable. The non-modifiable includes genetic factors, ethnicity,

gender, and age, and the modifiable risk factors include body weight, blood pressure, lipid and lipoprotein levels, and smoking status [14]. According to our results, overweight and obesity together (57%) were on the top of the modifiable risk factors among Hail region population.

For non-modifiable risk factors, positive family history of cardiovascular disease shows a significant high prevalence such as hypertension (52%), heart diseases (37.3%), obesity and high cholesterol (each about 30%). Other modifiable risk factors that were included in this study: smoking (10.3%), physical inactivity (34.7%), hypertension (8.3%), diabetes mellitus(7.3%), only 34.7% sometimes consume fruits and vegetables while 31% sometimes consume fast food, and 20.7% consume it 1-2 times per week, and 11.7% consume fast food more than three times a week. So, these results show unhealthy habits for large number of Hail population.

Table 1. Socio-demographic characteristics of the participants. (n= 300 participants, 231 females & 69 males)

Variable		Frequency	%
Gender	Male	69	23
	Female	231	77
Age (years)	18-30	161	53.7
	31-45	97	32.3
	> 45	42	14
Marital status	Single	154	51.3
	Married	133	44.3
	Widow	6	2
	Divorced	7	2.3
Employment status	Employee	105	35
	Student	125	41.7
	Unemployed	70	23.3

Table 2. Frequency and percentage of participants who had different diseases. (n= 300 participants, 231 females & 69 males)

Disease	Frequency	Percent %
Diabetes Mellitus (DM)	3	1.0 %
Diabetes -type 2, High cholesterol, Hypertension, Obesity	2	0.7%
DM, High cholesterol, Obesity	3	1.0%
DM, Hypertension, Obesity	1	0.3%
DM, Obesity	13	4.3%
High cholesterol	3	1.0%
High cholesterol, Hypertension, Obesity	5	1.7%
High cholesterol, Obesity	12	4.0%
Hypertension	6	2.0%
Hypertension, Obesity	11	3.7%
I don't suffer from any of these diseases	117	39.0%
Obesity & Overweight	124	41.3%
Total	300	100.0%

Table 3. The association between BMI and diabetes-type 2, hypertension and high blood cholesterol. (n= 300 participants, 231 females & 69 males)

Items		Total/raw	BMI					P Value
			Underweight	Normal	Overweight	Obese	Extremely Obese	
Gender	Male	69	4 (5.8%)	31(44.9%)	19 (27.5%)	8 (11.5%)	7 (10.1%)	*
	Female	231	20(8.6%)	74 (32%)	53 (22.9%)	42 (18.2%)	42 (18.2%)	
Age (years)	18-30	161	22 (13.7%)	80(49.7%)	30(18.6%)	18(11.2%)	11(6.8%)	***
	31-45	97	2(2.1%)	18(18.6)	32(33%)	31(31.9%)	14(14.4%)	
	>45	42	0(0%)	10(23.8%)	10(23.8%)	17(40.5%)	5(11.9%)	
Marital status	Single	154	21 (13.6%)	76 (49.4%)	29 (18.8%)	18 (11.7%)	10 (6.5%)	***
	Married	135	3 (2.2%)	29 (21.5%)	38 (28.1%)	40 (29.6%)	25(18.5%)	
	Widow	6	0 (0%)	2 (33.3%)	1 (16.7%)	2 (33.3%)	1 (16.7%)	
	Divorced	7	0 (0%)	1 (14.3%)	4 (57.2%)	1 (14.3%)	1 (14.3%)	
Employment status	Employee	105	3 (2.9%)	23 (21.9%)	33(31.4%)	30 (28.6%)	16 (15.2%)	***
	Student	125	17 (13.6%)	67 (53.6%)	20 (16%)	16 (12.8%)	5 (4%)	
	Unemployed	72	4 (5.6%)	18 (25%)	19 (26.4%)	21 (29.2%)	10 (13.9%)	
Non-diabetic		278	24 (8.6%)	102 (36.7%)	68 (24.5%)	44(15.8%)	40 (14.4%)	*
Diabetic		22	0 (0%)	3 (13.6%)	4 (18.2%)	6 (27.3%)	9 (40.9%)	
Non-hypertensive		275	24 (8.7%)	99 (36%)	70 (25.5%)	45 (16.4%)	37 (13.5%)	**
Hypertensive		25	0 (0%)	6 (24%)	2 (8%)	5 (20%)	12 (48%)	
Do you have high cholesterol level?	Yes (25)		0 (0%)	2 (8%)	4 (16%)	9 (36%)	10 (40%)	***
	No (275)		24 (8.7%)	103 (37.5%)	68 (24.7%)	41 (14.9%)	39 (14.2%)	

*** Significant difference from yes and no in high cholesterol between corresponding groups at $p<0.001$; ** Significant difference from hypertensive and non-hypertensive corresponding groups at $p<0.01$; * Significant difference from male and female corresponding groups, diabetic and non-diabetic groups at $p<0.05$

Table 4. Frequency and percentage of family history of different diseases. (n= 300 participants, 231 females & 69 males)

Diseases	Answer	Frequency	Percent	P Value
Hypertension	Yes	156	52%	NS
	No	144	48%	
Heart diseases	Yes	112	37.3%	***
	No	188	62.7%	
Obesity	Yes	92	30.6%	***
	No	208	69.4%	
High Cholesterol	Yes	90	30%	***
	No	110	70%	
Diabetes Mellitus	Yes	32	10.6%	***
	No	268	89.4%	
Heart attack	Yes	29	9.6%	***
	No	271	90.4%	
Vascular disease	Yes	21	7%	***
	No	279	93%	
Sudden death	Yes	14	4.4%	***
	No	286	95.6%	
Healthy family	Yes	59	19.6%	***
	No	241	80.4%	

(***) Significant difference between Yes and No at $p < 0.001$; (NS) no Significant difference between Yes and No at $p < 0.001$

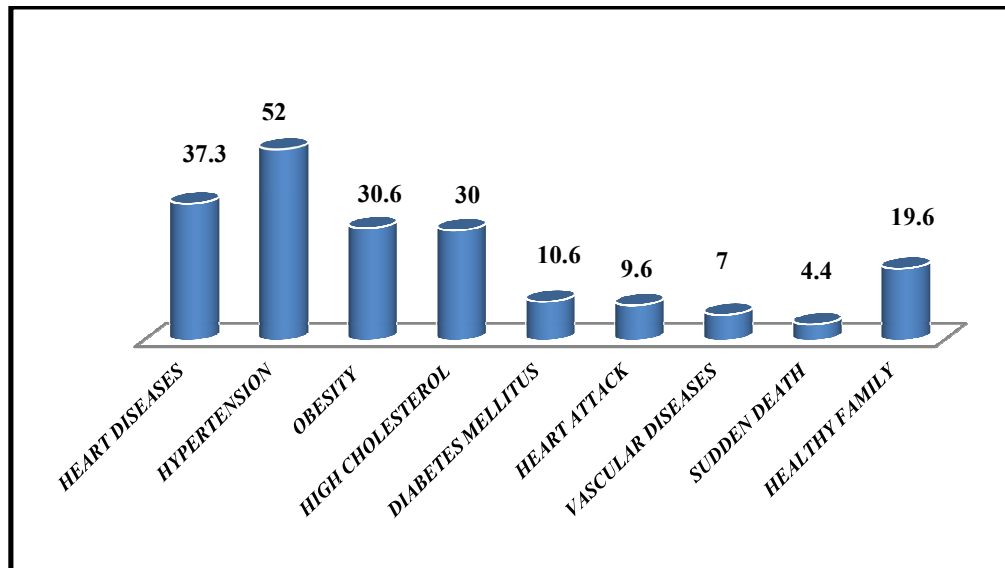


Fig. 1. The percentage of participants who have family history of different diseases

Overweight and obesity together were counting for 57% of the study population. Our results were similar to study done in Al-Qassim region (54%) [15]. According to gender we found 59.3% (females) and 49.1% (males) were obese. This is displayed a considerable high prevalence of obesity among females in Hail region which perhaps due to unhealthy diet and lack of

exercise. Other studies showed that the prevalence of overweight and obesity ranged from 31.2% to 43.3% and 22% to 34.1% in males and from 28% to 34.3% and 26.1% to 44% in females, respectively in Gulf countries [10]. Obesity was regarded as the first cardiovascular risk factor in Germany [16], while in Nepal it counts for 15.3% [17].

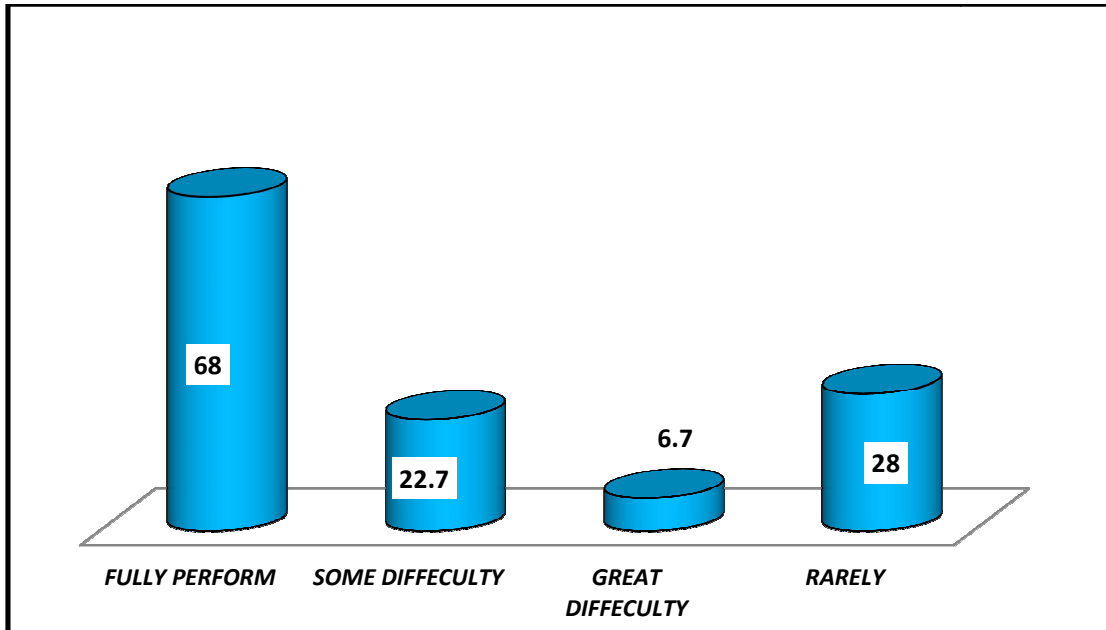


Fig. 2. The percentage of participants who are performing daily activities

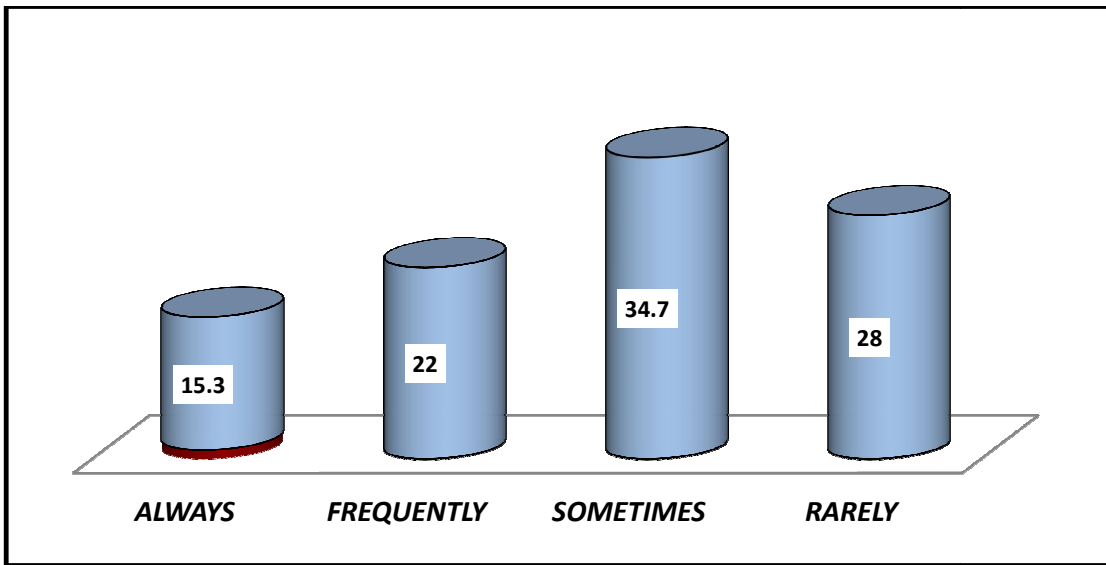


Fig. 3. The percentage of participants who are consuming fruits & vegetables

In our study, 34.7% of our participants showed physical inactivity. Our result was lower when compared with Egypt (98.4%) [18] and Jeddah (KSA) (52%) [19], but higher than Nepal (21%) [17]. Family history is considered as one of the important risk factors for cardiovascular diseases [14]. In our study, 80.4% of the population have family history of CVDs, which is considered significantly high in comparison with Shaqra city in KSA (50.1%) [20].

In our research, 34.7% of our participants were sometimes consuming fruits and vegetables but 28% consume it rarely. The prevalence of insufficient consuming fruits and vegetables was 62.7% which is a high percentage but still lower than other studies in Nepal (98%) and Egypt (98.4) [17,18] This can also be explained as result of insufficient knowledge on the benefits of fruit and vegetables intake [17].

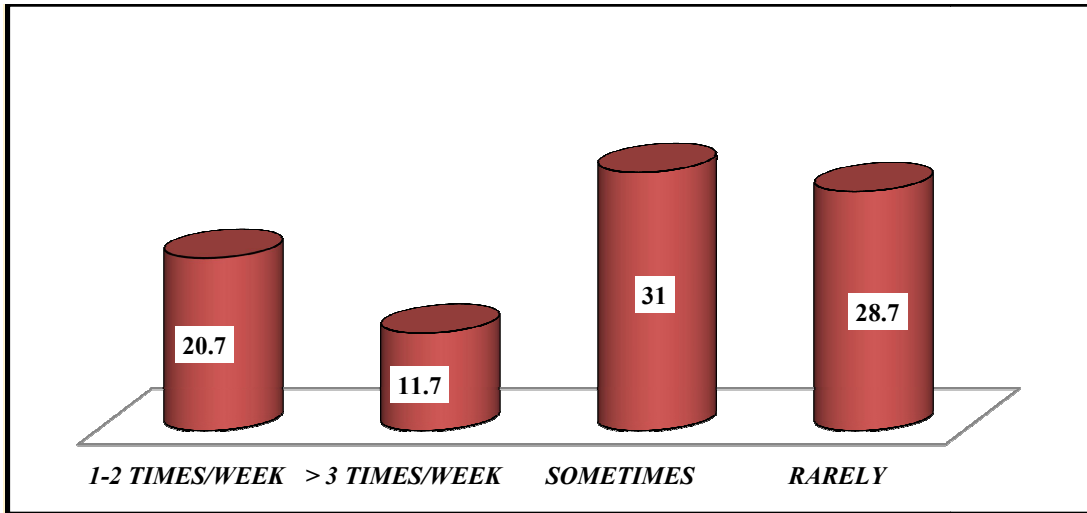


Fig. 4. The percentage of participants who are consuming fast foods

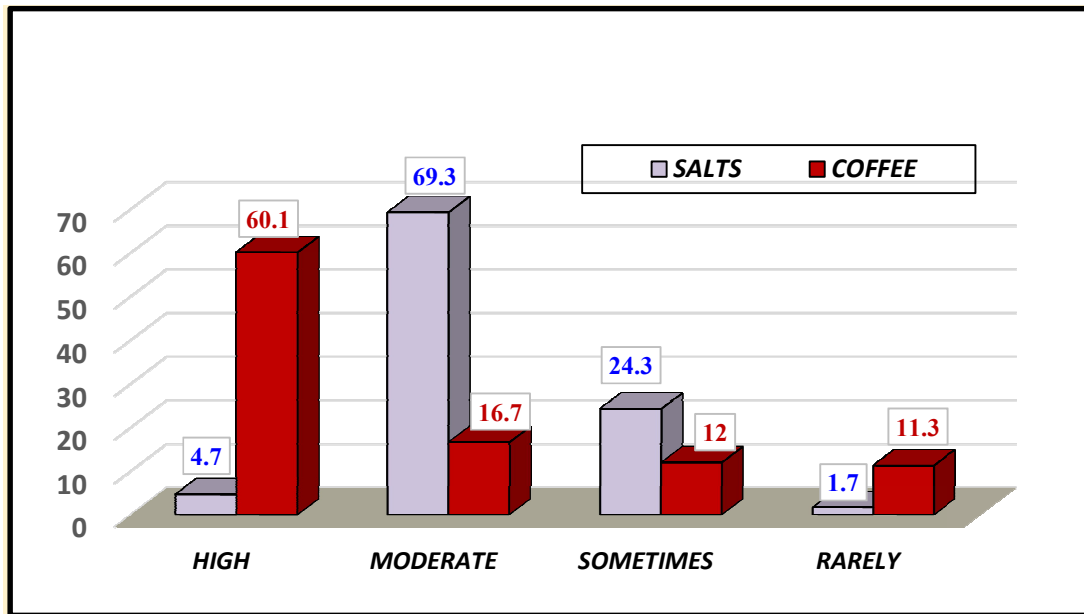


Fig. 5. The percentage of participants who are consuming daily salts and coffee

Smoking puts individuals at higher risk for heart disease and stroke [12]. Our results showed that about 10.3% of our participants are smokers. The prevalence of smoking in our study was low in comparison with the prevalence in Gulf countries (13.4% to 37.4%) in males and (0.5% to 20.7%) in females [18], total male and females in Nepal 17.6% [17], in Germany 23.3% [16] and in Bangladesh 40.6% [21]. In our research 32.4% were consuming fast food more than one time per week and these results were similar to that reported in the UAE [22].

In this study, most of participants had one or more modifiable cardiovascular risk factors either hypertension, diabetes mellitus, obesity or high cholesterol. The prevalence of hypertension was 8.3% of the participants, these results were similar to other cities in Saudi Arabia such as Al-Qassim (11.8%) among the women only [15]. Another study done in Shaqra show the prevalence of hypertension was (10.9%, 8.8%) in men and women respectively [20]. In Jeddah, especially at King Abdul-Aziz University Hospital, 72% of patients were diagnosed with high blood

pressure in both sexes [19]. In Emirates the prevalence of hypertension was in Stage 1 (26%) in both male and female and in Stage 2 (8.2%), and its more in male than female (9.3% Vs7.1%) respectively [23]. In Nepal, the Prevalence of hypertension was 34.6% and it is considered high in male 41.8% compared with female 29.6% [17].

The other modifiable risk factors are diabetes mellitus, the prevalence of DM in this study is 7.3%, which is highly associated with obesity in most of participate age 31-45 years old. Other study showed similar result that done in Egypt. They found that the prevalence in Egypt in 2018 is more among urban in Egypt 8.7% and the proportion is higher in male 11.3% comparison to female 5.4%, the participants who had Diabetes was more prevalent in new study of 2018 participants than in the national survey of 2015 (8.4% versus 4.8%). In fact, previous studies have shown that a higher prevalence of diabetes in deprived areas could be attributed to factors such as low physical activity, cigarette smoking, dietary patterns, and overweight and obesity, While the new data show a high prevalence of such factors, and two of them (smoking and low physical activity) were higher than the national rates [18]. In Nepal DM was present in 10.5% of the participants and males (11.5%) are higher than females (9.8%), most of participants with DM their ages 50- 59 [17]. A study done in Shaqra, showed low prevalence of DM (1.6%) [20]. On the other hand, study in Emirates represented high prevalence of DM (42.8%) either for males or females [23]. The prevalence of DM in China in both rural and urban areas was (7.8%) and the prevalence in urban was higher (9%) in comparison to rural (7.1%) [24].

In our study, the last modifiable risk factor is high cholesterol level (8.3%) of all participants. Our percentages were lower in comparison to study done in Abdul-Aziz University hospital in Jeddah that showed 71.6% of the patients with high blood cholesterol and they should follow a special diet prescribed by a healthcare professional [19]. The prevalence of dyslipidemia in the United Arab Emirates was 87.4% in both gender and male percentage was higher than female (90.7% vs 84.1%) respectively [23], while in Shaqra city (KSA), 16.8% participants were reported having a history of high cholesterol and/or triglyceride levels [20]. Also, another study was done in the Saudi population show (32.1%) had a high total cholesterol level [25]. In

China the prevalence of high cholesterol was (31.0%) and the prevalence in male was 31.2% and female 30.6% [24]. On the other hand, our results were slightly higher in comparison to study done in Al-Qassim, KSA. They found that the total prevalence of hyperlipidemia in young Saudi women was 2.8% [15]. Also, other study in Nepal showed very low prevalence of high cholesterol level (1.7%) [17]. Persons with high level of cholesterol, DM, hypertension explained insufficient knowledge about the risk from eating unhealthy food.

5. CONCLUSION AND RECOMMENDATIONS

From our results we can conclude that there is an increase in the prevalence of non- modifiable CVDs risk factors of Hail population in form of family history of some diseases such as heart diseases, hypertension, obesity and high cholesterol which put them in high risk of CVDs. Also, there is high prevalence of insufficient fruits and vegetables consumption (62.7%), obesity (44.6%), low physical activity (34.7%), consuming fast food more than one time per week (32.7%). These results showed increase in the incidence of modifiable risk factors of CVDs which can be reduced by increasing the awareness among Hail population through national programs focusing on these risk factors aiming to decrease the incidence and prevalence of CVDs in future. More advanced researches should be done in Hail, KSA about the risk factors of CVDs.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

This study has been reviewed and approved by the research Ethical Committee (REC) at the University of Hail dated 18/02/2021 and approved by University president letter number 33906/5/42 dated 09/07/1442H.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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