Knowledge of Cardiovascular Disease and its Risk Factors Among the Public in Saudi Arabia

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ABSTRACT

Introduction: Public awareness of CVD symptoms and associated risk factors is essential for early detection and prevention. The aim of this study was to assess the knowledge of cardiovascular disease and its risk factors among the public in Saudi Arabia.

Methods: This is an online survey study that was conducted on the general public in Saudi Arabia between September and October 2024. This study utilized previously developed questionnaire tool by Awad A. and Al-Nafisi, H. Awareness scale examined knowledge of CVD including the diseases comprising this category, symptoms, and its risk factors. Predictors of higher CVD knowledge score were determined using binary logistic regression.

Results: A total of 897 individuals participated in this study. Coronary heart diseases were the most commonly identified type of CVD (48.0%). Chest pain or discomfort was the most commonly identified heart attack symptom (45.6%). The most commonly identified stroke symptom was sudden numbness or weakness of the face, arm, or leg (47.9%). The most commonly identified risk factors for CVD were smoking (46.3%), hypertension (36.0%), and obesity (28.3%). The study participants demonstrated borderline knowledge of CVD with a mean score of 12.7 (SD: 7.1) out of 25. University students, those who work as freelancers, retire, or work in the private sector, have a higher education level and demonstrated a higher possibility of being knowledgeable of CVD compared to others ($p<0.05$).

Conclusion: The study participants demonstrated borderline knowledge of CVD. Awareness campaigns are needed to enhance public knowledge of CVD. Better knowledge is associated with higher prevention rate. Further studies are needed to examine the effectiveness of interventions that aim to enhance public knowledge of CVD, including telehealth.

Keywords: Cardiovascular disease; General public; Knowledge; Risk factors; Saudi Arabia

INTRODUCITON

Cardiovascular diseases (CVD) include a number of vascular diseases and cardiac problems such as heart failure (HF), hypertension, stroke, and peripheral arterial disease (1, 2). Furthermore, CVD is considered as one of the major deaths causes worldwide. In 2016, CVD was responsible for nearly one-third of all deaths across the globe (3). According to predictions, CHDs will overtake all other causes of death in developing nations in the coming years (4, 5). In the Arab world, CHDs and cerebrovascular illnesses rank in the top ten causes of death. For instance, CVDs have been reported to account for 46.0% of all deaths in Kuwait, where CHDs are the leading cause of both mortality and morbidity. CHDs are the second leading cause of death in Saudi Arabia, where CVD is thought to be responsible for 42% of all deaths (6, 7).

This increase in CVD deaths is due to a combination of factors, including a higher prevalence of CVD risk factors in these environments and a lack of population-based prevention and health care strategies (8). In sub-Saharan Africa, urban poverty, globalization, and rapid urbanization are the main causes of the rise in CVD risk factors. Both are linked to a shift in lifestyle and diet, with processed and high-energy foods replacing traditional diets and a rise in physical inactivity (9). Effective CVD prevention and treatment are significantly hampered by the general public's ignorance of CVD conditions and risk factors. A number of models, including the health belief model, have suggested the role of knowledge in health behaviors and long-lasting behavioral changes (8, 10).

In Saudi Arabia, CVD is estimated to account for 42% of the total mortalities and coronary heart disease are ranked as the second leading cause of death (11). In Saudi Arabia, the data suggested that the most common CVDs were coronary artery disease (18%), hypertension (16%), stroke (14%), peripheral artery disease (11%), and congenital heart disease (10%) (12). Several risk factors are linked to CVDs and can be categorized into two main groups: modifiable factors, which include obesity, dyslipidemia, diabetes, hypertension, and smoking; and nonmodifiable factors, which encompass age, ethnicity, and family history (13, 14). Public awareness of CVD symptoms and associated risk factors is essential for early detection and prevention. A recent study in Riyadh city showed that the awareness of CVD and associated risk factors is insufficient among Saudis in Riyadh City (5). There has been lack of studies conducted to evaluate the understanding of cardiovascular diseases symptoms and associated risk factors, especially within the Saudi population. Therefore, the aim of this study was to assess the knowledge of cardiovascular disease and its

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risk factors among the public in Saudi Arabia. This is essential for prevention, as awareness fosters healthier behaviors, facilitates early detection, and diminishes disease burden. It assists in identifying deficiencies, targeting at-risk people, and formulating effective public health policies to address one of the primary global causes of mortality.

METHODS

Study design

This is an online survey study that was conducted on the general public in Saudi Arabia between September and October 2024.

Study population

Inclusion criteria were participants from the general public in Saudi Arabia, aged 18 years or older, and resident in the Kingdom of Saudi Arabia. Participants who do not meet the inclusion criteria or don't understand Arabic were excluded from the study.

Sampling technique

Convenience sampling technique was implemented to recruit the study participants. An invitation for participation was distributed through the use of social network sites. All the participants provided informed consent on a purely voluntary basis; hence, written consents were not obtained. The study's objectives were communicated to all participants and their consent were obtained.

Questionnaire tool

This study utilized previously developed questionnaire tool by Awad A. and Al-Nafisi, H (6). The survey aims to gather general information of patients, including their age, gender, Saudi province where they live in, education level, job status, family income, and smoking habits. Additionally, volunteers will be asked to fill out a questionnaire composed of three segments; The first segment contains questions regarding medical status of the respondents. Second segment measures respondents' awareness of CVD, including the diseases comprising this category, symptoms, and its risk factors. Last segment is related to respondents' knowledge on possible roles of other health care professionals other than medical doctors in prevention and management of CVD. Four items were used to estimate participants' knowledge. Each correct answer for each sub-item within these four items was given a score of one. The maximum achievable score was 25. The higher the score the higher level of knowledge.

Sample size

Based on Saudi Arabia latest census obtained by General Authority for Statistics in Saudi Arabia shows the population of Saudi Arabia is 32,175,224, The minimal sample size of responses was calculated using SurveyMonkey Website to be at least 385 participants to reach a confidence level of 95% and a margin of error of 5%.

Ethical approval

This research was approved by the Institutional Review Board at Al-Imam Muhammad Ibn Saud Islamic University, Riyadh, Saudi Arabia (Project number: 695/2024).

Statistical analysis

All statistical analyses were done using SPSS, version 29. Descriptive statistics were used to describe the demographic features of participants in the study. categorical data were presented as percentages, with frequencies. Continuous data for were presented as mean ± standard deviation (SD) as the data were normally distributed. Odds ratio and 95% confidence intervals for the predictors of higher CVD knowledge score were determined using binary logistic regression. The cut-off for logistic regression was based on the mean knowledge score of the patients (which was 12.7 (SD: 7.1). The use of the mean score deemed suitable as it reflects the central tendency for the knowledge score among the study participants.

RESULTS

Demographic characteristics of the study participants:

A total of 897 individuals participated in this study. Males' participants contributed for 60.0% of the study sample. Around one-quarter the study sample (26.4%) were aged 40-49 years. Married participants contributed for 69.2% of the study sample. Around one-third of the study participants (32.8%) were working in the governmental sector. Almost half of the study sample (52.6%) reported that they have bachelor degree. Around one-third of the study participants (29.8%) reported that their monthly income category is more than 15,000 SAR, Table 1.

Table 1. Demographic characteristics of the study participants

Variable	Frequency	Percentage
Gender		
Males	538	60.0%
Age categories		
18-20 years	62	6.9%
21-29 years	117	13.0%
30-39 years	168	18.7%
40-49 years	237	26.4%
50-59 years	213	23.7%
60 years and older	100	11.1%
Marital status		
Single	242	27.0%
Married	621	69.2%
Divorced	27	3.0%
Widowed	7	0.8%
Employment status		
Housewife	105	11.7%
Student	117	13.0%
Unemployed	69	7.7%
Freelance	31	3.5%
Retired	184	20.5%
Government sector	294	32.8%
Private sector	97	10.8%
Education level		
Lower than high school level	38	4.2%
High school level	172	19.2%
Diploma	101	11.3%
Bachelor degree	472	52.6%
Higher education	114	12.7%
Monthly income level		
Less than 5,000 SAR	261	29.1%
5,000 – 10,000 SAR	172	19.2%
10,000 – 15,000 SAR	197	22.0%
More than 15,000 SAR	267	29.8%

SAR: Saudi Arabia riyal

Participants' personal health status:

Around 40.1% of the study participants evaluated their personal health status as excellent. Around one-third of the study participants (36.5%) reported that their height is 161-170 cm and weighting more than 80 kg (34.4%). Almost half of them (49.5%) described their weight as overweight. Around 17.2% of the study participants reported that they are current smokers of which 46.7% of them smoke more than 10 times per day. The majority of the participants who quit smoking (79.3%) more than 12 months ago, Table 2.

More than half of the study participants (67.6%) reported that they do at least 30 minutes of exercise per week and around 29.2% of them reported that they eat healthy food every day. Around 44.8% of them described their lifestyle as relatively stressful and 47.2% of them reported that they have family history of CVD, Table 2.

Table 2. Personal health status

Variable	Frequency	Percentage
Personal health evaluation		
Excellent	360	40.1%
Very good	345	38.5%
Good	155	17.3%
Fair	33	3.7%
Poor	4	0.4%
Height		
Less than 150 cm	28	3.1%
150-160 cm	273	30.4%
161-170 cm	327	36.5%
171-180 cm	234	26.1%
More than 180 cm	35	3.9%
Weight		
Less than 50 kg	36	4.0%
51-60 kg	113	12.6%
61-70 kg	192	21.4%
71-80 kg	247	27.5%
More than 80 kg	309	34.4%
Weight perception?		
Underweight	47	5.2%
Normal	328	36.6%
Overweight	444	49.5%
Obese	78	8.7%
Smoking status?		
No (never smoked)	593	66.1%
Previously smoked (Ex-smoker)	150	16.7%
Yes (currently smoker)	154	17.2%
If yes, how much do you smoke per day? (n= 154)		
"1-5 times per day"	54	35.1%
"6-10 times per day"	28	18.2%
"More than 10 times per day"	72	46.7%
When did you stop smoking? (n= 150)		
"Less than 6 months ago"	24	2.7%
"In the last 6-12 months"	7	0.8%
"More than 12 months ago"	119	79.3%
Frequency of doing at least 30 minutes of exercise per week?		
"0-2 times"	606	67.6%
"3-5 times"	210	23.4%
"5 times or more"	81	9.0%
Healthy food frequnecy?		
Not everyday	635	70.8%
Everyday	262	29.2%
Lifestyle description?		
"Very stressful"	48	5.4%
"Stressful"	154	17.2%
"Relatively Stressful"	402	44.8%
"No stress"	293	32.7%
Cardiovascular disease family history?		
Yes	423	47.2%

Table 3. Participants' medical status

Variable	Frequency	Percentage
Chronic diseases history?		
High blood cholesterol level	214	23.9%
Hypertension	180	20.1%
Diabetes	111	12.4%
Coronary heart disease	63	7.0%
If yes, medications use history?		
High blood cholesterol level	188	21.0%
Hypertension	182	20.3%
Diabetes	108	12.0%
Coronary heart disease	60	6.7%
Recent measures		
Recent blood pressure (Normal)	673	75.0%
Recent fasting blood glucose level (Normal)	628	70.0%
Recent cholesterol level (Normal)	460	51.3%

last time participants checked their blood cholesterol, blood glucose, blood pressure, and weight?

	Never being checked before	Unsure/ I do not know	Last 1-3 months	Last 4-6 months	Last 7-12 months	More than on year
Blood pressure	6.5%	7.9%	65.4%	9.4%	5.0%	5.8%
Blood cholesterol	20.2%	10.0%	42.1%	10.8%	6.7%	10.1%
Blood glucose	13.5%	7.8%	52.5%	11.1%	7.1%	7.9%
Body weight	2.8%	4.9%	82.2%	4.1%	2.9%	3.1%

Table 4. Participants correct answers to items examined knowledge about cardiovascular diseases

Variable	Frequency	Percentage
Types of cardiovascular diseases?		
“Coronary heart disease”	431	48.0%
“Cerebrovascular disease”	225	25.1%
“Deep vein thrombosis and pulmonary embolism”	184	20.5%
“Congenital heart disease”	180	20.1%
“Peripheral arterial disease”	168	18.7%
“Rheumatic heart disease”	136	15.2%
Which of the following are symptoms of a heart attack?		
“Chest pain or discomfort”	409	45.6%
“Difficulty in breathing or shortness of breath”	374	41.7%
“Feeling weak, light-headed, or faint”	275	30.7%
“Pain or discomfort in arms or shoulder”	252	28.1%
“Pain or discomfort in the jaw, neck, or back”	229	25.5%
Which of the following are symptoms of a stroke?		
“Sudden numbness or weakness of the face, arm, or leg”	430	47.9%
“Sudden confusion or trouble speaking or understanding others”	284	31.7%
“Sudden dizziness, trouble walking, or loss of balance or coordination”	263	29.3%
“Sudden severe headache with no known cause”	258	28.8%
“Sudden trouble seeing in one or both eyes”	161	17.9%
Which of the following can put someone at high risk of developing cardiovascular disease?		
Smoking	415	46.3%
Hypertension	323	36.0%
Obesity	254	28.3%
Diabetes	234	26.%
Stress	231	25.8%
Unhealthy diet	219	24.4%
High LDL Cholesterol	208	23.2%
Cardiovascular disease family history	193	21.5%
Physical inactivity	130	14.5%

Medical Status:

High blood cholesterol was the most commonly reported comorbidity across the study participants (23.9%). Around 75.0% of the study participants reported that their recent blood pressure measurement was normal followed by 70.0% and 51.3% for fasting blood glucose and cholesterol level. When the study participants were asked when was the last time they checked their blood cholesterol, blood glucose, blood pressure, and weight, 20.2%, 13.5%, 6.5%, and 2.8% confirmed that they have not checked them before, Table 3.

Knowledge about cardiovascular diseases:

Coronary heart diseases were the most commonly identified type of CVD (48.0%). Chest pain or discomfort was the most commonly identified heart attack symptom (45.6%). The most commonly identified stroke symptom was sudden numbness or weakness of the face, arm, or leg (47.9%). The most commonly identified risk factors for CVD were smoking (46.3%), hypertension (36.0%), and obesity (28.3%), Table 4.

Health care professionals role in prevention and management of cardiovascular disease:

Helping patients managing their prescribed medicine was the most commonly reported service the study participants reported they would ask pharmacists for (30.8%). On the other hands, measuring blood pressure was the most commonly reported service the study participants reported they would ask nurses for (31.8%). Blood pressure measurement was the most commonly reported service that the study participants would use if offered by community pharmacies, Table 5.

Table 5. Expected health care professionals' roles

Would you consider visiting the nurse or pharmacist instead of your medical doctor for any of the services listed below?		
	Pharmacist	**Nurse**
"Offer advice on healthy diet"	14.4%	25.3%
"Offer advice on exercise"	5.2%	9.5%
"Offer advice on smoking cessation"	3.8%	5.5%
"Measure blood pressure"	14.6%	31.8%
"Measure blood glucose"	10.5%	28.5%
"Measure blood cholesterol"	7.9%	24.5%
"Helping patients managing their prescribed medicine"	30.8%	8.7%
If the following services are offered in the community pharmacy, do you intend to use them?		
	Yes	
"Blood pressure measurement"	100.0%	
"Blood glucose measurement"	88.7%	
"Blood cholesterol level measurement"	80.6%	
"Body weight measurement"	16.1%	
"Advice on health diet"	0.0%	
"Advice on exercise"	0.3%	
"Advice on smoking cessation"	1.2%	

Predictors of participants knowledge and awareness:

The study participants demonstrated borderline knowledge of CVD with a mean score of 12.7 (SD: 7.1) out of 25. University students, those who work as freelancers, retire, or work in the private sector, have a higher education level and demonstrated a higher possibility of being knowledgeable of CVD compared to others ($p<0.05$), Table 6.

Table 6. Predictors of participants knowledge and awareness

Variable	**Odds ratio of better knowledge** (95% confidence interval)	**p-value**
Gender		
Females		
Males	0.94 (0.72-1.23)	0.672
Age categories		
18-20 years	1.00	
21-29 years	0.96 (0.52-1.79)	0.909
30-39 years	1.03 (0.57-1.85)	0.925
40-49 years	0.66 (0.37-1.15)	0.144
50-59 years	0.75 (0.42-1.33)	0.322
60 years and older	0.94 (0.50-1.79)	0.857
Marital status		
Single	1.00	
Married	0.68 (0.49-0.90)	0.008**
Divorced	1.67 (0.70-3.97)	0.244
Widowed	0.28 (0.05-1.48)	0.135
Employment status		
Housewife	1.00	
Student	2.79 (1.62-4.81)	<0.001***
Unemployed	1.43 (0.77-2.64)	0.253
Freelance	3.82 (1.60-9.10)	0.003**
Retired	1.70 (1.05-2.77)	0.032*
Government sector	1.40 (0.89-2.20)	0.146
Private sector	2.42 (1.38-4.27)	0.002**
Education level		
Lower than high school level	1.00	
High school level	4.86 (1.93-12.22)	<0.001***
Diploma	5.66 (2.18-14.71)	<0.001***
Bachelor degree	5.81 (2.38-14.14)	<0.001***
Higher education	12.04 (4.62-31.39)	<0.001***
Monthly income level		
Less than 5,000 SAR	1.00	
5,000 – 10,000 SAR	0.70 (0.47-1.02)	0.065
10,000 – 15,000 SAR	0.72 (0.50-1.05)	0.087
More than 15,000 SAR	1.33 (0.94-1.88)	0.103

*p<0.05; **p<0.01; ***p<0.001

DISCUSSION

This is study aimed to assess knowledge level about CVD among individuals in Saudi Arabia. Findings indicate a border line level of knowledge and moderate understanding of risk factors. These findings emphasize the need for enhancing CVD knowledge, which is crucial for encouraging preventative health behaviours across the population. Almost half of them (49.5%) described their weight as overweight. About 17.2% of participants reported that being current smokers, and of these, 46.7% smoked more than 10 times per day. Our findings with a 2015 study conducted in Saudi Arabia, which assessed smoking status in and reported a mean BMI of approximately 30 kg/ m^2, with the majority of the participants (35.3%) classified as overweight. Regarding smoking status, that study found that 12.2% were current smokers and 10.6% were former smokers. The similarity in weight related findings may be attributed to comparable sample characteristic as both studies conducted in KSA (15). Smoking behaviours in KSA have evolved significantly over years, with the prevalence rising significantly from

approximately 12% in 2013 to 21% in 2018. Likewise, the number of non-smokers exposed to second-hand smoke has also increased significantly (16).

In our study, more than half of the study participants (67.6%) reported that they do at least 30 minutes of exercise per week and around 29.2% of them reported that they eat healthy food every day. Around 44.8% of them described their lifestyle as relatively stressful and 47.2% of them reported that they have family history of CVD. In contrast, a study among Jordanian found that only 14.3% reported exercising for at least half an hour, five or more times a week, with the most participants indicating they paid attention to their diet. Similar levels of stress lifestyle were reported among Jordanian participants (17). These differences could be due to variations in sample characteristics and awareness of the risk factors management between two populations. In the Gulf countries like KSA, poor diet and sedentary lifestyle has increased significantly, leading to a rise in CVD risk factors (15, 18).

In our study, high blood cholesterol was the most commonly reported comorbidity across the study participants (23.9%). Similarly, other study has shown hypercholesteremia as a common comorbidity (19). This similarity may stem from common factors among the study populations. Hypercholesteremia is increasingly concerning Gulf region, with prevalence rates in 2015 reaching 40-50% among males and females, respectively (18). The prevalence increased in the last years and varied across countries (20).

When the study participants were asked when was the last time they checked their blood cholesterol, blood glucose, blood pressure, and weight, 20.2%, 13.5%, 6.5%, and 2.8% confirmed that they have not checked them before. These rates differ across cultures and regions. For instance, regular check for cardiovascular comorbidities such as diabetes, are higher in Brazil, which has improved goal achievement in disease control (21).

Coronary heart diseases were the most commonly identified type of CVD (48.0%). Chest pain or discomfort was the most commonly identified heart attack symptom (45.6%). The most commonly identified stroke symptom was sudden numbness or weakness of the face, arm, or leg (47.9%). Similarly, study in in reported chest pain as the primary symptom of heart attacks, and sudden facial weakness or numbness as the primary symptoms of strokes, though percentages were higher (6, 22, 23). Chest pain is a typical symptom of angina and heart attack, resulting from oxygen deficiency in heart muscle due to a decline in regional systolic wall thickening, which leads to pain and shortness of breath (24).

In our study, the most commonly identified risk factors for CVD were smoking (46.3%), hypertension (36.0%), and obesity (28.3%). A systematic review of 20 studies showed that hypertension and stress were the most commonly cited risk factors, with smoking varying among studies (8). These similarities may be due to the prevalence of hypertension and smoking among different study samples. Globally, chronic high blood pressure is a major risk factor for CVD and can lead to blood vessel damage, heart attack, stroke and heart failure (25).

Helping patients managing their prescribed medicine was the most commonly reported service the study participants reported they would ask pharmacists for (30.8%). On the other hands, measuring blood pressure was the most commonly reported service the study participants reported they would ask nurses for (31.8%). Blood pressure measurement was the most commonly reported service that the study participants would use if offered by community pharmacies (6). In contrast, a study conducted in Kuwaitis with higher demand for pharmacist help with prescribed medicines, with smoking cessation being the most requested services. These differences may reflect cultural and sample characteristic differences. A recent review noted that the role of community pharmacists has expanded in recent decades to include a wide range of roles in public health services, including smoking cessation support, nutritional and lifestyle advice, and blood pressure control (26).

In our study, the study participants demonstrated borderline knowledge of CVD with a mean score of 12.7 out of 25. University students, those who work as freelancers, retire, or work in the private sector, have a higher education level and demonstrated a higher possibility of being knowledgeable of CVD compared to others ($p<0.05$). In Kuwait, participants scored moderately in CVD. Related to the factors associated with knowledge, with factors such as education level contributing similarly to our findings. Other study has shown that age can also influence knowledge level (6, 27). Variations in knowledge factors among regions may be due to difference in educational exposure and critical thinking skills, as higher education is often associated with low cardiovascular risk factors (28).

The results of this study inform the development of focused public health initiatives to rectify knowledge deficiencies and misunderstandings. It facilitates the formulation of early intervention plans by pinpointing high-risk populations with limited knowledge, emphasizing preventive actions and regular health exams.

This study has several limitations. The study design and rely on self-reported data may increase the risk of recall bias as the participants may underreport or forget details about their health. Also, the study's regional focus may limit the generalizability of findings to populations with different cultural and health awareness levels. Future studies should expand to include different regions in KSA to assess the variation in knowledge. Expanding survey to include additional risk factors and symptoms could also provide a comprehensive assessment. Furthermore, incorporating health literacy assessments could facilitate targeted educational intervention to address specific gaps in CVD knowledge.

CONCLUSION

The study participants demonstrated borderline knowledge of CVD. University students, those who work as freelancers, retire, or work in the private sector, have a higher education level and demonstrated a higher possibility of being knowledgeable of CVD compared to others. Awareness campaigns are needed to enhance public knowledge of CVD. Better knowledge is associated with higher prevention rate. Further studies are needed to examine the effectiveness of interventions that aim to enhance public knowledge of CVD, including telehealth.

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