Awareness of Preventive Measures of Cardiovascular Diseases and Heart Attack Warning Symptoms: Gender-based Differences

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Abstract

Background: Cardiovascular diseases, mainly ischemic heart disease, is the first cause of mortality in Saudi Arabia (SA). Although cardiovascular diseases (CVDs) prevalence is usually lower in women than in men, women have a higher mortality rate and a worse prognosis than men. **Aim:** This study aims to identify the level of awareness of CVDs preventive measures and heart attack warning symptoms among the male and female Saudi population. **Subjects and methods:** A comparative cross-sectional study was conducted in the current study among 400 adults from Riyadh using a self-completed questionnaire. **Results:** Men and women had the same level of awareness about preventive measures for CVDs (p >0.05). Females had a higher awareness level than males about symptoms of chest pain (chi-square = 8.247, at p = .005) and weakness or fatigue (chi-square = 11.933, at p=.001), but their awareness level regarding other symptoms was similar. Conclusion: the study respondents had a suboptimal awareness about CVDs preventive measures and warning symptoms of heart attacks. **Recommendation:** Evidence-based educational intervention is required to enhance the population's knowledge and strengthen their positive attitude towards adopting a healthy lifestyle.

Keywords: Awareness, Cardiovascular Diseases, Heart Attack & Gender-based

Introduction

Globally, cardiovascular diseases (CVDs) account for the most non-communicable diseases (NCDs) mortalities **(World Health Organization, 2017).** Although CVDs are preventable and treatable, they are still one of the leading causes of death and disability worldwide. In 2016, CVDs caused 17.9 million deaths, representing more than a quarter of all global deaths; 85% were due to heart attack and stroke **(WHO, 2017)**. Although efforts are being made in developed countries to reduce the incidence of CVDs, the numbers are still increasing. Moreover, the number of deaths is expected to rise to 23.6 million or more by 2030 worldwide **(Benjamin et al., 2019).**

Cardiovascular diseases, mainly ischemic heart disease, is the first cause of mortality in Saudi Arabia (Centers for Disease Control and Prevention [CDC], 2018); 36% of deaths and 13% of disabilities were caused by CVDs (Saudi Ministry of Health, 2013). This number is estimated to increase twofold by 2035 **(Gagnon, 2021).** Heart diseases create enormous health and economic burdens globally **(Virani et al., 2020).** The economic burden of CVDs in SA has been expected to increase from US$3.5 billion in 2016 to US$9.8 billion by 2035 **(Gagnon, 2021).**

Although the prevalence of CVDs is usually lower in women than in men, women have a higher mortality rate and a worse prognosis than men **(Zhou & Bei, 2020).** There were almost 400,000 deaths in women in the USA due to CVDs and stroke, including a minor variation due to ethnicity (Benjamin et al., 2018; Coke & Hayman, 2021). The most predominant factors of differences in the prevalence of CVDs among women and men are attributed to cardiac structure and function, sex hormones, socio-psychological characters, nutrition, and lifestyle **(Blüher, 2019; Zhou & Bei, 2020).**

Significance of the study

The prevalence of CVD risks is high among Saudi women, as around a quarter to a third suffers from diabetes, hypertension, and hypercholesterolemia. More than half are overweight, obese, and physically

inactive **(Alshaikh et al., 2016).** Gender differences must be taken seriously during the assessment of prevalence and risk factors for CVDs. It is of great importance to determine the appropriate ways of prevention, diagnosis, treatment, and management of CVDs **(Coke & Hayman, 2021; Gao et al., 2019).** Awareness of CVD risks and preventive measures among Saudi women compared to men has not been significantly explained in the literature. The current study findings will enhance the insight of healthcare professionals, especially cardiovascular nurses, community health nurses, and healthcare policymakers, about the Saudi population's awareness of CVDs risk factors and preventive measures based on gender.

Aim of the study
The current study aims to identify the level of awareness of cardiovascular diseases (CVDs) preventive measures and heart attack warning symptoms among the male and female Saudi population.

Research questions
Three research questions were stated to achieve the aim of this study:
1. What is the level of awareness among males and females regarding CVDs risks preventive measures?
2. Is there a difference between the males and females awareness regarding heart attack warning symptoms?
3. What factors are significantly related to the level of awareness about heart attack warning symptoms and CVDs preventive measures?

Material and Methods
Design and setting
A cross-sectional comparative survey was conducted over a month to recruit eligible people (December 15, 2019, to January 15, 2020). The study sample recruited from public places in Riyadh, such as malls, parks, waiting areas in hospitals, and libraries.

Population and sample size
A convenience sample of adults aged ≥18 years old, living in Riyadh city, and accepted to participate in the study was recruited. Healthcare workers were excluded from the study to avoid selection bias since they are more likely to have a higher medical knowledge level than the general population. The www.raosoft.com website was used to calculate the sample size with a 5% margin of error. A 95% confidence level was accepted for the total population of 9,600,000 in Riyadh city. Hence, the minimum number for the required sample was 385, which was increased to 400 to avoid any missed data or dropout.

Instruments
The researchers developed a three-section questionnaire after an extensive review of relevant literature (Alotaibi et al., 2018; Aminde et al., 2017; Awad & Al-Nafisi, 2014; Mujamammi et al., 2020).

First section: Background Data Sheet
It consisted of 13 items related to sociodemographic and biomedical data of the study sample.

Second section: Warning Symptoms Questionnaire
It consisted of six common warning symptoms of a heart attack to assess the awareness level; each item had three responses (0. no, 1. not sure, 2. Yes). Each correct answer was given a point to obtain a total score of 12. A score from 0 to 4 indicates an insufficient level of knowledge, from 5 to 8 indicates a moderate level of knowledge, while 9 to 12 indicates a good level of knowledge.

Third section: Preventive Measures of CVDs Questionnaire
It included nine items to assess the awareness level of the respondents about CVDs preventive measures. However, it did not assess their actual practices since this might cause a response bias. The response scale ranged from strongly agree (=5) to strongly disagree (=1), which gave a total score from 9 to 45. A score from 9 to 21 indicates a low level of awareness, from 22 to 33 indicates a moderate level of awareness, while 34 to 45 indicates a high level of awareness.

Validity and Reliability of the Study Instruments;
Three medical-surgical nursing and community health nursing experts reviewed the study tools before it was used. The tools were evaluated for clarity, relevancy, applicability, comprehensiveness, and understanding. Changes have been made in response to their suggestions to make it readable and understandable to the respondents. The reliability of the second and third sections of the questionnaire was assessed using Cronbach Alpha, which was 0.70 and 0.64, respectively.

Ethical considerations
The study was approved (SP19/536/R) by the Research Unit - College of Nursing, King Saud bin Abdulaziz University for Health Sciences, and Institutional Review Board (IRB) in King Abdullah International Medical Research Canter (KAIMRC), National Guard Health Affairs, Riyadh, Saudi Arabia. The respondents gave informed consent after explaining the aim of the study. The researchers emphasized the right of the participant to withdraw from the study at any time. Privacy and confidentiality were maintained, and no identifier data were collected.

Pilot study
A pilot study was conducted on 10% of the study sample (40 respondents) to test the clarity and

feasibility of the developed instruments. Also, it provided an estimation of the time needed to fill out the tools. Minor modifications were done based on the findings obtained from the pilot study. The sample in the pilot study was not included in the study sample and compensated with the same number of males and females.

Data collection method

Data collection was conducted over a month to recruit eligible people (December 15, 2019, to January 15, 2020) for three days a week. The researchers recruited the participants from public places in Riyadh, such as malls, parks, waiting areas in hospitals, and libraries after ensuring their voluntary participation. The researchers introduced themselves to the eligible participants and briefly explained the aim and methodology of the study then they started to distribute the questionnaire, this step took about 30 minutes for each participant to fill it.

Statical analysis

The Statistical Package for the Social Sciences (SPSS) version 26 (IBM SPSS Statistics, New York, USA) was used to analyze the data. A descriptive analysis was used to present a statistical summary for the sociodemographic data, medical health history variables, economic status, stress level, awareness of CVDs preventive measures, and heart attack symptoms. A Student T-Test and ANOVA and A Chi-Square were used to identify factors associated with awareness and comparison of sociodemographic data between males and females. All tests were carried out at a p-value of 0.05.

Results

Table (1): Sociodemographic characteristics of the respondents, n = 400

Sociodemographic data		Entire sample	Male N = 170	Female N = 230	Chi-square (p-value)
		N (%)	N (%)		
Age	● 18-<45	326(81.5)	126(74.1)	200(87.0)	**10.687(.001)***
	● ≥45	74(18.5)	44(25.9)	30(13.0)	
BMI	● Underweight	14(3.5)	4(2.4)	10(4.3)	**10.264(.015)***
	● Normal	156(39)	70(41.2)	86(37.4)	
	● Obese	147(36.8)	72(42.4)	75(32.6)	
	● Overweight	83(20.8)	24(14.1)	59(25.7)	
Marital status	● Single	123(30.8)	40(23.5)	83(36.1)	**14.256(.002)***
	● Married	251(62.7)	124(72.9)	127(55.2)	
	● Divorced	20(5.0)	4(2.4)	16(7.0)	
	● Widow	6(1.5)	2(1.2)	4(1.7)	
Nationality	● Saudi	304(76)	124(72.9)	180(78.3)	1.517(.237)
	● Non- Saudi	96(24)	46(27.1)	50(21.7)	
Educational Level	● Primary school	22(5.5)	5(2.9)	17(7.4)	3.909(.145)
	● Secondary school	19047.5)	85(50.0)	105(45.7)	
	● College	188(47)	80(47.1)	108(47.0)	
Monthly income	● Low	218(45.5)	64(37.6)	154(67.0)	**37.108(.000)***
	● Average	108(27)	57(33.5)	51(22.2)	
	● High	74(18.5)	49(28.8)	25(10.9)	
Current Smoking	● No	308(77)	91(53.5)	217(94.3)	**91.962(.000)***
	● Yes	92(23)	79(46.5)	13(5.7)	
Having a family history of cardiovascular diseases	● No	229(57.3)	103(60.6)	126(54.8)	1.346(.262)
	● Yes	171(42.8)	673(9.40	104(45.2)	
Having chronic medical conditions.	● No	317(79.3)	134(78.8)	183(79.6)	.033(.901)
	● Yes	83(20.8)	36(21.2)	47(20.4)	
Perceived stress	● No	73(18.3)	42(24.7)	31(13.5)	**8.259(.006) ***
	● Yes	327(81.8)	128(75.3)	199(86.5)	
Practicing exercise	● <3 times/week	313(78.3)	130(76.5)	183(79.6)	.550(.465)
	● ≥3 times/week	87(21.8)	40(23.5)	47(20.4)	

* Statistically significant differences

Table (2): Cardiovascular diseases preventive measures as mention by the study sample, n = 400

List of preventive measures	Strongly agree	Agree	Do not know	Disagree	Strongly disagree
	N (%)				
1. Smoking cessation	**248(62.0)**	**91(22.8)**	27(6.8)	26(6.5)	8(2)
2. Control obesity by exercise and appropriate diet.	**277(69.3)**	**115(28.7)**	4(1.0)	3(0.8)	1(0.3)
3. Maximum 5 hours of sleep each night.	**197(49.3)**	**131(32.8)**	25(6.3)	40(10)	7(1.8)
4. Compliance with blood pressure medication.	**112(28)**	**102(25.5)**	147(36.8)	31(7.8)	8(2.0)
5. Compliance with cholesterol medication.	**119(29.8)**	**132(33)**	126(31.5)	18(4.5)	5(1.3)
6. Regular health screening.	**251(62.7)**	**117(29.3)**	25(6.3)	6(1.5)	1(0.3)
7. Exercise 30 min/3 times/week.	**171(42.8)**	**149(37.3)**	61(15.3)	16(4)	3(0.8)
8. Practicing relaxation techniques.	**119(29.8)**	**183(45.8)**	86(21.5)	11(2.8)	1(0.3)
9. Regular monitoring of blood glucose.	**150(37.5)**	**161(40.3)**	79(19.8)	9(2.3)	1(0.3)
Mean ± SD: Range:	38.00±4.001 (Median = 38.00) 22-45				

Table (3): Awareness of the warning symptoms of a heart attack, n = 400

Symptoms	Entire sample, n = 400 N (%)		Comparison between males and females N (%) of yes responses		
	No	Yes	Male (N=169)	Female (N=230)	Chi-square (P-value)
			N (%)		
1. Chest pain	131(32.8)	269(67.3)	101(59.4)	168(73.0)	**8.247(.005)** *
2. Shortness of breath	107(26.8)	293(73.3)	120(70.6)	173(75.2)	1.069(.306)
3. Sweatiness	168(42)	232(58)	94(55.3)	138(60.0)	.889(.358)
4. Weakness or fatigue	110(27.5)	290(72.5)	108(63.5)	182(79.1)	**11.933(.001)** *
5. Jaw and neck pain	283(70.8)	117(29.3)	51(30.0)	66(28.7)	.080(.824)
6. Palpitations (n=399) *	111(27.8)	288(72)	113(66.5)	175(76.1)	4.127(.057)

* Statistically significant differences

Table (4): Factors associated with awareness of symptoms and awareness of preventive measures, n = 400

Demographic data	N (%)	Awareness of symptoms	F/T (p-value)	Awareness of preventive measures	F/T(p-value)
		Mean±SD		Mean±SD	
Age					
● 18-<45	326(81.5)	4.22±2.118	-1.195(.233)	37.47±3.703	-1.346(.179)
● ≥45	74(18.5)	4.53±1.676		38.16±5.104	
BMI					
● Underweight	14(3.5)	3.36±1.985		35.64±3.079	
● Normal	156(39)	4.09±2.162	**10.276(.001)***	37.38±3.634	**4.084(.044) ***
● Obese	147(36.8)	4.21±1.963		37.71±4.113	
● Overweight	83(20.8)	4.90±1.850		38.13±4.501	
Gender					
● Male	170(42.5)	3.99±2.087	**-2.421(.016) ***	37.29±4.173	-1.330(.184)
● Female	230(57.5)	4.49±1.993		37.83±3.863	
Marital status					
● Single	123(30.8)	4.07±2.093		36.69±3.518	
● Married	251(62.7)	4.29±2.061	**4.815(.029) ***	38.04±4.186	**3.985(.047) ***
● Divorced	20(5.0)	5.00±1.487		38.45±3.316	
● Widow	6(1.5)	5.50±1.225		34.83±3.920	
Nationality					
● Saudi	304(76)	4.18±2.147	-1.695(.091)	37.60±4.064	-.019(.985)
● Non- Saudi	96(24)	4.58±1.659		37.60±3.815	

Demographic data	N (%)	Awareness of symptoms Mean±SD	F/T (p-value)	Awareness of preventive measures Mean±SD	F/T(p-value)
Educational Level ● Primary school ● Secondary school ● College	22(5.5) 19047.5) 188(47)	4.09±2.136 4.15±2.000 4.43±2.081	1.761(.185)	39.23±4.208 37.25±4.282 37.76±3.630	.017(.896)
Monthly income ● Low ● Average ● High	218(45.5) 108(27) 74(18.5)	4.20±1.991 4.31±2.177 4.47±2.021	.960(.328)	37.41±4.009 38.03±4.061 37.51±3.897	.301(.583)
Current Smoking ● No ● Yes	308(77) 92(23)	4.24±2.100 4.40±1.858	-.676(.500)	37.99±3.835 36.27±4.274	**3.678(.000) ***
Having a family history of cardiovascular diseases ● No ● Yes	 229(57.3) 171(42.8)	 3.96±2.097 4.70±1.901	**-3.607(.000) ***	 37.57±3.873 37.64±4.178	-.172(.863)
Having chronic medical conditions ● No ● Yes	 317(79.3) 83(20.8)	 4.16±2.143 4.71±1.551	**-2.153(.032) ***	 37.53±3.758 37.86±4.837	-.659(.510)
Perceived stress ● No ● Yes	73(18.3) 327(81.8)	3.45±2.334 4.46±1.932	**-3.872(.000) ***	37.58±3.880 37.60±4.034	-.052(.958)
Practicing exercise ● <3 times/week ● ≥3 times/week	313(78.3) 87(21.8)	4.18±2.045 4.61±2.025	-1.724(.086)	37.60±3.937 37.57±4.250	.060(.952)

* Statistically significant differences

Table (1): Sociodemographic characteristics of the entire sample Displays the characteristics of the respondents (n=400). The mean age of the respondents was 34.40 ±1.28; the majority (81.5%) had an age range between 18-45 years. Most of the respondents were Saudi nationals (76.0%), females (57.5%), and married (62.8%). Less than half (47.0%) had a university education. More than half (57.6%) were either overweight or obese. A few were smokers (23%) and had a chronic medical condition (20.8%). Statistically significant differences were found between males and females related to their age-BMI, marital status, income, current smoking, and perceived stress.

Table (2): Awareness of CVDs risks preventive measures Shows the awareness of CVDs preventive measures among the respondents. The majority of them (strongly) agreed that smoking cessation (84.8%), active exercises (80.1%), and control of obesity through an appropriate diet (98%) could

prevent CVDs. Around two-thirds (77.8%) also (strongly) agreed that regular blood glucose monitoring could prevent CVDs. However, most of the respondents (strongly) agreed that taking blood pressure (53.5%) and cholesterol medication (62.8%) can prevent CVDs. Men and women had the same level of awareness about preventive measures for CVDs.

Table (3):Awareness of heart attack warning symptoms:Shows the awareness of the heart attack warning symptoms among the respondents. Looking at each symptom, most of the respondents recognized shortness of breath (73.3%) and weakness or fatigue (72.5%) as warning symptoms, followed by chest pain (67.3%). Only a low number (27.3%) recognized jaw and neck pain as symptoms of a heart attack. Females had a higher awareness level than males about symptoms of chest pain (chi-square = 8.247, at p = .005) and weakness or fatigue (chi-square =

11.933, at p=.001), but their awareness level regarding other symptoms was similar.

Table (4): Factors determine the awareness about heart attack warning symptoms and CVDs preventive measures :Illustrated the association between sociodemographic data and an overall score of (i) awareness of symptoms and (ii) awareness of preventive measures. Results revealed that those who were overweight, female, widow, having a family history of CVD, having a chronic health condition, and reporting having stress were more likely to have a higher awareness level of heart attack symptoms (p<0.05) than others. Also, respondents who were overweight, divorced, and nonsmokers were more likely to have a high level of awareness of CVDs preventive measures (p<0.05).

Discussion

This comparative cross-sectional survey was done among 400 adults (170 men and 230 women) in Riyadh to evaluate the types and prevalence of CVDs risks and awareness of preventive measures and compare the awareness of heart attack warning symptoms among males and females.

The prevalence of CVDs risk factors was high among our study respondents, especially females, where the majority had at least one of the most common CVDs risk factors. For instance, most of them had a family history of CVDs, were obese and physically inactive, and a few were smokers and had chronic conditions like diabetes, hypertension, and hypercholesterolemia. Our findings are in line with previous studies' findings, which show that the prevalence of CVDs risk factors is noticeably high among Saudi mainly due to obesity and sedentary lifestyle **(Alshaikh et al., 2016; Mujamammi et al., 2020),** which considerably increases women's susceptibility for CVDs.

In Saudi Arabia, obesity is highly prevalent and might increase in the future. 59.5% of the population may suffer from obesity in Saudi Arabia by 2022 **(Alqarni, 2016). Between 1980 & 2015,** the body mass index increased by nearly 11.6% in women and 13.1% in men globally **(Manrique-Acevedo et al., 2020).** Obesity-related comorbidities are increasing globally. Obesity constitutes one of the most critical risk factors for chronic diseases such as diabetes mellitus, hypertension, fatty liver disease, stroke, and other NCDs, thereby contributing to poor quality of life and a decrease in life expectancy **(Blüher, 2019; Manrique-Acevedo et al., 2020).** A sedentary lifestyle and a poor diet seem to be the main drivers of the obesity pandemic. On the other hand, **Abdo Ahmed et al. (2020),** in their study that assessed the

awareness of the risk factors for heart attack among the general public in Pahang, Malaysia, reported that diabetes (26%) was the risk factor that their study's respondents least recognized.

Regarding the awareness of CVDs preventive measures, the current study found that most respondents strongly agreed that smoking cessation, active exercises, and control of obesity through an appropriate diet could prevent CVDs. In the same line, **Abdo Ahmed et al. (2020)** reported that the majority of the respondents identified smoking and obesity as risk factors for heart attack and also the multivariable logistic regression showed that respondents with a family history of heart attack had an excellent level of awareness.

Our study key findings showed that women were more likely to have a higher level of perceived stress than men. Gender has been an important biological determinant of vulnerability to stress **(Alshammari et al., (2020),** making women highly susceptible to CVDs. Nowadays, raising awareness of the population about the symptoms of stress and how to overcome them has become essential, as it helps prevent many of the diseases associated with it.

This study showed that more than a quarter of the respondents did not know CVDs risk factors and their preventive measures. Previous studies in Riyadh found that more than a third of the respondents did not know that an unhealthy diet, smoking, dyslipidemia, physical inactivity **(Mujamammi et al., 2020),** and uncontrolled hypertension **(Alotaibi et al., 2018)** are risks for CVDs.

The knowledge of CVDs risks and warning symptoms of heart attacks among the respondents were suboptimal. The majority of our respondents did not recognize the critical warning symptoms of a heart attack. However, the majority could identify shortness of breath, and weakness or fatigue as warning symptoms, followed by chest pain. Conversely, a few of the respondents recognized the most common heart attack symptoms (i.e., jaw and neck pain). Similarly, respondents in previous studies in Riyadh **(Mujamammi et al., 2020)** and Cameron **(Aminde et al., 2017)** reported shortness of breath as a heart attack warning symptom. Other significant symptoms, such as pain in the left arm or shoulder, pain in the jaw, weakness, or light-headedness, were identified only by a minority of the respondents, similar to a previous study **(Aminde et al., 2017)**. In Kuwait, two-fifths of the respondents (n=900) were not aware of any heart attack symptoms, while almost half of the respondents reported chest pain and shortness of breath **(Awad & Al-Nafisi, 2014).** These results indicate that further attention must be directed

towards enhancing the population's understanding of significant heart attack symptoms.

Our findings are congruent with previous studies' findings, where females had a better knowledge of the warning symptoms of heart attacks and strokes than males **(Aminde et al., 2017; Awad & Al-Nafisi, 2014).** Females had a higher awareness level than males about the key symptoms, such as chest pain, weakness, and fatigue, their awareness of other symptoms was almost the same. These findings might be because women have a higher self-awareness of their health. It could also be that they are more likely to attend heart health campaigns which include different awareness strategies regarding many common health problems. On the other hand, Koniak-Griffin and Brecht (2015), in their study to assess the awareness of CVDs and preventive behaviours among overweight immigrant Latinas, reported that many women possessed limited knowledge about heart disease and prevention strategies.

Conclusion :

Our study is among the first to compare awareness of CVD risk in men versus women. Lack of knowledge of CVD risks, and preventive measures, and heart attack warning symptoms is suboptimal. Obesity and stress are widespread among women. Nevertheless, women were more aware of heart attack warning symptoms than men. Subsequently,

Recommendations:

we recommend that:

- Healthcare policymakers, public health workers, and professional cardiovascular nurses develop a comprehensive, evidence-based public health education program that taking into consideration gender differences.
- Ministry of health can facilitate electronic services of sending cell phone messages to provide cardiac health tips and describe the warning symptoms of heart attacks while considering the population's literacy level.
- The population's awareness is the responsibility of every healthcare professional member, especially community and medical-surgical nurses. Thus, heart health screening and awareness campaigns can be arranged at regular intervals in the outpatient setting during the patients' and their relatives' waiting time and for patients' visitors to the hospital.
- Nurses should provide ongoing training to inform people about CVDs risks and prevention by promoting healthy heart habits. Also, future research to deeply explore stress and its predictors and develop evidence-based stress control programs among Saudi women is needed.

- Nurses have a significant responsibility to design evidence-based health education programs to reinforce the population's positive attitude towards adopting a healthy lifestyle and recognizing risks of CVDs.

Limitations

Although the cross-section design was used in this study, an adequately computed sample was recruited from several geographical regions in the capital of Saudi Arabia, which increases the possibility of generalizing the results to other sites. Also, establishing a causal relationship between the examined variables was impossible because the adopted design was a snapshot. Thus, future studies using other methods may yield different results.

Contribution

SSS & HAG: Conceptualized and designed the study. NY: Analyzed the data, interpreted the findings. SSS & NY: write the manuscript. FA, WA, & HA collected the study data. All authors have made substantive contributions to the study and approved the final draft.

Conflict of interest

The authors declare that there is no conflict of interest.

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