Original Article

Public Knowledge of Cardiovascular Diseases and its Risk Factors Among Adults in Makkah City, Saudi Arabia

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ABSTRACT

Background and aim: Cardiovascular diseases (CVDs) are among the leading causes of death globally, with both modifiable and non-modifiable risk factors playing major roles in their development. Limited research exists on public awareness of CVDs in Makkah, Saudi Arabia. This study aims to assess the level of knowledge regarding CVDs and their risk factors among the adult population in Makkah.

Methods: A descriptive cross-sectional study was conducted between January and April 2025 among the general population in Makkah City. Data were collected using a validated Arabic-based, self-administered online questionnaire. Participants included residents aged 18 and above from various educational and occupational backgrounds.

Results: A total of 676 participants were participated, with 63.2% being female. The majority (38.3%) were aged 18–25 years, and 74.0% held a university degree. Most respondents (94.8%) were Saudi nationals. Although 91.7% had heard of heart attacks, only 57.4% demonstrated good overall knowledge of CVDs and their risk factors. Notably, those with higher education levels, CPR training, or prior CPR experience showed significantly better awareness.

Conclusion: Despite high exposure to general CVDs information, many participants displayed limited understanding of less common symptoms and specific risk factors. Educational efforts, particularly those incorporating cardiopulmonary resuscitation (CPR) training, withtargeting younger and less-informed groups, are essential to improve public awareness and reduce the risk of CVDs.

Keyword: Cardiovascular diseases, awareness, Risk factors, Makkah City, Saudi Arabia.

Introduction

Cardiovascular disorders rank among the leading causes of death and illness globally. Identifying traditional risk factors for atherosclerotic heart disease is crucial in mitigating the risks associated with cardiovascular disorders. These diseases encompass a range of conditions affecting the heart, blood vessels, or both. Examples include deep vein thrombosis, pulmonary embolism, rheumatic heart disease, congenital heart disease, peripheral arterial disease, cerebrovascular disease, and coronary heart disease (CHD) [2].

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Public awareness and knowledge are vital, as cardiovascular diseases (CVDs) are the leading cause of death in both developed and developing countries. In 2008, CVDs accounted for 17.5 million deaths worldwide, comprising 30% of all deaths. Of these, 7.3 million were due to CHD and 6.2 million to stroke. It is estimated that CVDs-related fatalities will reach 23.3 million by 2030 [3]. In 2016, a cross-sectional study conducted in Jeddah, Saudi Arabia, involved 507 participants aged 20 to 40, focusing on the prevalence of undiagnosed cardiovascular risk factors. The study revealed that men had a higher incidence of high blood pressure (10.6%) compared to women (0.8%) [4]. The effective management of risk factors is crucial for preventing coronary artery disease (CAD). Risk factors for CAD can be categorized as either modifiable or non-modifiable factors. Modifiable risk factors include hypertension, hypercholesterolemia, tobacco use, diabetes mellitus, insufficient physical activity, obesity, and psychological stress. Conversely, non-modifiable risk factors encompass age, gender, family history of CADs, and certain ethnic backgrounds. Addressing modifiable risk factors is imperative to reduce the overall risk of developing CADs [5]. Behavioral risk factors may lead to elevated blood pressure, elevated blood glucose, elevated blood lipids, and overweight or obesity. Primary care centers can assess these "intermediate risk factors", which indicate a higher risk of heart attack, stroke, heart failure, and other complications [2]. Understanding CVDs and their contributing factors is essential for altering health-related attitudes, behaviors, and habits. Early medical intervention, prompted by increased awareness of heart attack and stroke signs, can lead to better patient outcomes. A thorough understanding of CVDs risk factors empowers individuals to take proactive steps to lower their risk, as most risk factors can be modified [6]. CVDs pose a significant scientific challenge in the Kingdom of Saudi Arabia [7]. Despite this, research on awareness and understanding of these diseases and their associated risk factors still need more highlighted, particularly in Makkah. Consequently, this study aims to assess public knowledge of CVDs and their risk factors among adults in Makkah City, Saudi Arabia.

Methods

A cross-sectional study was conducted among the general population of Makkah City, Saudi Arabia, from January 2025 to April 2025. Ethical approval was obtained from the Biomedical Ethics Committee of the Faculty of Medicine at Umm Al-Qura University (UQU), Makkah, Saudi Arabia (approval number HAPO-02-K-012-2025-02-2545). The study included the adults residing in Makkah City, irrespective of gender or nationality. Individuals who declined to participate and those under the age of 18 were excluded. The minimum sample size required for this study was estimated using Raosoft, taking into account a 95% confidence interval and a 5% margin of error. The calculated sample size was 385 participants, which was adjusted to 422 to account for a potential 10% data loss. However, the final data collection included 676 participants. Data was collected through an online self-administered questionnaire using Google Forms. The questionnaire, validated in a prior study by Kolo et al. [8], enhances the reliability and accuracy of the research instrument. The questionnaire comprises three sections. The first section includes a consent and agreement to participate form. The second section collects sociodemographic data, such as gender, age, marital status, educational level, nationality, occupation, and history of chronic diseases. The final section measures awareness and knowledge of CVDs and their risk factors. Participants were scored based on correct responses to assess overall knowledge, with each correct response earning one point. This scoring resulted in an overall score for each participant, categorizing their knowledge level into two groups: those scoring below 60% were deemed to have "poor" knowledge, while those scoring above 60% were classified as having "good" knowledge.

Data Analysis

Data analysis utilized SPSS version 27 (IBM Corp., 2020). Descriptive statistics, including frequency distributions and percentages, summarized the participants' demographic and knowledge-related characteristics. To examine factors influencing CVD knowledge, chi-square tests (Pearson's X^2 test) were conducted to evaluate associations between categorical variables – such as age, gender, education level, and employment status – and overall knowledge level. Subsequently, multiple logistic regression was employed to identify significant predictors of CVD knowledge, reporting adjusted odds ratios (ORA) with corresponding 95% confidence intervals (CIs). This model accounted for potential confounding factors, with a p-value threshold for significance set at ≤ 0.05. Adjusted odds ratios (ORA) and 95% CIs were provided for each predictor.

Results

(Table 1) outlines the personal characteristics of the study participants in Makkah, Saudi Arabia. The age group with the largest representation comprised individuals aged 18–25 years, totaling 259 participants (38.3%). This was followed by those aged over 45

years, with 191 participants (28.3%). Participants aged 36–45 years numbered 124 (18.3%), and those aged 26-35 accounted for 102 participants (15.1%). Regarding gender, the study included 427 female participants (63.2%) and 249 male participants (36.8%). In terms of marital status, the majority were married, comprising 375 participants (55.5%). Single participants numbered 275 (40.7%), and 26 participants (3.8%) were divorced or widowed. Educational attainment revealed that 500 participants (74.0%) held a university degree, 109 participants (16.1%) had completed secondary education, and 32 participants (4.7%) had education below the secondary level. Nationality data showed that 641 participants (94.8%) were Saudi nationals. Concerning employment status, 234 participants (34.6%) were employed, 222 participants (32.8%) were students, and 146 participants (21.6%) were not working. Regarding health insurance, 543 participants (80.3%) did not have coverage, whereas 133 participants (19.7%) possessed health insurance. Obesity was reported by 80 participants (11.8%), while 31 participants (4.6%) were smokers. In terms of health conditions, 436 participants (64.5%) reported no prior diagnoses of any listed conditions. Among those with specific health issues, 102 participants (15.1%) reported hypertension, 85 participants (12.6%) had high cholesterol, and 71 participants (10.5%) had diabetes mellitus. A prior heart attack or heart disease was reported by 21 participants (3.1%), whereas eight participants (1.2%) had a history of stroke. (Figure 1) illustrates the participation in CPR courses and the experience of performing CPR among the study participants. Of the 676 participants, 205 individuals (30.3%) reported having completed a CPR course. Additionally, 62 participants (9.2%) indicated that they had performed CPR on someone. (Table 2) presents public knowledge and awareness among adults in Makkah, Saudi Arabia. Concerning heart attacks, of the participants, 620 individuals (91.7%) have know about the heart attack. When asked to describe a heart attack, 530 participants (78.4%) accurately identified it as “sudden pain at the back of the chest bone, with pain moving towards the left or both arms”. In contrast, 101 participants (14.9%) mistakenly chose “sudden weakness of the upper and lower limbs on one side of the body”; 30 participants (4.4%) selected “sudden loss of sight in one or both eyes, with deviation of the mouth to one side”; nine participants (1.3%) indicated it is a “pain in the upper part of the abdomen that worsens with hunger”, and six participants (0.9%) chose “cough productive of foaming sputum and swelling of both legs”. When described the heart attack symptoms, 542 participants (80.2%) correctly identified chest pain or discomfort as a symptom, while 516 participants (76.3%) recognized shortness of breath. Additional symptoms, such as jaw, neck, or back pain, were correctly identified by 239 participants (35.4%). Weakness in the arm and leg on one side of the body was identified by 306 participants (45.3%). Moreover, 386 participants (57.1%) correctly recognized weakness, dizziness, and fainting as symptoms, and 408 participants (60.4%) identified pain or discomfort in the arm or shoulder. Trouble seeing in one or both eyes was correctly recognized by 211 participants (31.2%). In response to what actions to take if someone is having a heart attack, 473 participants (70.0%) correctly answered calling an ambulance as the first step. Only 170 participants (25.1%) suggested taking the person to the hospital directly. Regarding the causes and risk factors of heart attacks, 523 participants (77.4%) correctly identified hypertension, 508 participants (75.1%) recognized high cholesterol, and 515 participants (76.2%) acknowledged cigarette smoking as a risk factor. Furthermore, 445 participants (65.8%) correctly recognized alcoholism, while 298 participants (44.1%) identified excess salt intake as a contributing factor. (Figure 2) illustrates the overall public knowledge about CVDs and their risk factors among the study participants. Of the 676 participants, 388 individuals (57.4%) demonstrated a good level of knowledge, whereas 288 participants (42.6%) exhibited poor knowledge. (Table 3) shows correlation between the study participants` sociodemographic characteristics and their knowledge about CVDs. Participants with a university-level education exhibited the highest percentage of good knowledge at 60.6%, while those with less than secondary education had the lowest at 37.5% ($p = 0.001$). Regarding nationality, Saudi participants had a higher percentage of good knowledge at 58.7%, compared to non-Saudis, with only 34.3% ($p = 0.005$). Employment status also revealed significant differences; students demonstrated the highest percentage of good knowledge at 64.0%, followed by employees at 57.3%, and then those not working at 54.8% ($p = 0.016$). Additionally, participants who had completed a CPR course exhibited a significantly higher percentage of good knowledge at 77.1% compared to those who had not, with only 48.8% showing good knowledge ($p = 0.001$). Likewise, individuals who had performed CPR had a good knowledge rate of 77.4%, in contrast to those who had never performed CPR, at

55.4% (p = 0.001). No significant differences were observed based on age (p = 0.368), gender (p = 0.638), marital status (p = 0.268), health insurance (p = 0.296), or a history of prior stroke or heart attack (p = 0.475).

The multiple logistic regression model presented in (Table 4), the results identified several significant predictors of CVD knowledge among study participants. Age emerged as a significant predictor (p = 0.015), with older participants more likely to demonstrate better CVD knowledge. This is reflected in an adjusted odds ratio (ORA) of 1.28 (95% CI: 1.05–1.56). Higher education level was also a significant predictor (p = 0.001); participants with higher education exhibited superior CVD knowledge (ORA = 1.66, 95% CI: 1.25–2.19). Employment status showed a significant association (p = 0.049), indicating that employed or student participants had a greater likelihood of enhanced CVD knowledge compared to non-employed individuals (ORA = 1.24, 95% CI: 1.01–1.62). Participation in CPR courses was a strong predictor (p = 0.001), with those who had taken a CPR course displaying markedly better CVD knowledge (ORA = 3.72, 95% CI: 2.38–5.80). Similarly, having performed CPR was a significant predictor (p = 0.045), with individuals who had performed CPR more likely to possess better CVD knowledge (ORA = 1.71, 95% CI: 1.01–2.29). In contrast, factors such as gender, marital status, nationality, health insurance, and prior experience of stroke or heart attack did not show significant associations with CVD knowledge, as their p-values exceeded 0.05.

Discussion

This study aimed to evaluate the current level of public awareness in Makkah, Saudi Arabia, regarding the risk factors and warning signs of CVDs. Adequate knowledge and understanding of these risk factors are crucial for preventing CVD and reducing related mortality. Increasing public awareness of modifiable factors remains the primary strategy for lowering incidence and prevalence. Participants were predominantly between 18–25 years (38.3%), while those aged ≥45 years accounted for 28.3% [1]. Although participants demonstrated a high overall knowledge of heart attacks (91.7%), their understanding of specific symptoms and risk factors varied. They showed strong awareness of common symptoms such as chest pain, shortness of breath, and arm or shoulder discomfort, but limited recognition of less obvious symptoms like jaw pain, dizziness, and visual disturbances. Similar gaps have been documented in both local and international studies, especially among women and younger individuals [9, 10]. Chest pain (80.2%) was the most frequently reported symptom, aligning with findings from Jeddah (76.4%) and comparable to Beijing (64%) and Nigeria (67%). Awareness was notably higher than in Pakistan (36%), Tanzania (44.1%), Nepal (20.5%), and Kuwait (50%). While the public recognizes chest pain as a key cardiovascular symptom [6, 8–13]., Further education is needed to improve understanding of the full range of CVD symptoms. In Makkah, 76.3% of participants identified shortness of breath as a CVD sign, exceeding levels in Tanzania (74.3%), Jeddah (73.7%), and Nigeria (62%), and higher than those in Nepal (13%), Kuwait (48%), Pakistan (24%), and Canada (39%) (2–6,8,9). Similarly, 60.4% recognized pain or discomfort in the arms or shoulders, surpassing Tanzania (43.3%), Nigeria (28%), Kuwait (41.2%), and Jeddah (56%) (2,3,6,8). Furthermore, 57.1% identified weakness, dizziness, or fainting, higher than Jeddah (51.2%), Nigeria (41%), and Kuwait (25%), and comparable to Tanzania (60.2%) [6, 8–10].

Regarding the risk factors, 76.2% recognized smoking as the leading cause of heart attacks, a rate higher than in Nigeria (48.8%), Canada (55%), Pakistan (31.9%), Tanzania (26.5%), and Nepal (5.8%), and comparable to Jeddah (78.1%), Kuwait (88.7%), and Jordan (75.7%)[6, 8-12, 14,15]. Hypertension was the second most frequently identified risk factor (77.4%), consistent with Nigeria (73.2%) and Jeddah (72%), and higher than in Kuwait (64.3%), Jordan (62%), Canada (20%), Tanzania (36.6%), Pakistan (7.10%), and Nepal (13.3%) (6,8-12,14,15). In addition, 75.1% identified high cholesterol as a risk factor, exceeding rates in Tanzania (64.3%), Nigeria (37.6%), Canada (31%), Nepal (15.6%), and Pakistan (7.4%), and aligning with Jeddah (70%) and Kuwait (69.7%) [6, 8–12, 14].In addition, high cholesterol and excess salt intake from the known risk factors leading to CVD. Strong evidence suggests a direct causal relationship between sodium intake and blood pressure (BP) and a modest reduction in salt consumption is associated with a meaningful reduction in BP in hypertensive as well as normotensive individuals [16]. Elevated levels of blood lipids are well documented risk factors for cardiovascular disease [17]. A strong correlation was found between improved knowledge of CVD and CPR training. Participants who had attended CPR classes or had prior CPR experience demonstrated greater awareness of symptoms and risk factors, emphasizing the educational benefits of practical, hands-on instruction. These findings align with research showing a positive association between health literacy

Table 1: Sociodemographic characteristics of the study participants, Makkah, Saudi Arabia (N=676).

Personal data	**No**	**%**
Age in years		
18-25	259	38.3
26-35	102	15.1
36-45	124	18.3
> 45	191	28.3
Gender		
Male	249	36.8
Female	427	63.2
Marital status		
Single	275	40.7
Married	375	55.5
Divorced / widow	26	3.8
Educational level		
Below secondary	32	4.7
Secondary	109	16.1
University	500	74.0
Other	35	5.2
Nationality		
Saudi	641	94.8
Non-Saudi	35	5.2
Employment		
Not working	146	21.6
Student	222	32.8
Employee	234	34.6
Other	74	10.9
Do you have health insurance?		
Yes	133	19.7
No	543	80.3
Anthropometric measurements		
Not obese	596	88.2
Obese (BMI> 30 kg/m^2)	80	11.8
Are you a smoker?		
Yes	31	4.6
No	645	95.4
Chronic health problems		
None	436	64.5
Hypertension	102	15.1
High cholesterol	85	12.6
DM	71	10.5
Prior heart attack or heart disease	21	3.1
Prior stroke	8	1.2

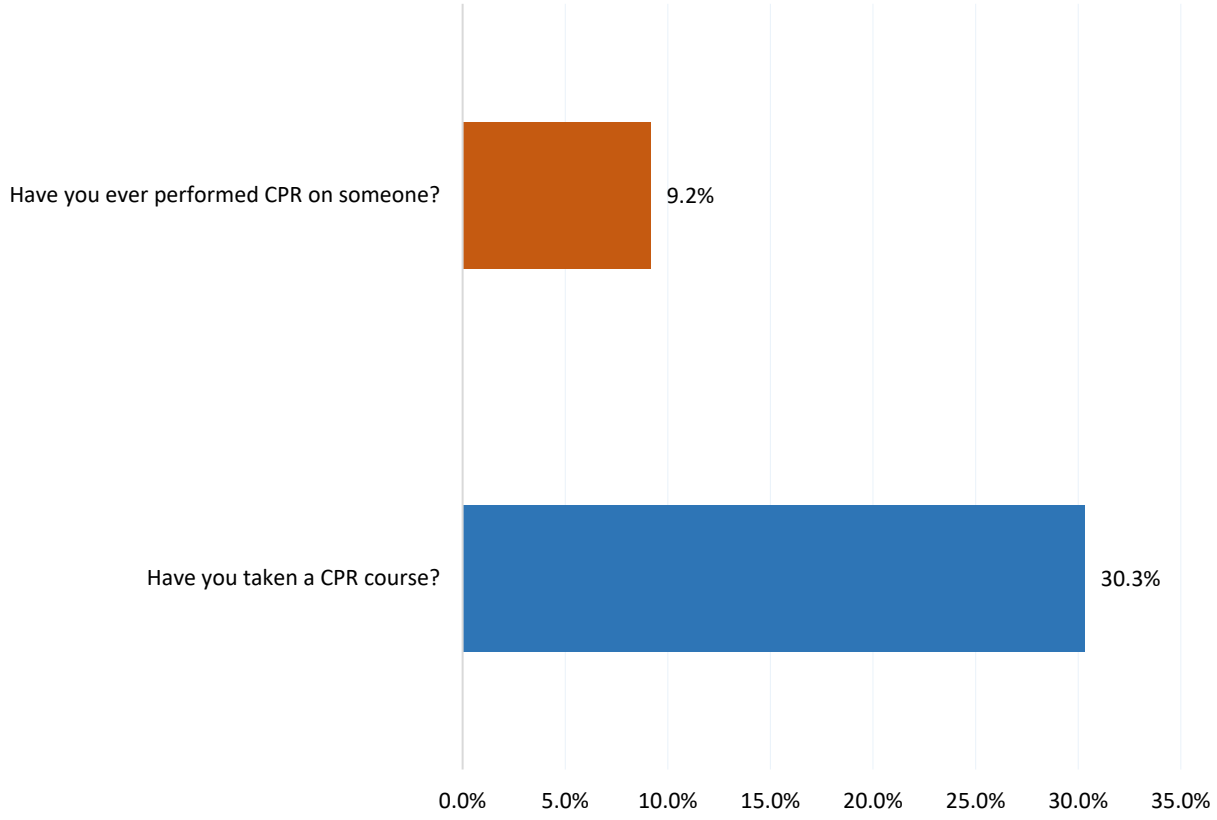

Figure 1: Participation in a CPR course and experience in performing CPR on someone among participants in Makkah (N=676).

Table 2: Public Knowledge of Cardiovascular Diseases and Their Risk Factors among adults in Makkah, Saudi Arabia (N=676).

Knowledge items	No	%
Have you ever know about the heart attack?		
Yes	620	91.7
No	56	8.3
What is a heart attack?		
Sudden pain at the back of the chest bone, with pain moving towards the left or both arms	530	78.4
Sudden weakness of the upper and lower limbs on one side of the body	101	14.9
Sudden loss of sight in one or both eyes, with deviation of the mouth to one side	30	4.4
Pain in the upper part of the abdomen that worsens by hunger	9	1.3
Cough productive of foaming sputum and swelling of both legs	6	.9
Symptoms of heart attacks		
Jaw, neck, or back pain		
Yes	239	35.4
No	218	32.2
Not sure	219	32.4
Weakness in the arm and leg on one side of the body		

Yes	306	45.3
No	191	28.3
Not sure	179	26.5
Weakness, dizziness, and fainting		
Yes	386	57.1
No	103	15.2
Not sure	187	27.7
Chest pain or discomfort		
Yes	542	80.2
No	27	4.0
Not sure	107	15.8
Trouble seeing in one or both eyes		
Yes	211	31.2
No	204	30.2
Not sure	261	38.6
Pain or discomfort in the arm or shoulder		
Yes	408	60.4
No	81	12.0
Not sure	187	27.7
Shortness of breath		
Yes	516	76.3
No	37	5.5
Not sure	123	18.2
If someone has a heart attack, what is the first thing you will do?		
Call the ambulance number	473	70.0
Take to the hospital	170	25.1
Tell him to call his doctor	15	2.2
Call a spouse or a family member	15	2.2
Go to a pharmacy	3	.4
Causes and risk factors of a heart attack		
Hypertension		
Yes	523	77.4
No	23	3.4
Not sure	130	19.2
High cholesterol		
Yes	508	75.1
No	30	4.4
Not sure	138	20.4
Cigarette smoking		
Yes	515	76.2
No	27	4.0
Not sure	134	19.8
Alcoholism		
Yes	445	65.8
No	41	6.1
Not sure	190	28.1
Excess salt intake		
Yes	298	44.1
No	112	16.6
Not sure	266	39.3

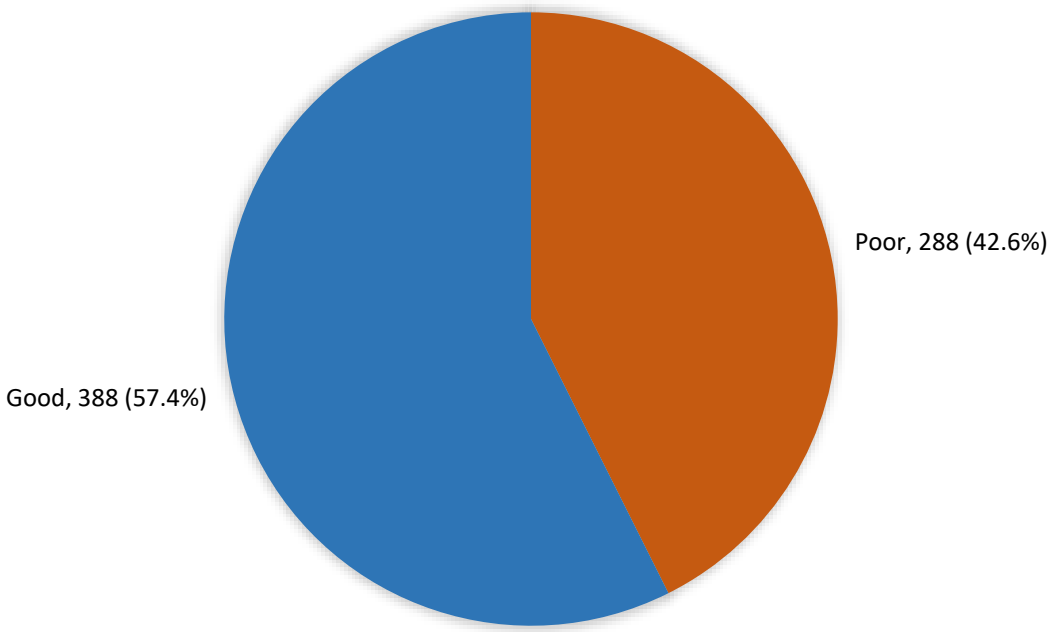

Figure 2: The Overall Public Knowledge about Cardiovascular Diseases and Their Risk Factors among adults in Makkah, Saudi Arabia (N=676).

Table 3: Correlation between the study participants' sociodemographic characteristics and their knowledge level about CVD.

Factors	**Overall knowledge level**				**p-value**
	Poor		**Good**		
	No	**%**	**No**	**%**	
Age in years					.368
18-25	107	41.3	152	58.7	
26-35	47	46.1	55	53.9	
36-45	46	37.1	78	62.9	
> 45	88	46.1	103	53.9	
Gender					.638
Male	109	43.8	140	56.2	
Female	179	41.9	248	58.1	
Marital status					.268
Single	109	39.6	166	60.4	

Married	165	44.0	210	56.0	
Divorced / widow	14	53.8	12	46.2	
Educational level					.001*
Below secondary	20	62.5	12	37.5	
Secondary	60	55.0	49	45.0	
University	197	39.4	303	60.6	
Other	11	31.4	24	68.6	
Nationality					.005*
Saudi	265	41.3	376	58.7	
Non-Saudi	23	65.7	12	34.3	
Employment					.016*
Not working	66	45.2	80	54.8	
Student	80	36.0	142	64.0	
Employee	100	42.7	134	57.3	
Other	42	56.8	32	43.2	
Do you have health insurance?					.296
Yes	62	46.6	71	53.4	
No	226	41.6	317	58.4	
Have you taken a CPR course?					.001*
Yes	47	22.9	158	77.1	
No	241	51.2	230	48.8	
Have you ever performed CPR on someone?					.001*
Yes	14	22.6	48	77.4	
No	274	44.6	340	55.4	
Prior stroke or heart attack					.475^
Yes	1	25.0	3	75.0	
No	287	42.7	385	57.3	

P: Pearson X^2 test *^: Exact probability test*
** P < 0.05 (significant)*

Table 4: Multiple logistic regression model for predictors of CVD knowledge among study participants in Makkah, Saudi Arabia.

Predictors	**p-value**	**OR_A**	**95% CI**	
			Lower	**Upper**
Age in years	.015*	1.28	1.05	1.56
Female vs. male	.156	1.29	0.91	1.84
Single vs. married	.418	1.19	0.77	1.82

High education	.001*	1.66	1.25	2.19
Saudi vs. Non-Saudi	.134	1.81	0.83	3.97
Employed / students vs. non-employed	.049*	1.24	1.01	1.62
No health insurance	.368	1.21	0.80	1.82
Taken a CPR course	.001*	3.72	2.38	5.80
Performed CPR on someone	.045*	1.71	1.01	2.29
Prior stroke or heart attack	.393	2.71	0.27	3.70

ORA: Adjusted odds ratio *CI: Confidence interval*
** P ≤ 0.05 (significant)*

and exposure to CPR and first-aid education [18,19]. The primary limitation of this study is its cross-sectional design, which restricts assessment of long-term changes and causal relationships. To address this, nationwide community programs are recommended to raise public awareness about CVD, focusing on both common and atypical symptoms as well as lifestyle-related risk factors. Programs should integrate CPR and first-aid training through digital media and local platforms such as secondary schools to reach broader audiences. Future research should examine the impact of these interventions among rural and less-educated populations and compare outcomes with other countries to enhance understanding of their effectiveness.

Conclusion

This study assessed public knowledge of CVD and their risk factors among adults in Makkah, Saudi Arabia. The findings indicate that although overall awareness was generally positive, particularly concerning with common symptoms such as chest pain, understanding of less apparent signs and risk factors were limited. Higher levels of education, CPR training, and prior CPR experience were associated with improved knowledge. In contrast, factors such as gender or previous health issues had no significant effect. Therefore, community programs and CPR education should be expanded to increase public awareness, with a particular focus on underserved and less informed populations.

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Conflict of Interest

None

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None

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