Knowledge and awareness on cardiovascular diseases among the Iraqi population

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A B S T R A C T

This community-based, cross-sectional study was conducted to assess the knowledge on cardiovascular diseases among the Iraqi population. The sample was convenient and included all populations aged between 18-80 years old. Data were collected during the period from 1st to 15th of August using a structured questionnaire which was distributed to the participants via Facebook, Telegram, and WhatsApp. All data were entered into the computer software program SPSS version 26 for statistical analysis. Association between variables was assessed by Chi-square test and independent-sample t-test accordingly. The 974 respondents were with a mean age of 37 years. Females represented 71% of them. Around 18% had an overall poor knowledge, whereas 49% and 33 % had moderate and good knowledge respectively. More than two-thirds of respondents (69.8%) identified coronary heart disease as a type of CVDs. Chest pain or discomfort was distinguished as a symptom of heart attack by 84%. Sudden confusion or disturbed consciousness was recognized by 73% as warning symptoms of stroke, whereas severe headache of unknown cause was recognized by only 48%. Most of the participants (91.2%) knew that obesity is a risk factor for this disease, but only 55% identified diabetes as its cause. Overall knowledge related to CVDs is acceptable. Unsatisfactory awareness about types and warning symptoms of CVDs although of good awareness about risk factors. Important determinants of knowledge on CVDs are gender, educational level, residence, monthly income, body mass index, family history of CVDs, perception of lifestyle, and personal history of diabetes or hypertension. The researchers recommend further studies including different educational and socioeconomic classes.

INTRODUCTION

Cardiovascular diseases (CVDs) are diseases that arise from a defect in the heart and blood vessels. This term includes six major types of conditions which can be identified as coronary heart disease; cerebrovascular disease; peripheral arterial disease; rheumatic heart disease; congenital heart disease; and deep vein thrombosis and pulmonary embolism (World Health Organization [WHO], 2021a). These diseases are caused by multiple factors including elevated blood pressure, elevated blood sugar, lipid disturbances, genetic predisposition, and increasing body weight. In addition to factors associated with a daily lifestyle like smoking habit, no exercise, and eating a non-healthy diet (National Health Services [NHS], 2018). The most known mechanism for developing heart and blood vessels diseases is atherosclerosis. Atherosclerosis arises from narrowing the arteries by a plaque which leads to blocking of blood flow by a clot and causing stroke or heart attack (American Heart Association [AHC], 2017). Different signs and symptoms are presented in patients with CVD depending on the cause of the disease, and the most frequent symptoms mentioned by them are chest pain or tightness, inability to breathe normally, feeling tired, and abnormal sensation and numbness in arms and/ or legs (Cleveland Clinic, 2021).

Globally, there were 422 million patients suffer from CVDs distributed through different regions and mostly reported among older age groups. These conditions counting to 18 million deaths all over the world which represented near one-third of all deaths. In the Middle East region, CVDs were responsible for 34.1% of all deaths in 2015 (GBD 2015 Eastern Mediterranean Region Cardiovascular Disease Collaborators, 2015). Recently in 2018, from World Health Organization (WHO) report about Iraq, there were 11,205 deaths (6.53%) due to stroke and 32,463 deaths (18.92%) due to coronary heart disease (World Health Rankings, 2021). The Ministry of Health (MOH) in Iraq was reported in 2019 that 27% of total deaths in Iraq are related to CVDs (WHO, 2021b). Death related to CVDs can occur due to different complications that can be prevented if the patient was aware of warning signs and symptoms. The World Health Organization (WHO) recommended behavioral modifications in order to prevent CVDs like stop smoking, stop alcohol drinking, practicing healthy exercise, control body weight, control stress, and eating healthy food (WHO, 2007). Awareness and knowledge of the main modifiable risk factors and symptoms of CVDs can surely help in the prevention of occurrence of and death from CVDs. If the population know the modifiable factors leading to CVDs, so they can avoid them by changing lifestyle and behaviors and finally decreases the risk of occurrence and death from CVDs (Mujamammi A et al., 2020; Muntner P et al., 2010). In addition to knowing the main symptoms of heart attack and stroke leading to early detection, early treatment, and good prognosis (Jafary et al., 2005; McKinley S et al., 2004).

The assessment of the knowledge level of the population about risk factors and symptoms of CVDs is of great benefit for those responsible for planning and decision-making about future educational programs. Many previous studies had estimated the baseline knowledge about CVDs like that conducted in Kuwait, Buea, Nepal, and Iran (Aminde, L.N et al., 2017; Awad & Al-Nafisi, 2014; Koohi F& Khalili D, 2020; Vaidya A et al., 2013). An educational program for the population can be a very helpful tool for increasing population knowledge and awareness regarding CVDs. This was approved by different studies conducted among male metal workers and first-year, Faculty of Science, Zagazig University students. There was a significant improvement in the knowledge of freshmen students from Zagazig University about CVDs from 58% with adequate knowledge to 99.2% after the educational course (Ganassin, G et al., 2016; Naglaa M et al., 2019).

OBJECTIVES

This study was performed to assess the knowledge and awareness of the general Iraqi population regarding CVDs. The specific objectives of this study were:

1. To identify the socio-demographic, lifestyle, and clinical history of the participants.
2. To assess the participants' knowledge regarding types, symptoms, and risk factors of CVDs.
3. To determine the associated factors with knowledge score.

METHODS

Research Design

This is a community-based, analytical cross-sectional study conducted among a sample of the Iraqi population. This type of study is useful to assess the distribution of the knowledge score among the selected sample. It is a relatively quick, easily performed design, and measuring prevalence.

Respondents

The sample was convenient and included all Iraqi populations, reading the Arabic language, accept to participate, and aged between 18-80 years old. Health care professionals and students were excluded. The sample size was calculated according to the sample size equation for the cross-sectional survey ($n=Z^2P\ (1-P)\ d^2$) (Pourhoseingholi et al., 2013). According to the equation, the minimum sample required in this study is 383 when considering the prevalence of good knowledge of CVDs and risk factors in Saudi Arabia (Mujamammi et al., 2020) which is 47.1% with a 95% confidence interval and 80% power of the study. The sample size was multiplied by 2 (design effect) because of the non-probability procedure used for acquiring the sample.

Instrument

The data were collected using a specially structured questionnaire derived from previous studies (Aminde, L.N et al., 2017; Awad & Al-Nafisi, 2014). The questionnaire was modified and prepared by two community medicine specialists. It was first written in English and then translated by a language specialist to Arabic. The format of the questionnaire has consisted of five parts; part one included sociodemographic features, lifestyle habits, and history of the presence of chronic diseases; part two included knowledge about types of CVDs; part three and four included symptoms of heart attack and stroke; and finally risk factors of CVDs. This questionnaire was pretested on 10 people before it was online distributed to the participants via different applications like Facebook, Telegram, and WhatsApp. Data continued to be collected through the period from 1st August to 15th August.

From the reported weight and height of the participants, the researchers calculate the Body Mass Index (BMI) according to the following equation: weight [kg] /height [m]^2 (Center for Disease Control and Prevention [CDC], 2014). Then BMI was categorized into four categories including underweight for those with BMI less than 18.5 kg/m^2, normal weight if it lies between (18.5 - 24.9), overweight for people with BMI from 25 to 29.9, and obese if ≥ 30 kg/m^2 (CDC, 2021).

The total knowledge questions were 25 divided into 6 for the types of CVDs, 5 for signs and symptoms of heart attack, 5 for symptoms of stroke, and 9 for related risk factors. Each correct answer was scored by 1, incorrect and don't know were scored as zero. The total score for each participant was calculated considering the minimum score of zero and the maximum of 25. Categorization of knowledge has followed other studies (Aminde, L.N et al., 2017; Awad & Al-Nafisi, 2014) as following: Poor knowledge if the collected score is less than or equal to 12, moderate for knowledge score between (13-19), while those equal or more than 20 were classified as good knowledge score.

Ethical Consideration

The ethical committee of the College of Medicine/ Wasit University had approved the study. All participants were informed about the objectives of the study prior they gave their consent to participate. They all told that their data were secret and would be used for research purposes only without any refereeing to their personal information or address.

Data Analysis

After the collection of data was completed, all of them were entered into the computer software program SPSS version 26 for completing the statistical analysis. The qualitative data were represented by frequency and percentages while quantitative data like age were represented by the mean and standard deviation (SD). Association between variables was assessed by Chi-square test and independent-sample t-test accordingly. A P-value of ≤ 0.05 was considered significant.

RESULTS

The result of the current study was depending on the analysis of 794 fully returned questionnaires from the participants. The respondents' mean age and standard deviation were (37.08±11.138) years old, with a minimum age of 18 and a maximum of 68 years old.

Table 1 shows the characteristic features of participants including demographic, socioeconomic, lifestyle, clinical history, and family history of any CVD. The majority of the sample (70.5%) were females and about two-third (67.3%) were married. There were 68% employed with governmental jobs, near three quarters (75.8%) were living in city centers. Regarding economic status, near half of the sample (46.7%) were receiving more than one million Iraqi dinars per month (note that each 1$ equal to around 1470 Iraqi Dinars). Even that only 9.6% of participants were thinking that they are obese, there are 28.5% of them with BMI of more than 30. There are only 24(3%) thought they had bad health and 152(19.1%) thought they live stressful and very stressful life situations. The participants were also asked about their lifestyle habits like smoking, physical activity, and eating healthy food. There are 496 persons (62.5%) who never did any physical activity, more than half (55.9%) eating healthy food every day, and 702(88.4%) never smoked during their lives. Less than half of the participants (48.9%) mentioned having first- or second-degree relatives diagnosed with one of the CVDs. Although only 180 (22.7%) of the sample complaining of chronic diseases, some of them had more than one disease. Those who lived with hypertension were represented (15.1%) followed by diabetes mellitus (7.8%) and then dyslipidemia (6.8%).

Table 1. *Socio-demographic, lifestyle, and clinical features of the 794 respondents*

Variables		Frequency	Percentage
Gender	Male	234	29.5
	Female	560	70.5
Marital status	Married	534	67.3
	Single	234	29.5
	Divorced or widowed	26	3.3
Educational level	Secondary and intermediate school	114	14.4
	College	322	40.6
	Post graduated	358	45.1
Occupation	Governmental employment	540	68.0
	Self-employed	30	3.8
	Nonemployee or student	224	28.2
Place of living	City center	602	75.8
	District and sub-district	168	21.2
	Village and peripheries	24	3.0
Monthly income	Below 500000Iraqi Dinars	204	25.7
	500000-1 million Iraqi dinars	218	27.5

	More than 1 million	372	46.9
Body Mass Index (BMI) category	Underweight	14	1.8
	Normal	232	29.2
	Overweight	322	40.6
	Obese	226	28.5
Description of your health status	Excellent	44	5.5
	Very good	216	27.2
	Good	320	40.3
	Fair	190	23.9
	Bad	24	3.0
Describing body weight	Under weight	60	7.6
	Normal	316	39.8
	Overweight	342	43.1
	Obese	76	9.6
Description of your lifestyle	Not stressful at all	112	14.1
	Relatively stressful	530	66.8
	Stressful or very stressful	152	19.1
Smoking habit	Current smoker	78	9.8
	Ex-smoker	14	1.8
	Non-smoker	702	88.4
Eating healthy food	Every day	444	55.9
	Not every day	350	44.1
Exercise for 30 min/ day	No activity	496	62.5
	1-2 times/ week	198	24.9
	3-4 times/week	60	7.6
	5 times/week and more	40	5.0
Presence of relative with CVDs*	No	406	51.1
	Yes	388	48.9
Presence of chronic disease	Chronic diseases	180	22.7
	No chronic diseases	614	77.3
Presence of Hypertension	No hypertension	674	84.9
	Hypertension	120	15.1
Presence of Diabetes mellitus	No DM	732	92.2
	DM	62	7.8
Presence of Dyslipidemia	No dyslipidemia	740	93.2
	Dyslipidemia	54	6.8

Cardiovascular diseases

As shown in Table 2, the most disease identified by the respondents as a type of CVDs is coronary heart disease (69.8%) followed by congenital heart disease (67.8%). Only 278 (28.5%) knew that cerebrovascular disease is one of the CVDs. The majority of the participants (83.6%) were aware that chest pain or discomfort can be a sign of heart attack while only 296 (37.3%) knew about pain in the neck, back, or jaw. The most frequent symptom of stroke mentioned by the study sample was sudden confusion or disturb consciousness (72.8%), followed by (71.5%) feeling of weakness or numbness in legs, arms, or face. There are 724 (91.2%) who succeeded in distinguishing obesity as a risk factor for CVDs. About 706 (88.9%) defined smoking as a risk factor. Hypertension and elevated cholesterol level were mentioned among (87.2%) and (86.6%) in respective order.

Table 2: *Frequency distribution of correct knowledge answers*
related to cardiovascular diseases

Variables	Items	Frequency	Percentage
Types of cardiovascular diseases	Coronary heart disease	554	69.8
	Congenital heart disease	538	67.8
	Deep venous thrombosis and pulmonary embolism	372	46.9
	Rheumatic heart disease	384	48.4
	Peripheral arterial disease	278	35.0
	Cerebrovascular disease	226	28.5
Symptoms of heart attack	Chest pain or discomfort	664	83.6
	Difficulty in breathing or shortness of breath	638	80.4
	Pain or discomfort in arms or shoulder	534	67.3
	Feeling weak, light-headed, or faint	450	56.7
	Pain or discomfort in the jaw, neck, or back	296	37.3
Symptoms of stroke	Sudden confusion or trouble speaking or understanding others	578	72.8
	Sudden numbness or weakness of the face, arm, or leg	568	71.5
	Sudden dizziness, trouble walking, or loss of balance or coordination	550	69.3
	Severe headache with no known cause	382	48.1
	Sudden trouble seeing in one or both eyes	468	58.9
Risk factors for CVDs *	Smoking	706	88.9
	Obesity	724	91.2
	Unhealthy diet	672	84.6
	Physical inactivity	630	79.3
	High LDL Cholesterol levels	688	86.6
	Hypertension	692	87.2
	Positive family history	648	81.6
	Stress	632	79.6
	Diabetes mellitus	440	55.4

Cardiovascular diseases

The overall knowledge means and standard deviation about different items related to CVDs for all participants were (16.76±5.32). The minimum score was 0 while the maximum was 25. We classified the knowledge score into 3 levels including poor, moderate, and good knowledge score. From 794 persons who filled the questionnaire, there were only 142 (17.9%) have got a bad knowledge score. Near half of them, 48.9% were with moderate knowledge while good knowledge was represented among 264 (33.2%) (Figure1).
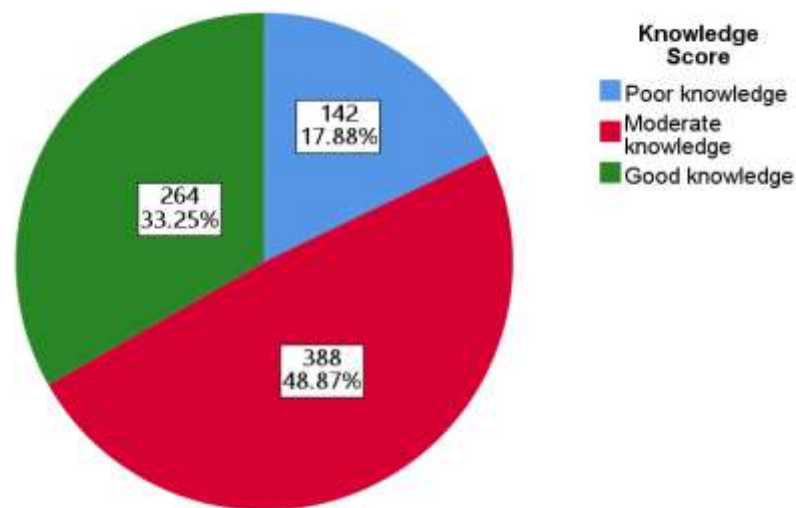
Figure 1. Pie-chart of knowledge scores among 794 participants

To assess the association of knowledge score with different factors, we dichotomized these scores into low (score < 13) which is considered as inadequate knowledge and moderate-to-good (score ≥ 13) out of 25 which is considered as adequate knowledge score. There is no significant association between age and knowledge score (P=0.707). The mean age ± SD for those people with adequate knowledge were (37.01±11.14) and for those with bad knowledge were (37.39±11.13).

Table 4 shows a significant association between knowledge score with gender (P=0.014), education (P=0.002), living place (P=0.037), monthly income (P=0.002), BMI (P>0.001), perception of lifestyle (P=0.001), family history of CVDs (P=0.041), previous hypertension (P=0.006), and those with DM (P=0.017).

Table 4: *Association between studied socio-demographic and*
clinical features with the knowledge score

Variables	Categories	Inadequate knowledge level	Adequate knowledge level	P-value (Chi-square test)
		Frequency (%)	Frequency (%)	
Gender	Male Female	54(23.1) 88(15.7)	180(76.9) 472(84.3)	0.014
Marital status	Married Single Divorced or widowed	94(17.6) 46(19.7) 2(7.7)	440(82.4) 188(80.3) 24(92.3)	0.306
Educational level	Secondary and below College Post graduated	34(29.8) 52(16.1) 56(15.6)	80(70.2) 270(83.9) 302(84.4)	0.002
Employment status	Governmental Self-employed Non -employed	96(17.8) 8(26.7) 38(17)	444(82.2) 22(73.3) 186(83)	0.430
Place of living	City center Others	98(16.3) 44(22.9)	504(83.7) 148(77.1)	0.037

Monthly income	< 500000 IQD*	38(18.6)	166(81.4)	0.002
	500000-1 million IQD*	54(24.8)	164(75.2)	
	> 1 million IQD*	50(13.4)	322(86.6)	
Body Mass Index categories	Under weight	2(14.3)	12(85.7)	<0.001
	Normal	48(20.7)	184(79.3)	
	Over weight	30(9.3)	292(90.7)	
	Obese	62(27.4)	164(72.6)	
Smoking habit	Smoker	12(15.4)	66(84.6)	0.544
	Non-smoker	130(18.2)	586(81.8)	
Activity for 30 minutes/day	Not active (≤ twice/week)	128(18.4)	566(81.6)	0.278
	Active (≥3 times/week)	14(14)	86(86)	
Eating healthy diet	Every day	76(17.1)	368(82.9)	0.525
	Not every day	66(18.9)	284(81.1)	
Perception of health status	Good and above	96(16.6)	484(83.4)	0.107
	Fair and below	46(21.5)	168(78.5)	
Perception of body weight	Under-weight	12(20)	48(80)	0.058
	Normal	52(16.5)	264(83.5)	
	Overweight	56(16.4)	286(83.6)	
	Obese	22(28.9)	54(71.1)	
Perception of lifestyle	Not stressful at all	30(26.8)	82(73.2)	0.001
	Relatively stressful	76(14.3)	454(85.7)	
	Stressful or very stressful	36(23.7)	116(76.3)	
Family history of CVDs**	No	84(20.7)	322(79.3)	0.041
	Yes	58(14.9)	330(85.1)	
Chronic disease	Yes	38(21.1)	142(78.9)	0.199
	No	104(16.9)	510(83.1)	
Hypertension	No	110(16.3)	564(83.7)	0.006
	Yes	32(26.7)	88(73.3)	
Diabetes Mellitus	No	124(16.9)	608(83.1)	0.017
	Yes	18(29)	44(71)	
Dyslipidemia	No	134(18.1)	606(81.9)	0.542
	Yes	8(14.8)	46(85.2)	

*Iraqi dinars   **Cardiovascular diseases

DISCUSSIONS

This is the first known study conducted in Iraq demonstrating the level of awareness regarding types, symptoms, and risk factors of CVDs among the general population. According to the current findings, more than two-thirds of participants knew that coronary heart and congenital heart diseases are types of CVDs, meanwhile more than half of respondents did not know other types of CVDs. However, these results were higher than reported by earlier studies (Awad & Al-Nafisi, 2014; Mujamammi et al, 2020).

Concerning symptoms of heart attack, more than three-quarters of them recognized that chest pain and shortness of breath are warning symptoms of heart attack, whereas other symptoms like pain in the jaw, neck, or back were recognized by 37% of them. Similar to current results, a study conducted in Saudi Arabia showed that the majority of the study sample indicated chest pain or discomfort, and shortness of breath as the most prominent

symptom, while other symptoms like pain in the jaw or neck were recognized by only 44.8% of them (Alghamdi A et al., 2021). Current results were higher than found by other studies conducted in Kuwait, and Saudi Arabia (Albugami S et al., 2020; Awad & Al-Nafisi, 2014). Considering symptoms of stroke, more than two-thirds of respondents distinguished sudden confusion, dizziness, and numbness, whereas nearly half of them distinguished severe headache of unknown cause as a warning symptom of stroke. These results were higher in comparison with other studies from Kuwait, and Saudi Arabia (Awad & Al-Nafisi, 2014; Mujamammi et al, 2020). Awareness about signs and symptoms of CVDs is important for early diagnosis, and intervention. Although of inadequate knowledge of the study sample about types, and symptoms of CVDs, they were much better knowledgeable about risk factors, it's found that over three-quarters of them identified eight factors. Current findings are consistent with the results of a previous study conducted in Kuwait (Awad & Al-Nafisi, 2014) in which participants were familiar with risk factors of CVDs more than their types and symptoms. Whereas other studies conducted in Saudi Arabia, Middle Eastern, and developing African and countries reported a lack of knowledge of CVDs risk factors (Mujamammi et al, 2020; Boateng D et al., 2017; Fahs I et al., 2017). There was a knowledge deficit of diabetes among 44.6% of our respondents as a risk factor of CVD, this might explain the high prevalence of poor diabetic control. This result was less than reported by other studies from Saudi Arabia, and Iran (Albugami S et al., 2020; Koohi F& Khalili D, 2020), but it was higher than reported by the Kuwaiti study (Awad & Al-Nafisi, 2014).

In this study, the mean (standard deviation) of the overall knowledge related to CVDs for all participants was 16.76(5.32) out of the possible 25. More than three-quarters of participants had adequate overall knowledge, 33.2%, 48.9% of them had good, and moderate knowledge, respectively. In contrast, other studies conducted in different countries reported a low level of knowledge among their population (Albugami S et al., 2020; Aminde, L.N et al., 2017; Awad & Al-Nafisi, 2014; Jafary FH et al., 2005; Mujamammi et al., 2020). However, other studies found a highly satisfying knowledge among most of the respondents (Amadi C et al., 2019; Ibrahim M et al., 2016; Koohi F& Khalili D, 2020). These inconsistencies in results could be attributed to the difference in sampling method, population characteristics, and the study tools. A review study demonstrated that knowledge of CVDs and their risk factors to be significantly related to the type of studied population, residency, and the level of contact with health information about CVDs (Boateng D et al., 2017). According to current findings, gender, educational level, residence, monthly income, BMI, family history of CVDs, perception of lifestyle, and having diabetes or hypertension were found to be significantly associated with overall knowledge related to CVDs. Based on current results, adequate knowledge was found significantly higher among females than males (P=0.014), which is consistent with previous studies (Awad & Al-Nafisi, 2014; Güneş F et al., 2019). Whereas, other researchers reported males to have higher knowledge about CVDs than females (Albugami S et al., 2020; Mujamammi et al, 2020). However, this is in contrast to other studies, which showed non-significant differences among males and females regarding their knowledge about CVDs (Amadi C et al., 2019; Aminde, L.N et al., 2017; Fahs I et al., 2017; Ibrahim M et al., 2016; Koohi F& Khalili D, 2020). The present result could be due to characteristics of the studied population as 70.5% of them were females, therefore comparing the level of knowledge according to gender cannot ideally be established.

Similar to the current results, several studies revealed that good knowledge related to CVDs was significantly associated with high levels of educational attainment (Amadi C et al., 2019; Awad & Al-Nafisi, 2014; Boateng D et al., 2017; Fahs I et al., 2017; Koohi F& Khalili D, 2020; Mujamammi et al, 2020), and positive family history of CVDs (Amadi C et al., 2019; Awad & Al-Nafisi, 2014; Mujamammi et al, 2020), and this might be explained by the fact that further education and having a family history of CVDs lead to additional exposure to information about health and diseases. Based on the current results, place of living is a significant factor in predicting knowledge about CVDs. A systematic review in sub-Saharan Africa concluded that rural residency is a predicting factor of poor knowledge about CVDs (Boateng D et al., 2017), this finding could be due to urban residents were more educated, having higher income levels, easier healthcare access, and better teaching facilities (Fahs I et al., 2017).

Based on our findings, having diabetes mellitus or hypertension was significantly associated with lower score overall knowledge about CVDs, this is an alarming finding as diabetic and hypertensive peoples are more liable to developed CVDs, therefore education campaigns should be specifically focused on those risky groups. Age

is one of the important factors in predicting the knowledge about CVDs as reported by earlier studies (Amadi C et al., 2019; Awad & Al-Nafisi, 2014; Boateng D et al., 2017; Koohi F& Khalili D, 2020; Mujamammi et al, 2020). In contrast, the current result demonstrated no significant association between age and awareness about CVDs (P>0.05), the same result was found by Amadi et al (2019). This finding could be explained by the wide age range of this study (18-68) years so that the relationship between knowledge score and age was studied exclusively.

CONCLUSION AND RECOMMENDATION

This study concluded that the overall knowledge about CVDs was adequate among our participants. Participants showed a good awareness about risk factors, although inadequate awareness about types and warning symptoms of CVDs. The knowledge score was related to gender, educational level, residence, monthly income, BMI, family history of CVDs, perception of lifestyle, and personal history of diabetes or hypertension. Further studies were recommended to include people from different educational attainment and socioeconomic classes to confirm the level of public awareness. More educational interventions about CVDs are essential, especially for risky individuals. Concentrated on the different types of CVDs and related symptoms especially for males, low educational levels, living away from city centers, those perceived living non-stressful life, and those having diabetes and/or hypertension.

LIMITATIONS

This study has some limitations. First, the sampling method is convenient, and the voluntary response was dependent in this study so that people with little information might avoid participation. Additionally, the questionnaire form was distributed through social media, therefore; poor, and illiterate people were missed from this survey. This limits the generalization of the findings. Second, there is a possibility of recall biases as some of the introduced questions depended on self-reporting answers. Third, the cause-and-effect relationship cannot be inferred as the study is cross-sectional in design. Despite these limitations, this is the first study conducted in Iraq to estimate the level of knowledge about CVDs among the public, it included a relatively large sample from a wide range of age, residence, and economic groups.

REFERENCES

Abdo, N., Mortada,E., El Seifi, O. Effect of Knowledge About Cardiovascular Diseases on Healthy Lifestyle Behavior Among Freshmen of Zagazig University: An Intervention Study. *The Open Public Health Journal*, *12*, 300-308. https://doi.org/10.2174/1874944501912010300

Albugami, S., Al-Husayni, F., Bakhsh, L., Alhameed, F., Alsulami, A., Abumelha, K., Balubaid, M., Al-Harbi, M., Mufti, H.N.. (2020). Correction: the perception of coronary artery disease and cardiac catheterization in Saudi Arabia: "What the public know". *Cureus, 12*(1), c27. https://doi.org/ 10.7759/cureus.c27

Alghamdi, A., Alzahrani, M., Alsolami, B., Thabet, S., Alghamdi, B., Kinsara, A. (2021). A Community-Based, Cross-Sectional Study Assessing the Level of Awareness and Insight Related to Cardiovascular Diseases. *Cureus, 13*(6), e15681. https://doi.org/10.7759/cureus.15681

Amadi, C., Lawal, F., Mbakwem, A., Ajuluchukwu, J., Oke, D. (2019). Correction to: Knowledge of cardiovascular disease risk factors and practice of primary prevention of cardiovascular disease by Community Pharmacists in Nigeria: a cross-sectional study. *International Journal of Clinical Pharmacy*, *42*(1), 293-293. https://doi.org/10.1007/s11096-018-0744-3

American Heart Association (AHC). (May 31, 2017). What is cardiovascular disease?. https://www.heart.org/en/health-topics/consumer-healthcare/what-is-cardiovascular-disease

Aminde, L.N., Takah, N., Ngwasiri, C. Noubiap, J., Tindong, M., Dzudie, A., & Veerman, J. L. (2017). Population awareness of cardiovascular disease and its risk factors in Buea, Cameroon. *BMC Public Health*, *17*, 545. https://doi.org/10.1186/s12889-017-4477-3

Awad, A., and Al-Nafisi, H. (2014). Public knowledge of cardiovascular disease and its risk factors in Kuwait: a cross-sectional survey. *BMC Public Health*, *14*, 1131. https://doi.org/10.1186/1471-2458-14-1131

Boateng, D., Wekesah, F., Browne, J., Agyemang, C., Agyei-Baffour, P., Aikins, A.,Smit, H., Grobbee, D., Klipstein-Grobusch, K. (2017). Knowledge and awareness of and perception towards cardiovascular disease risk in sub-Saharan Africa: A systematic review. *PLOS ONE*, *12*(12), e0189264. https://doi.org/10.1371/journal.pone.0189264

Center for Disease Control and Prevention (CDC). (2014). Division of Nutrition, Physical Activity, and Obesity. Growth Chart Training; Calculating BMI Using the Metric System. https://www.cdc.gov/nccdphp/dnpao/growthcharts/training/bmiage/page5_1.html

Center for Disease Control and Prevention (CDC). (2021). Overweight & Obesity. Adult Overweight & Obesity. Adult Body Mass Index. https://www.cdc.gov/obesity/adult/defining.html

Cleveland Clinic. (03/16/2021). Cardiovascular Disease. (03/16/2021). Available from: https://my.clevelandclinic.org/health/diseases/21493-cardiovascular-disease

Fahs, I., Khalife, Z., Malaeb, D., Iskandarani, M., Salameh, P. (2017). The prevalence and awareness of cardiovascular diseases risk factors among the Lebanese population: a prospective study comparing urban to rural populations. *Cardiol Res Pract*., *2017*, 3530902. https://doi.org/10.1155/2017/3530902

Ganassin, G. S., Silva, E. M., Pimenta, A. M., & Marcon, S. S. (2016). Efficacy of an educative intervention on knowledge related to cardiovascular diseases among men. *Acta Paul Enferm*., *29*(1), 38-46. http://dx.doi.org/10.1590/1982- 0194201600006

GBD 2015 Eastern Mediterranean Region Cardiovascular Disease Collaborators. (2018). Burden of cardiovascular diseases in the Eastern Mediterranean Region, 1990–2015: findings from the Global Burden of Disease 2015 study. *Int J Public Health*, *63*, 137–149. https://doi.org/10.1007/s00038-017-1012-3

Güneş, F., Bekiroglu, N., Imeryuz, N., Agirbasli, M. (2019). Awareness of cardiovascular risk factors among university students in Turkey. *Primary Health Care Research & Development*, *20*, e 127. https://doi.org/10.1017/S146342361900063X

Ibrahim, M., Rahman, N., Haque, M. (2016). Knowledge, Attitude and Practice of Malaysian Public University Students on Risk Factors for Cardiovascular Diseases. *J Appl Pharm Sci*., *6*(02), 56–63. https://doi.org/10.7324/japs.2016.60208.

Jafary, F. H., Aslam, F., Mahmud, H., Waheed, A., Shakir, M., Afzal, A., Qayyum, M. A., Akram, J., Khan, I. S., & Haque, I. U. (2005). Cardiovascular health knowledge and behavior in patient attendants at four tertiary care hospitals in Pakistan--a cause for concern. *BMC public health*, *5*, 124. https://doi.org/10.1186/1471-2458-5-124

Koohi, F., & Khalili, D. (2020). Knowledge, Attitude, and Practice Regarding Cardiovascular Diseases in Adults Attending Health Care Centers in Tehran, Iran, *Int J Endocrinol Metab*., *18*(3), e101612. https://doi.org/10.5812/ijem.101612

McKinley, S., Dracup, K., Moser, D. K., Ball, C., Yamasaki, K., Kim, C. J., & Barnett, M. (2004). International comparison of factors associated with delay in presentation for AMI treatment. *European journal of cardiovascular nursing: journal of the Working Group on Cardiovascular Nursing of the European Society of Cardiology*, *3*(3), 225–230. https://doi.org/10.1016/j.ejcnurse.2004.06.004

Mujamammi, A. H., Alluhaymid, Y. M., Alshibani, M. G., Alotaibi, F. Y., Alzahrani, K. M., Alotaibi, A. B., Almasabi, A. A., & Sabi, E. M. (2020). Awareness of cardiovascular disease associated risk factors among Saudis in Riyadh City. *Journal of family medicine and primary care*, *9*(6), 3100–3105. https://doi.org/10.4103/jfmpc.jfmpc_458_20

Muntner, P., Woodward, M., Mann, D. M., Shimbo, D., Michos, E. D., Blumenthal, R. S., Carson, A. P., Chen, H., & Arnett, D. K. (2010). Comparison of the Framingham Heart Study hypertension model with blood pressure alone in the prediction of risk of hypertension: the Multi-Ethnic Study of Atherosclerosis. *Hypertension*, *55*(6), 1339–1345. https://doi.org/10.1161/HYPERTENSIONAHA.109.149609

National Health Services (NHS). (17 September 2018). Cardiovascular disease. https://www.nhs.uk/conditions/cardiovascular-disease/

Pourhoseingholi, M.A., Vahedi, M., Rahimzadeh, M. (2013). Sample size calculation in medical studies. *Gastroenterol Hepatol Bed Bench*, *6*(1), 14-17. https://pubmed.ncbi.nlm.nih.gov/24834239/

Vaidya, A., Aryal, U. R., & Krettek, A. (2013). Cardiovascular health knowledge, attitude and practice/behaviour in an urbanising community of Nepal: a population-based cross-sectional study from Jhaukhel-Duwakot

Health Demographic Surveillance Site. *BMJ open*, *3*(10), e002976. https://doi.org/10.1136/bmjopen-2013-002976

World Health Organization (WHO). (2007). Prevention of cardiovascular disease. Guidelines for assessment and management of cardiovascular risk. https://www.who.int/cardiovascular_diseases/guidelines/Full%20text.pdf

World Health Organization (WHO). (2021a). Cardiovascular diseases (CVDs). https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)

World Health Organization (WHO). (2021b) Iraq | Priority areas | Noncommunicable diseases. http://www.emro.who.int/iraq/priority-areas/noncommunicable-diseases.html

World Health Rankings. (2021). Live Longer Live Better. Iraq Health Profile. https://www.worldlifeexpectancy.com/iraq-coronary-heart-disease