Awareness and management of modifiable risk factors for cardiovascular disease among Iraqis aged 30-60 years

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ABSTRACT

INTRODUCTION: Cardiovascular disease is a major cause of disability and premature death worldwide, it is one of the most preventable causes of death in the world, due to the fact that the majority of its risk factors are preventable or controllable.

OBJECTIVE: To assess the awareness and management of 8 modifiable risk factors for cardiovascular disease among Iraqis aged 30-60 years, and to determine the barriers why some people refrain from doing periodic blood tests for glucose and lipid profile.

METHODS: A Cross- sectional study was conducted in 6 Primary Health Care Centers in Baghdad from April 2019 to the end July of 2019. Data collection was carried out through direct interview with the participants according to a structured questionnaire.

RESULTS: The study revealed that 58.2% of participants had good awareness level, diabetes is the most risk factor that the participants managed, while smoking is the least one. Only 18.6% of participant perform periodic blood tests, and the most common reasons why participants refrain from performing periodic blood tests are because they are busy or considered it unimportant. Higher level of education, governmental occupation, 30-39 years age group, being single and female gender have a statistically significant association with higher level of awareness.

CONCLUSION: More than half of the participants have a good awareness level for risk factors of cardiovascular disease.

Key words: cardiovascular disease, risk factors, awareness, management.

INTRODUCTION

Cardiovascular diseases (CVD) are considered a substantial social and health problem, and their impacts are rising rapidly due to urbanisation and machine-dependent lifestyles. The prevalence of these diseases will increase in the next years.[1]

Middle East is endemic with the risk factors of CVD like hypertension, diabetes mellitus, obesity, and smoking, proposing that CVD will be the main health problem.[2] In the Middle East, CVD is expected to be tripled within two decades and it affects younger age compared with patients in other regions of the world.[3,4]

Cardiovascular disease is one of the most preventable causes of death worldwide because most of its risk factors are preventable or controllable, such as diabetes mellitus, hypertension, dyslipidaemia, smoking, overweight/obesity, lack of physical activity, and unhealthy diet.[5]

Public awareness and understanding of the risk factors for cardiovascular disease are essential for successful primordial and primary prevention.[6] Effective prevention and management of CVD need regular screening for risk factors, high awareness of the condition, effective management of the identified risk factors, and adherence to the prescribed drugs.[7] Raising awareness of the community and early work to detect the risk factors for CVD and

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intervene to modify them will control CVD in the future.[8] Modification of the risk factors has unequivocally reduced mortality and morbidity, especially in people with either unrecognized or recognized cardiovascular disease.[9]

In Iraq, cardiovascular disease are estimated to be responsible for 27 % of all deaths. STEP survey in 2015 among Iraqi adults aged more than 18 years found that diabetes/hyperglycemia was prevalent in 13.9%, hypercholesterolemia in 37.8%, hypertriglyceridemia in 33.6%, current smokers in 20.7%, hypertension/raised blood pressure in 35.6% , and obesity in 33.5%.[10] Most of these risk factors are increasing in prevalence due to the change in the life style of Iraqi people, leading to more CVD in the community.

Measuring awareness of Iraqi people are very essential to design campaign programs to overcome this looming threat. Many studies have measured the knowledge and awareness about the CV risk factors in different society sectors in Iraq; however, studies addressing the response of the persons to change the risk factors by drugs or life styles modification are scarce.

The objectives of this study was to assess the awareness among visitors of healthcare centres in Baghdad about eight modifiable risk factors of cardiovascular disease; diabetes mellitus, dyslipidemia, hypertension, tobacco use, obesity, unhealthy diet, sedentary lifestyle, and alcohol consumption and to identify the determinants of the level of awareness. Also to measure the participants' practice for treating these risk factors by drugs or life style modifications and the barriers prevent them from doing periodic blood testing for sugar and lipid profile.

METHODS

Setting and study design: A cross-sectional study was conducted in Baghdad from April to the end of July 2019. The authors selected six primary health care centres randomly to choose the participants; three from the Al-Karkh district and three from Al-Rusafa.

Ethical considerations: The Arab Board of Health Specializations in Iraq has approved the protocol of this study, and it was implemented according to the code of ethics in research of the Ministry of Health. All study participants signed consent after being informed of the aim and nature of the study. Data of all participants were kept confidential and only used for this study.

Inclusion and exclusion criteria: Attendees, of both genders, of the primary healthcare centres at the time of the authors' visit, aged 30-60 years, were included in this study. The selection of this age group was based on the fact that they are the main victims of premature mortality and morbidity of CVD.[11] Patients with CVD like angina pectoris, myocardial infarction, heart failure, and stroke, are also included because they are the targets for secondary prevention of the CVD. Those who refused to participate or were health professionals like physicians, dentists, pharmacists, and nurses were excluded from the study.

Sample size: The following simple formula is used for calculating the adequate sample size in cross sectional studies/surveys: [12]

$$N=(Z^2 \times pq)/d^2$$

N: sample size, **Z**: statistic corresponding to level of confidence, **p**: expected prevalence, **q**: 1– P, d: degree of precision (type one error). When: **Z** = 1.96 (corresponding to 95% confidence interval), **P** = 0.50, **q** = 1-p = 0.50, and **d** = 0.05. Then the sample size will be **N** = 384. Since the confidence of the result is likely to increase with a higher sample size,[13] We increased our sample size to 500.

Sampling: A multi-stage random sampling method was used in Baghdad. The Tigris River splits Baghdad into two sides, the eastern side, Al-Rusafa, and the Western side, Al-Karkh. A health directorate runs the primary health issues on each side through ten primary healthcare sectors. We randomly selected three sectors from each directorate and one primary healthcare centre from each primary healthcare sector. The total sample size was distributed equally among these six primary healthcare centres. The researcher visited these centres

and conveniently selected the participants who fulfilled the inclusion criteria.

The questionnaire and data collection: When the attendee agreed to participate, the researcher collected the data through a face-to-face interview with him. The researchers designed the questionnaire form after reviewing published literature, and ten community medicine experts reviewed the form to assess its validity. A preliminary pilot study was conducted by choosing a sample of 40 persons from one primary health care centre before the start of this study to determine any difficulty in understanding the questionnaire and to estimate the time required for the respondents to answer the questionnaire. The results of the pilot study have not been included in the final analysis of this study.

The questionnaire form included two parts; *the first* was for collecting the sociodemographic characteristics (age, gender, level of education, marital status, and occupation), past medical history, and family history of CVD. *The second* included questions about periodic blood tests for sugar and lipid profile and questions related to the awareness and management of 8 modifiable risk factors for CVD. These risk factors were diabetes mellitus, hypertension, dyslipidemia, tobacco use, obesity, unhealthy diet, sedentary lifestyle, and alcohol consumption. We asked the participants four questions about each eight risk factors; **(1)** Do you think this factor is a risk for CVD? **(2)** Have you measured or checked this factor previously? **(3)** Have you ever been told by a healthcare professional that you have this risk factor? **(4)** If you have this risk factor, have you managed it?

Outcomes and procedure: The participants' awareness are classified into three levels: poor, fair, and good, according to the number of risk factors correctly recognised for CVD. Participants who correctly recognised 0-3 risk factors are classified as having poor awareness, participants who correctly recognised 4-5 risk factors are classified as having fair awareness, and participants who correctly recognised 6-8 risk factors are classified as having good awareness.

Then we tested any association between the

Table 1 | Distribution of participants according to sociodemographic characteristics

Characteristics		n = 500	%
Gender	Male	231	46.2
	Female	269	53.8
Age group in years	30 – 39	193	38.6
	40 – 49	148	29.6
	50 – 60	159	31.8
Level of education	Illiterate	41	8.2
	Primary	232	46.4
	Secondary	128	25.6
	Higher	99	19.8
Marital status	Married	407	81.4
	Single	31	6.2
	Divorced	18	3.6
	Widow	44	8.8
Occupation	Governmental	140	28
	Private	151	30.2
	Retired	17	3.4
	Housewife	165	33
	Unemployed	27	5.4

level of awareness and demographic features of the sample.

Statistical analysis: We used (SPSS) version 23 for data entry and statistical analysis. Descriptive data analysis in the form of frequency tables and graphs was used. The Chi-square test was used to test the association between sociodemographic characteristics and the level of awareness. A level of P-value ≤ 0.05 is considered statistically significant.

RESULTS

We asked 612 attendees to participate in this study, and 500 agreed. **Table 1** summarises the sociodemographic characteristics of participants. The results also showed that 4.6% of participants had a past medical history of CVD, and 31.2% had a family history of CVD among first-degree relatives.

Regarding periodic blood tests for sugar and lipid profiles, only 93(18.6%) of participants perform periodic blood tests, and 41 (44.1%) do so every seven months to 1 year. For more details, see **figure 1 and 2**. Of all participants, 407 (81.4%) do not perform periodic blood
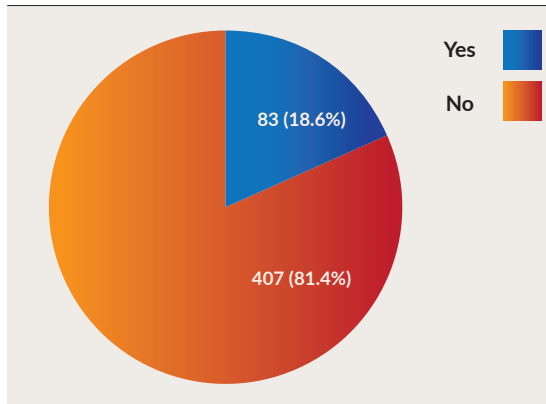
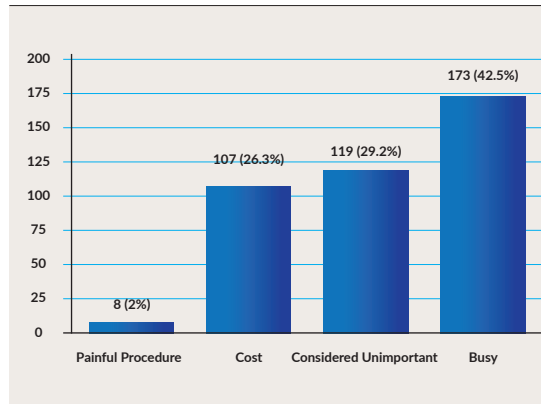**Figure 1** | Distribution of participants according to periodic blood tests performance.

Figure 3 | Reasons for not performing periodic blood tests for sugar and lipids by the participants
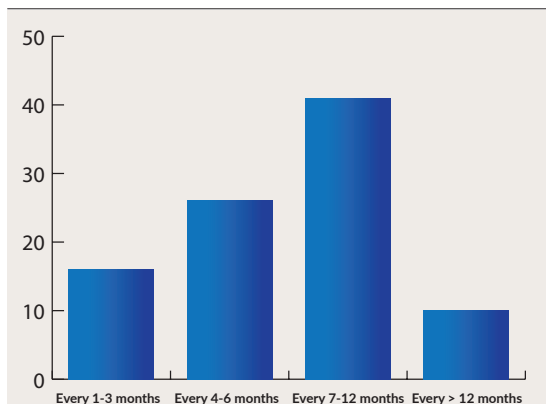

Figure 2 | Participants who perform periodic blood tests according to the time interval for performing these tests.

tests. Being busy was their commonest cause preventing them from doing the tests, 173 (42.5%). For more details, see **figure 3**.

Table 2 shows the Distribution of participants according to the awareness and management of 8 modifiable risk factors for CVD. Hypertension is the most risk factor of CVD the participants are aware of (93.4%), while the

sedentary lifestyle is the least (59.6%). Diabetes is the most risk factor the participants managed (88.5%) while smoking is the least (9.4 %).

The study revealed that 291 (58.2%) of participants had a good awareness of the risk factors of CVD, 141 (28.2%) had fair awareness, and 68 (13.6%) had a poor awareness level, **figure 4**.

Young adults aged 30-39 years, female gender, higher level of education, being single, and having a government job are the sociodemographic features that have a statistically significant association with the high level of awareness about the risk factors of CVD, see **table 3**.

Past medical history and family history of cardiovascular disease have a statistically significant association with a high level of awareness; participants with a past medical history of CVD are more aware than healthy participants, and Participants with a positive family history of CVD are more aware than those without, **table 4**.

Table 2 | Distribution of participants according to the awareness and management of 8 modifiable risk factors for cardiovascular disease

| Risk factors	Aware it as a risk factor for CVD (%)	Measured or checked this factor regularly (%)	Have this risk factor (%)	Have this risk factor and manage it (%)
Diabetes	444 (88.8)	398 (79.6)	61 (15.3)	54 (88.5)
Dyslipidaemia	380 (76)	137 (27.4)	47 (34.3)	37 (78.7)
Hypertension	467 (93.4)	487 (97.4)	115 (23.6)	80 (69.6)
Obesity	327 (65.4)	245 (49)	142 (58)	58 (40.8)
Tobacco use	393 (78.6)		106 (21.2)	10 (9.4)
Unhealthy Diet	340 (68)		276 (55.2)	85 (37.1)
Sedentary lifestyle	298 (59.6)		315 (63)	92 (38.3)
Alcohol consumption	408 (81.6)		7 (1.4)	2 (33.3)
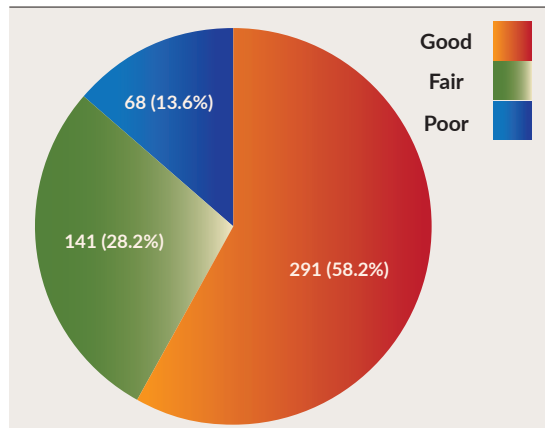
Figure 4 | The level of the participants' awareness about the risk factors for cardiovascular disease.

DISCUSSION

Increased use of the internet, especially in younger age groups, and acquaint of people with topics related to health awareness of risk factors for cardiovascular diseases has contributed to raising awareness. Also, awareness of risk factors for cardiovascular diseases and their management has increased in recent years due to advertisements made by private laboratories that encourage people to perform comprehensive laboratory tests at affordable prices.

Diabetes: the present study showed that 88.8% of the participants correctly identified diabetes as a risk factor for CVD. Two studies have reported a high level of awareness about DM as a risk factor for CVD. In India, Mariya et al.[14] in their study on hospitalised patients with cardiovascular diseases, reported that 93.3% of the participants were aware. In the same line but to a lesser extent, a study from Saudi Arabia[15] showed that 60 % of the participants who were university students, primary healthcare visitors and social media users were aware of DM as a risk factor for CVD. On the contrary, a study in Iran showed that only 20% were aware that diabetes is a risk factor for CVD.[16] This difference might be due to the difference in the targeted population; in the Iranian study, the participants were women ages 15-49 years. Regarding the management of diabetes, our study showed that 88.5% of participants with a prior diagnosis of DM manage their risk factors by taking medications or modifying their lifestyle. This finding was close to the result of Mohtasham-Amiri et al., which showed that 79.7% of participants with a prior diagnosis of diabetes manage their disease.[17]

Table 3 | Relationship of level of awareness with sociodemographic characteristics of participants

Characteristics		Awareness			Total	x^2	P-value
		Poor (%)	Fair (%)	Good (%)			
Gender	Male	39 (16.9)	70 (30.3)	122 (52.8)	231	6.2	0.045
	Female	29 (10.8)	71 (26.4)	169 (62.8)	269		
Age group	30-39 year	11 (5.7)	46 (23.8)	136 (70.5)	193	42.6	< 0.001
	40-49 year	21 (14.2)	34 (23)	93 (62.8)	148		
	50-60 year	36 (22.6)	61 (38.4)	62 (39)	159		
Level of education	Illiterate	25 (61)	15 (36.6)	1 (2.4)	41	214.5	< 0.001
	Primary	41 (17.7)	101 (43.5)	90 (38.8)	232		
	Secondary	2 (1.6)	17 (13.3)	109 (85.2)	128		
	Higher	0 (0)	8 (8.1)	91 (91.9)	99		
Marital status	Married	49 (12)	119 (29.2)	239 (58.7)	407	15	0.02
	Single	2 (6.4)	7 (22.6)	22 (71)	31		
	Divorced	4 (22.2)	3 (16.7)	11 (61.1)	18		
	Widow	13 (29.5)	12 (27.3)	19 (43.2)	44		
Occupation	Governmental	2 (1.4)	13 (9.3)	125 (89.3)	140	99.6	< 0.001
	Private	33 (21.9)	62 (41.1)	56 (37.1)	151		
	Retired	0 (0)	4 (23.5)	13 (76.5)	17		
	Housewife	25 (15.2)	58 (35.2)	82 (49.7)	165		
	Unemployed	8 (29.6)	4 (14.8)	15 (55.6)	27		

Table 4 | Relationship of level of awareness with participants' past medical history and family history of cardiovascular disease.

Characteristics		Awareness			Total	x^2	P-value
		Poor (%)	Fair (%)	Good (%)			
Past medical history of cardiovascular disease	Positive	0 (0)	0 (0)	23 (100)	23	17.3	< 0.001
	Negative	68 (14.2)	141 (29.6)	268 (56.2)	477		
Family history of cardiovascular disease	Positive	5 (3.2)	11 (7.1)	140 (89.7)	156	92.7	< 0.001
	Negative	63 (18.3)	130 (37.8)	151 (43.9)	344		

Dyslipidemia: Our finding showed that 76% of the participants correctly identified dyslipidemia as a risk factor for CVD, consistent with studies from Kuwait and Lebanon.[5, 18] Regarding the management of dyslipidemia, the current study showed that 78.7% of participants with a prior diagnosis of dyslipidemia manage it by taking medications; a finding agreed with that of Supiyev in his study in Kazakhstan [19] but disagreed with Luo et al. from China. [20] The difference in results may be due to the different age groups of the participants of these studies.

Hypertension: we found that 93.4% of the participants correctly identified hypertension as a risk factor for CVD; a similar result was reported by many studies.[18, 21, 22] However, a study done in Pakistan found that only 55% of the participants were aware that hypertension is a risk factor for CVD.[23] The reason for such discrepancy may reside in the differences in the source of information. Also, we found that 97.4 % of the participants checked their blood pressure previously. Similarly, a Canadian study reported that 98% of the participants checked their blood pressure previously.[24] In our sample, 69.6 % of those already diagnosed with hypertension were using medications to control it. A study from Tunisia[25] has reported that 84.8 % of the participants were using drugs to treat their blood pressure. While a study from Palestine showed that only 40.2 % of the participants already diagnosed with hypertension were using antihypertensive drugs.[26]

Tobacco use: The current study showed that 78.6% of the participants correctly identified smoking as a risk factor for CVD, consistent with studies from Jordan, Saudi Arabia and the United States.[15,27,28] However, studies done in Venezuela and South Africa reported a much lower awareness level.[29, 30] High awareness about the bad effects of smoking on CVD was not reflected in behaviour; our study has shown that only 9.4 % of smoker participants quit smoking after being advised by a healthcare provider. A close result was also reported from Saudi Arabia.[15]

Obesity: Our findings showed that 65.4% of the participants correctly identified obesity as a risk factor for CVD, consistent with that of studies from Jordan, Cameroon and Bangladesh.[27,31,32] However, it is relatively lower compared to a study from Saudi Arabia where 94% of participants were aware that obesity is a risk factor for CVD,[33] And it is much higher than that reported from Pakistan and Nigeria. [34,35] In addition the difference in the sample size and the sampling methods used by different studies, the controversial results might be due to the different educational background of different communities in the health aspect.

Unhealthy diet: The present study revealed that 68% of the participants correctly identified an unhealthy diet as a risk factor for CVD, in accordance with studies conducted in India and Uganda.[36,37] However, our finding is relatively lower than that of studies from the United Arab Emirates and Germany, where about 75% of participants knew that unhealthy diet is a risk factor for CVD.[38, 39] In contrast, A South African study has found a poorer awareness level of unhealthy diet as a risk factor for CVD.[30] The difference in results may be due to different sociodemographic characteristics of the participants in these studies.

Sedentary lifestyle: Our study revealed that 59.6% of the participants correctly identified sedentary lifestyles as a risk factor for CVD. This finding was close to the 57 % reported by a study in the United States.[28] An Omani study reported awareness of a sedentary lifestyle as

a risk factor for CVD as high as 91.2%.[40] on the contrary, a study from Morocco showed that only 17.9% of the participants were aware that sedentary lifestyle is a risk factor for cerebrovascular diseases.[41] The method of data collection may influence the results obtained from these different studies.

Alcohol consumption: The current study showed that 81.6% of the participants correctly identified excessive alcohol consumption as a risk factor for CVD. Our results agree with that reported by studies from Lebanon and Kazakhstan,[18, 42] but a result as low as 34.3% was reported from Nigeria.[43] The difference in results may be due to different religions of the participants in these studies.

CONCLUSION

More than half of the participants have a good awareness of the risk factors of CVD. Hypertension is the most risk factor for CVD the participants are aware of, while sedentary lifestyle is the least. Diabetes is the most risk factor the participants managed, while smoking is the least.

Less than one-fifth of the participants perform periodic blood tests for sugar and lipids. The most common reasons why participants refrain from performing periodic blood tests are because they are busy or considered it unimportant.

Higher level of education, governmental occupation, 30-39 years age group, being single and female gender have a statistically significant association with a higher level of awareness.

REFERENCES

1. Salahshoori A, Nasirzadeh M, Haruni J, Pourhaji F, Salahshoori S, Nozarpoor J. The Knowledge, Attitude, and Practice (KAP) of Women Health Services Staff About Risk Factors of Cardiovascular Diseases (CVDs) in City of Fereydan and Chadegan, Iran. *Jundishapur J Chronic Dis Care*. 2015;4(1): e26599.

2. Motlagh B, O'Donnell M, Yusuf S. Prevalence of cardiovascular risk factors in the Middle East: a systematic review. *Eur J Cardiovasc Prev Rehabil*. 2009;16(3):268–80.

3. Khan S, Khoory A, Al Zaffin D, Al Suwaidi M. Exploratory study into the awareness of heart diseases among Emirati women (UAE) and their health seeking behaviour-a qualitative study. *BMC Womens Health*. 2016;16(1):71.

4. Almahmeed W, Arnaout MS, Chettaoui R, Ibrahim M, Kurdi MI, Taher MA, et al. Coronary artery disease in Africa and the Middle East. *Ther Clin Risk Manag*. 2012;8:65-72.

5. Awad A, Al-Nafisi H. Public knowledge of cardiovascular disease and its risk factors in Kuwait: a cross-sectional survey. *BMC Public Health*. 2014;14(1):1131.

6. Nash IS, Mosca L, Blumenthal RS, Davidson MH, Smith SC, Pasternak RC. Contemporary awareness and understanding of cholesterol as a risk factor: results of an American Heart Association national survey. *Arch Intern Med*. 2003;163(13):1597–600.

7. Silva H, Hernandez-Hernandez R, Vinueza R, Velasco M, Boissonnet CP, Escobedo J, et al. Cardiovascular Risk Awareness, Treatment, and Control in Urban Latin America. *Am J Ther* . 2010;17(2):159-66.

8. Baghaei A, Sarrafzadegan N, Rabiei K, Gharipour M, Tavasoli AA, Shirani S, et al. How effective are strategies for non-communicable disease prevention and control in a high risk population in a developing country? Isfahan Healthy Heart Programme. *Archives of Medical Science.* 2010;6(1):24-31.

9. De Backer G, Ambrosioni E, Borch-Johnsen K, Brotons C, Cifkova R, Dallongeville J, et al. European guidelines on cardiovascular disease prevention in 68 clinical practice: third joint task force of European and other societies on cardiovascular disease prevention in clinical practice (constituted by representatives of eight societies and by invit. *Eur Heart J*. 2003;24(17):1601–10.

10. Noncommunicable Diseases Risk Factors STEPS Survey Iraq 2015 [Internet]. Baghdad; 2015. Available from: http://www.who.int/chp/steps/Iraq_2015_STEPS_Report.pdf?ua =1. Accessed on 20 January 2020.

11. World Health Organization. Sixty-Sixth World Health Assembly 2013. Report by the Director-General. Available from: https://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_8-en.pdf. Accessed on 20 January 2020.

12. Charan J, Biswas T. How to calculate sample size for different study designs in medical research? *Indian J Psychol Med*. 2013;35(2):121.

13. Kalla S. Statistical significance and sample size. Retrieved from: Explor com https//explorable com/statistical-significance-sample-size2. Accessed 21st Aug 2019.

14. Mariya A, Siddiq A, Paul EM, Thomas J. Assessment of Knowledge and Awareness on Cardiovascular Risk Factors in a Teaching Hospital. *Int J Pharma Res Heal Sci*. 2016;4(3):1166–70.

15. Mujamammi AH, Alluhaymid YM, Alshibani MG, Alotaibi FY, Alzahrani KM, Alotaibi AB, et al. awareness of cardiovascular disease associated risk factors among Saudis in Riyadh City. *J Fam Med Prim Care*. 2020;9(6):3100.

16. Mazloomy SS, Baghianimoghadam MH, Ehrampoush MH, Baghianimoghadam B, Mazidi M, Mozayan MR. A study of the knowledge, attitudes, and practices (KAP) of the women referred to health centers for cardiovascular disease (CVDs)

and their risk factors. *Health Care Women Int*. 2014;35(1):50–9.

17. Mohtasham-Amiri Z, Barzigar A, Kolamroudi HR, Hoseini S, Rezvani SM, Shakib RJ, et al. Prevalence, awareness and control of diabetes in urban area of north of Iran, 2009. *Int J Diabetes Dev Ctries*. 2015;35(3):346–50.

18. Fahs I, Khalife Z, Malaeb D, Iskandarani M, Salameh P. 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;2017:Article ID 3530902. https://doi.org/10.1155/2017/3530902.

19. Supiyev A, Nurgozhin T, Zhumadilov Z, Peasey A, Hubacek JA, Bobak M. Prevalence, awareness, treatment and control of dyslipidemia in older persons in urban and rural population in the Astana region, Kazakhstan. *BMC Public Health*. 2017;17(1):651.

20. Luo J, Ma Y-T, Yu Z, Yang Y-N, Xie X, Ma X, et al. Prevalence, awareness, treatment and control of dyslipidemia among adults in northwestern China: the cardiovascular risk survey. *Lipids Health Dis*. 2014;13(1):4.

21. George C, Andhuvan G. A population-based study on Awareness of Cardiovascular Disease Risk Factors. *Indian J Pharm Pract*. 2014;7(2):23.

22. Khadka M. Knowledge Regarding Modifiable Risk Factors of Coronary Atherosclerosis Heart Diseases in Kathmandu Municipality. *Nepal Hear J*. 2012;9(1):37–42.

23. Hashmia SF, Jafarb MZ, Ayuba S, Zahrac T, Hussain M, Cheemaa MIT. Assessment of public awareness about risk factors for coronary heart disease among general population of a union council of a major city. *J Cardiovasc Dis* 2019;15(3):63-67.

24. Joffres MR, Ghadirian P, Fodor JG, Petrasovits A, Chockalingam A, Hamet P. Awareness, treatment, and control of hypertension in Canada. *Am J Hypertens*. 1997;10(10):1097–102.

25. Romdhane H Ben, Ali S Ben, Skhiri H, Traissac P, Bougatef S, Maire B, et al. Hypertension among Tunisian adults: results of the TAHINA project. *Hypertens Res*. 2012;35(3):341–7.

26. Khdour MR, Hallak HO, Shaeen M, Jarab AS, Al-Shahed QN. Prevalence, awareness, treatment and control of hypertension in the Palestinian population. *J Hum Hypertens*. 2013;27(10):623–8.

27. Mukattash TL, Shara M, Jarab AS, Al-Azzam SI, Almaaytah A, Al Hamarneh YN. Public knowledge and awareness of cardiovascular disease and its risk factors: a cross-sectional study of 1000 Jordanians. *Int J Pharm Pract*. 2012;20(6):367–76.

28. Wartak SA, Friderici J, Lotfi A, Verma A, Kleppel R, Naglieri-Prescod D, et al. Patients' knowledge of risk and protective factors for cardiovascular disease. *Am J Cardiol*. 2011;107(10):1480–8.

29. Querales M, Ruiz N, Rojas S, Espinoza M. The level of knowledge concerning cardiovascular risk factors in people living in Naguanagua, Venezuela. *Rev Salud Pública*. 2011;13(5):759–71.

30. Li YQ, Wright SCD. Risk factors for cardiovascular disease in the Ga-Rankuwa community. *Curationis*. 2007;30(4):79–87.

31. Aminde LN, Takah N, Ngwasiri C, Noubiap JJ, Tindong M, Dzudie A, et al. Population awareness of cardiovascular disease and its risk factors in Buea, Cameroon. *BMC Public* Health. 2017;17(1):545.

32. Rahman M, Akter S, Zohora FT, Shibly A. Public knowledge of cardiovascular disease and its risk factors in Tangail, Bangladesh: a cross-sectional survey. *Int J Community Med Public Heal*. 2019;6:1838.

33. Albadrani AM, Al-Ajlan SS, Alharbi ASE, Alharbi AS, Alharbi SMR. Public awareness of coronary artery disease risk factors in Qassim, Saudi Arabia: a cross-sectional study. *International Journal of Medicine in Developing Countries*. 2020;4(3):593–599.

34. Umbreen G, Jabeen C. A population based study on awareness of cardiovascular disease risk factors and preventive measures in a Rural Community. *Rawal Med J*. 2017;42(3):404–7.

35. Alabi AN, Onuoha FM, Alabi KM. Awareness of obesity as a cardiovascular risk factor among different occupational groups in a primary care clinic in Nigeria. *Niger J Fam Pract*. 2014;5:13–8.

36. Sathiyamoorthy S, Priya VV, Gayathri R. Awareness and risk factors of atherosclerosis among working professionals-A survey. *Drug Invent Today*. 2020;14(3): 462-466.

37. Ndejjo R, Nuwaha F, Bastiaens H, Wanyenze RK, Musinguzi G. Cardiovascular disease prevention knowledge and associated factors among adults in Mukono and Buikwe districts in Uganda. *BMC Public Health*. 2020;20(1):1–9.

38. Khan NS, Shehnaz SI, Guruswami GK, Ibrahim SAM, Mustafa SAJ. Knowledge of warning signs, presenting symptoms and risk factors of coronary heart disease among the population of Dubai and Northern Emirates in UAE: a cross-sectional study. *Nepal J Epidemiol*. 2017 Jun 30;7(2):670-680.

39. Kraywinkel K, Heidrich J, Heuschmann PU, Wagner M, Berger K. Stroke risk perception among participants of a stroke awareness campaign. *BMC Public Health*. 2007;7(1):39.

40. Ammouri AA, Tailakh A, Isac C, Kamanyire JK, Muliira J, Balachandran S. Knowledge of coronary heart disease risk factors among a community sample in Oman: Pilot study. *Sultan Qaboos Univ Med J*. 2016;16(2):e189.

41. Kharbach A, Obtel M, Achbani A, Bouchriti Y, Hassouni K, Lahlou L, et al. Level of Knowledge on Stroke and Associated Factors: A Cross-Sectional Study at Primary Health Care Centers in Morocco. *Ann Glob Heal*. 2020;86(1).

42. Kulkayeva G, Harun-Or-Rashid MD, Yoshida Y, Tulebayev K, Sakamoto J. Cardiovascular disease risk factors among rural Kazakh population. *Nagoya J Med Sci*. 2012;74(1–2):51.

43. Ofoegbu C, Okedo-Alex I, AL I, CC I. Awareness of Cardiovascular Diseases and Knowledge of Cardiovascular Risk Factors and Risk Reduction Measures among Urban and Rural Primary School Teachers in South-Eastern Nigeria. *J Heal Educ Res Dev*. 2018 Jan 1;06.