

CLINICAL RESEARCH

Knowledge of Cardiovascular Disease Risk Factors and Associated Factors among Diabetes Mellitus Patients in West Arsi, Oromia, Ethiopia, 2022

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ABSTRACT

INTRODUCTION

Patients with diabetes mellitus are at significant risk for a variety of cardiovascular diseases. Knowledge about the risk factors of diabetes plays an important role in reducing its morbidity and mortality. Little is known about the cardiovascular risk factors in Ethiopia. Therefore, this study was aimed at assessing knowledge of cardiovascular disease risk factors and associated factors among diabetes mellitus patients in West Arsi Zone Selected public Hospitals, South East Ethiopia.

METHODS

Hospital-based cross-sectional study was conducted from April 6, 2022 to May 8, 2022. A total of 423 patients were enrolled in the study, using simple random sampling. Statistical Packages for Social Sciences Version 25 was used to analyze data, using the logistic regression model. Bivariable logistic regression analysis was used to identify candidate variables for the final model, considering a p-value <0.25. An adjusted odds ratio with a 95% confidence interval with a corresponding p-value <0.05 was used to determine association of variables.

RESULT

Two hundred thirty-two (54.85%) of the participants had good knowledge about the cardiovascular disease risk factors. Marital status [AOR = 0.032, 95% CI: 0.003, 0.355], Level of education [AOR = 0.189, 95% CI: 0.042, 0.855], Occupation [AOR = 0.093, 95% CI: 0.018, 0.477], Duration of diabetes mellitus treatment [AOR = 0.083,

95% CI: 0.020, 0.348], Income status [AOR = 0.201, 95% CI: 0.065, 0.620], and having information [AOR = 4.503, 95% CI: 4.503, 19.804] were significantly associated with knowledge of cardiovascular disease risk factors.

CONCLUSION

Marital status, level of education, occupation, length of diabetes mellitus treatment, having information about cardiovascular disease risk factors, and income were found to be substantially linked with knowledge of cardiovascular disease risk factors. The findings advocate for more educational efforts to help diabetics prevent cardiovascular disease.

KEYWORDS

Knowledge; Cardiovascular disease; Risk factors; Diabetes mellitus

INTRODUCTION

Cardiovascular diseases (CVDs) are a group of disorders that involve the heart, blood vessels, or both. Because the majority of its risk factors are preventable or controlled, cardiovascular disease (CVD) is one of the most preventable causes of mortality in the world [1]. Over the past few decades, the rate of cardiovascular mortality has declined markedly in many developed countries, likely due to reductions in cardiovascular disease risk factors and improved management of CVD [2]. On the other hand, the incidence of CVD has been increasing in many developing countries, where 80% of the global deaths from CVD are estimated to occur [2].

Cardiovascular diseases are the main cause of morbidity and mortality in individuals with diabetes [3]. The primary cause of diabetes-related morbidity and mortality is now cardiovascular problems. Patients with Type 1 or Type 2 diabetes mellitus are at considerable risk for a number of cardiovascular problems [4]. Cardiovascular disease risk factors might be modifiable (that can be reduced or controlled with behavior change or modification) or non-modifiable (that cannot be changed) [5,6]. Non-modifiable cardiovascular disease risk factors include a person's age, ethnicity, family history, and sex [5,6]. High blood pressure, diabetes, high cholesterol, smoking, high blood glucose levels, excessive alcohol consumption, a poor diet, obesity, or inadequate physical activities are classified as modifiable cardiovascular disease risk factors [5,6]. Most of the CVD risk was attributable to lifestyle and behavioral patterns, and these behaviors can be modified given the right sensitization and education strategies [7].

Most patients with T2DM have at least one complication, and CVD is the leading cause of morbidity and mortality among these patients [8]. Type 2 diabetes was found to be highly linked to all types of CVD, including peripheral artery disease, ischemic stroke, stable angina, heart failure, and non-fatal myocardial infarction [9]. Despite that, undiagnosed diabetic patients also have an increased risk of developing macro vascular and micro vascular complications [10]. In 2000, the global number of people with diabetes was estimated to be 171 million (2.8 percent of the world's population), with that number expected to rise to 366 million (6.5 percent) by 2030, with 298 million of those living in developing countries [10]. As a result, this population is at a higher risk of developing diabetes-related cardiovascular complications [11].

The strong correlation between CVD and T2DM found in statistics from the American Heart Association [8]. Accordingly, at least 68.0% of diabetics aged 65 years and up died of heart disease, while 16.0% died from a

stroke. Furthermore, persons with diabetes are two to four times more likely than non-diabetic adults to die from cardiac disease. Patients with diabetes who also have other risk factors such as hypertension, dyslipidemia, obesity, lack of physical exercise, smoking, and poorly regulated blood sugar are at an even higher risk of heart disease than those who only have one risk factor. However, by managing their risk factors, diabetic patients may avoid or delay the development of heart and blood vessel diseases [4].

Understanding the risk factors that predispose to cardiovascular disease is a crucial step in changing lifestyle behaviors that promote good cardiovascular health [12]. Knowledge gaps in CVD and its risk factors are significant impediments to effective prevention and treatment. Yet, evidence on the awareness and knowledge level of CVD and associated risk factors among populations of Sub-Saharan Africa (SSA) is scarce [12]. Lack of CVD knowledge and concern may lead to a lack of motivation to change habits that are known to increase the risk of CVD in diabetes patients. Patients' perceptions of their CVD risk might have a big impact on their decision-making process when it comes to self-management. So, these patients with diabetes mellitus are potentially important targets for health promotion about cardiovascular risk factors [13]. To our knowledge, little is known about the knowledge of risk factors of CVDs among diabetes patients in Ethiopia. Therefore, this study was aimed at assessing the knowledge of cardiovascular disease risk factors and associated factors among diabetes mellitus patients in West Arsi, Oromia, Ethiopia, 2022.

METHOD AND MATERIALS

Study Design, Setting and Sampling

A cross-sectional study was conducted in Shashamane comprehensive specialized hospital, Melka oda general hospital and Dodola general hospital outpatient chronic clinics from April 6 - May 8, 2022. The chronic follow up unit provides regular outpatient care for patients with chronic conditions such as hypertension, heart failure, myocardial infarction and diabetes mellitus. The clinic specifically focuses on providing follow up services which include treatment of CVD and counselling of patients to achieve healthy lifestyle behaviors. During the study period, a total of 423 patients with CVD attended the care in the three participating hospitals. Patients with a confirmed diagnosis of hypertension, heart failure, or myocardial infarction, the age group above 18 years were eligible for participation in the study. Patients with congenital heart disorders, rheumatic heart disease, infectious heart disease and inflammatory heart disease were excluded. Mentally ill patients and those with a disability (hearing and talking impairment) which would hinder their ability to participate in the study were also excluded. The required sample size was determined using the single population proportion formula with the assumption of 95% confidence interval, 5% margin of error, and 50% (There was no information from previous study. Accordingly, taking 50% which is conservative) the proportion of diabetes mellitus patients who have good knowledge of CVD risk factors. The final calculated sample size was 423.

The study populations were proportionally allocated to each hospital based on the average number of patients who receive diabetic care services. The average number of patients visiting the Shashamane comprehensive specialized hospital per month is around 500 (Report of the hospital). Whereas, the average number of diabetic patients under follow up at Melka oda general hospital per month is around 360 (Report of the hospital), and average number of diabetic patients under follow up at Dodola general hospital is around 320 (Report of the

hospital). The total population is 1180. Finally, from each hospital, respondents were selected using simple random sampling method to attain the final sample size.

Data Collection Tools, Procedure and Quality Control

Data were collected using two validated tools, the Heart Disease Fact Questionnaires (HDFQ) and the World Health Organization (WHO) STEPs instrument adapted from previous studies with some modification [1]. The HDFQ showed good content and face validity, and demonstrated adequate internal consistency, with Kuder-Richardson 20 formula of 0.77 [14]. The WHO STEPs instrument follows a stepwise approach to chronic disease risk factor surveillance in individuals aged 18 years - 64 years [1,15]. The questionnaires' used a list of 25 CVD risk factors, and then the study participants select from the option by Yes, No and I don't know mark. Each correct answer rated as 1 point, while each wrong or I don't know answer rated as 0. The total knowledge score was calculated by summing the points for the correct answers and grading the score out of 25. The questionnaire also contains some questions to assess the socio demographic characteristic of the patients, duration of treatment for DM, information about CVD risk factors, family history of CVD, and Having CVD. The main outcome of the study was knowledge of cardiovascular risk factors among patients with cardiovascular disease. The English versions of the questionnaire were translated into local languages and were back translated into English by language experts to check reliability. An interviewer administered a standardized structured questionnaire was used to collect data. Two trained nurses who have bachelor qualifications conducted data collection through face-to-face interviews. The collected data were reviewed and crosschecked for completeness by the supervisors on a daily basis. The questionnaire was assessed for its understandability, sensitivity of the subject matter and cultural acceptability in the study area. Pre-test was done on a 5% of on randomly selected patients with diabetes mellitus who were on follow up at Negele Arsi Primary Hospital one week before the actual data collection. The necessary correction was made based on the pretest result to avoid any confusion and for better completion of the questions.

Ethical Considerations

Ethical approval was obtained from Research and Ethical Committee of Madda Walabu University, Goba Referral Hospital, School of Health Sciences, Department of Nursing before the data collection commenced. Informed and written consent was obtained from each participant prior to participation in the study. All methods were carried out in accordance with the relevant ethical guidelines and standards.

Statistical Analysis

The data were entered on Epidata version 3.1 and were checked for completeness and consistency. Statistical analysis was performed by using SPSS version 25. Descriptive statistics was used to summarize the data. The fitness of the model was checked by Hosmer-Lemeshow fitness of good test, a non-significant value indicating that the data fit reasonably well. Bivariable logistic regression was conducted to identify candidate variables for the adjusted model, with a p-value of ≤ 0.25 . An adjusted odds ratio (AOR) with a 95% confidence interval was used to identify factors significantly associated with the outcome variable.

RESULTS

In this study, we included a sample of 423 diabetes mellitus patients who were receiving chronic follow-up care were included in the study, with a response rate of 100%. Regarding the sex of respondents, 330 (78%) was male. The mean age of respondents was 48.28 ± 10.57 years (Table 1).

Table 1: Socio demographic characteristics of patients with diabetes mellitus in Western Arsi, Oromia, Ethiopia, 2022.

Variables	Category	Frequency (n = 432)	Percentage (%)
Sex	Male	330	78.00%
	Female	93	22.00%
Age	18-40	177	27.70%
	41-60	253	59.80%
	>=61	53	12.50%
Place of Residence	Urban	257	60.80%
	Rural	166	39.20%
Marital Status	Single	16	3.80%
	Married	308	72.80%
	Widowed	84	19.90%
	Divorced	15	3.50%
Level of Education	No Formal Schooling	118	27.90%
	High School and Less	87	20.60%
	Diploma and Above	218	51.50%
Occupation	Employed	196	46.30%
	Retired	44	10.40%
	Unemployed	183	43.30%
Income	<=3000	166	39.20%
	>=3001	257	60.80%

Clinical Characteristics of Patients

About 253 (59.8%) of the respondents have been on DM treatment for more than 6 years. More than half of the respondents 247 (58.4%) had information about CVDRFs. The majority of the participants, 397 (93.9%), had type 2 DM (Table 2).

Table 2: Clinical characteristics of patients with diabetes mellitus in Western Arsi, Oromia, Ethiopia, 2022.

Variables	Category	Frequency (n = 432)	Percentage (%)
Duration of Treatment for DM	Less than 6 Years	170	40.20%
	Above 6 Years	253	59.80%
Family History of CVD	Yes	14	3.30%
	No	208	49.20%
	I Don't Know	201	47.50%
History of CVD	Yes	109	25.80%
	No	314	74.20%
Heard about CVDRFs?	Yes	247	58.40%
	No	176	41.60%
Who Told You?	HCPs	198	78.30%
	Relatives and Friends	47	18.60%
	Media	8	3.20%
Type of DM	Type 1	26	6.10%
	Type 2	397	93.90%

Knowledge Response of Cardiovascular Disease Risk Factors

Majority of the respondents, 364 (86.1%), identified "smoking as a risk factor for heart disease." The next CVD risk factor identified by the participants was "A person who stops chewing khat will lower their risk of heart disease." 360 (85.1%), followed by "The older a person is, the greater their risk of having heart The next CVD risk factor identified by the participants was "A person who stops chewing khat will lower their risk of heart disease," 360 (85.1%), followed by "The older a person is, the greater their risk of having heart disease," 357

(84.4%). The least common CVD risk factors identified by the participants were "If your ‘bad’ cholesterol (LDL) is high, you are at risk for heart disease." 117 (27.7), "People with diabetes tend to have low HDL "good" cholesterol", 123 (29.1%)", "If your ‘good’ cholesterol (HDL) is high, you are at risk for heart disease", 171 (40.4%), and "People with diabetes rarely have high cholesterol, 174 (41.1%), respectively. Almost half of the respondents (49.9%) understood that "A person who has diabetes can reduce their risk of developing heart disease if they keep their weight under control". A majority of the 322 respondents (76.1%) knew that "A person who has diabetes can reduce their risk of developing heart disease if they keep their blood pressure under control" (Table 3).

Table 3: Frequency distribution of respondents` knowledge score towards cardiovascular disease risk factors in Western Arsi, Oromia, Ethiopia, 2022.

No	Questions (n = 423)	Correct Response	Frequency (%)
Q1	People can easily know by themselves when they have heart disease	FALSE	232(54.8%)
Q2	If you have a family history of heart disease you are at risk for developing heart disease	TRUE	270(63.8%)
Q3	The older a person is, the greater their risk of having heart disease	TRUE	357(84.4%)
Q4	Smoking is a risk factor for heart disease	TRUE	364(86.1%)
Q5	A person who stops smoking will lower their risk of developing heart disease	TRUE	336(79.4%)
Q6	Chewing khat is a risk factor for heart disease	TRUE	338(79.9%)
Q7	A person who stops chewing khat will lower their risk of heart disease	TRUE	360(85.1%)
Q8	Drinking alcohol is a risk factor for heart disease	TRUE	309(73%)
Q9	High blood pressure is a risk factor for heart disease	TRUE	303(71.6%)
Q10	Keeping blood pressure under control will reduce a person’s risk for developing heart disease	TRUE	286(67.6%)
Q11	High cholesterol is a risk factor for developing heart disease	TRUE	285(67.4%)
Q12	Eating fatty foods does not affect blood cholesterol levels	False	280(66.2%)
Q13	If your ‘good’ cholesterol (HDL) is high, you are at risk for heart disease	False	171(40.4%)
Q14	If your ‘bad’ cholesterol (LDL) is high, you are at risk for heart disease	TRUE	117(27.7%)
Q15	Being overweight increases a person’s risk for heart disease	TRUE	320(75.7%)
Q16	Regular physical activity will lower a person’s chance of getting heart disease	TRUE	317(74.9%)
Q17	Only exercising at a gym in an exercise class will help lower a person’s chance of developing heart disease	FALSE	247(58.4%)
Q18	Walking and gardening are considered as an exercise that will help to lower a person’s chance of developing heart disease	TRUE	314(74.2%)
Q19	Diabetes is a risk factor for developing heart disease	TRUE	294(69.5%)
Q20	A person who has diabetes can reduce their risk of developing heart disease if they keep their blood sugar level under control	TRUE	316(74.7%)
Q21	A person who has diabetes can reduce their risk of developing heart disease if they keep their blood pressure under control	TRUE	322(76.1%)
Q22	A person who has diabetes can reduce their risk of developing heart disease if they keep their weight under control	TRUE	211(49.9%)
Q23	People with diabetes rarely have high cholesterol	FALSE	174(41.1%)
Q24	People with diabetes tend to have low HDL “good” cholesterol	TRUE	123(29.1%)
Q25	If your blood sugar is high over several months, it can cause your cholesterol level to go up and increase your risk of heart disease	TRUE	241(57%)

Knowledge Level of CVD Risk Factors

Respondents were asked 25 knowledge-based questions to assess their knowledge of CVD Risk factors, and they were categorized into two groups based on their score (good knowledge and poor knowledge). The correct response to 25 knowledge questions was used to assess the level of knowledge of DM patients about CVD risk

factors. Participants' lowest and highest scores were five and twenty-four, respectively, with a mean score of 16.28 + 4.55. Findings of this study revealed that the majority of patients who participated in this study had good knowledge, with 232 (54.85%) [95% CI (50.3-59.8)] giving correct responses to ≥16 questions, while 191 (45.15%) [95% CI (40.2-49.7)] had poor knowledge, giving correct responses to <16 questions (Figure 1).

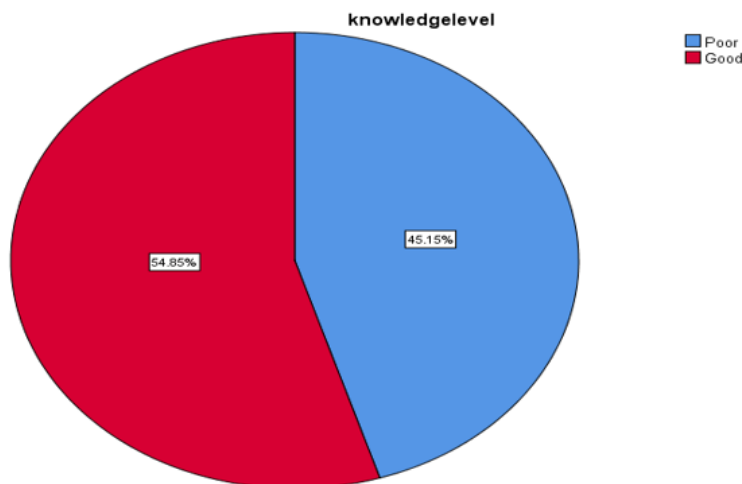


Figure 1: Knowledge of CVD risk factors among patients who visited the DM clinic for follow up in western Arsi, Oromia, Ethiopia 2022.

Factors Associated with CVD Risk Factors

Bivariable logistic regression was performed to select candidate variables for the final model using p ≤0.25. Accordingly, sex, age, age place of residence, marital status, level of education, occupation, duration of treatment for DM, family history of CVD, history of CVD, information about CVDRFs, income, and Type of DM showed an association with the outcome variable.

In the multivariate logistic regression, marital status [AOR = 0.032, 95% CI: 0.003-0.355], level of education [AOR = 0.189, 95% CI: 0.042-0.855], occupation [AOR = 0.093, 95% CI: 0.018-0.477], duration of DM treatment [AOR = 0.083, 95% CI: (0.020-0.348)], having information on CVDRFs [AOR = 4.503, 95% CI: 4.503-19.804], and income [AOR = 0.201, 95% CI: 0.0065-0.620] were significantly associated with knowledge of CVD risk factors among DM patients (Table 4).

Table 4: Factors associated with knowledge of CVD risk factors in western Arsi, Oromia, Ethiopia 2022 (n = 423).

Variable	Category	Knowledge of the CVD Risk Factors		COR (95% CI)	AOR (95% CI)	p-value
		Good (%)	Poor (%)			
Sex	Male	206	124	4.28(2.58-7.09)	0.65(0.17-2.43)	0.52
	Female	26	67	1	1	
Age	18-40	43	74	0.17(0.08-0.35)	1.95(0.25-15.28)	0.53
	41-60	148	105	0.42(0.21-0.82)	3.87(0.63-23.92)	
	>60	41	12	1	1	
Place of Residence	Urban	218	39	60.69(31.85-115.65)	1.46(0.33-6.39)	0.62
	Rural	14	152	1	1	

Marital Status	Single	7	9	5.06(0.85-30.18)	0.06(0.008-0.45)*	0.006
	Married	204	104	12.75(2.83-57.56)*	0.03(.003-0.36)*	0.005
	Widowed	19	65	1.90(0.39-9.17)	0.003(.000-0.13)*	0.003
	Divorced	2	13	1	1	
Level of Education	No formal schooling	9	109	0.005(0.002-0.013)	0.19(0.04-0.86)*	0.031
	High school and less	18	69	0.02(0.008-0.036)	0.04(0.01-0.16)	0.159
	Diploma and above certificate	205	13	1	1	
Occupation	Employed	185	11	203.02(89.71-459.47)	0.21(.044-.93)	0.929
	Retired	33	11	36.23(15.12-86.73)	0.09(0.018-.48)*	0.004
	Unemployed	14	169	1	1	
Duration of Treatment for DM	Less than 6 years	17	153	0.02(0.01-0.04)	0.08(0.02-0.35)**	0.001
	Above 6 years	215	38	1		
Family History of CVD	Yes	11	3	2.53(0.68-9.34)	1.04(0.11-10.41)	0.97
	No	102	106	0.66(0.45-0.98)	2.19(0.65-7.42)	0.21
History of CVD	I don't know	119	82	1	1	
	Yes	101	8	17.64(8.29-37.49)	2.49(0.61-10.29)	0.21
Heard about CVDRFs	No	131	183	1	1	
	Yes	219	28	98.07(49.27-195.19)	4.51(4.51-19.81)*	0.046
Income	No (<=3000)	13	163	1	1	
	>3000	36	130	0.09(0.05-0.14)	0.21(0.07-.62)*	0.005
Type of DM	Type 1	196	61	1	1	
	Type 2	9	17	0.42(0.18-0.95)	0.24(.03-1.79)	0.163
		223	174	1	1	

1-Reference, * = p-value <0.05, ** = p-value <=0.01

DISCUSSION

In this study, we identified both the level of knowledge and factors associated with cardiovascular risk factors among diabetes mellitus patients in Western Arsi, Oromia, Ethiopia. The findings of this study showed that the level of knowledge about cardiovascular risk factors among diabetes mellitus patients was high.

The findings of this study were consistent with reports of a study among adult Ethiopians, as their knowledge levels about risk factors for CVD was 54% [1]. This finding was low compared to the findings of the studies among diabetic patients in Riyadh, Saudi Arabia. Higher results in this study can be attributed to KSUMC's multidisciplinary intensive education program aiming at glycemic control and CVD risk factors in type 2 diabetes patients [16]. This percentage of having a good level of knowledge among DM patients in this study was better compared to patients with type 2 diabetes mellitus at Hospital University Sains Malaysia, (50%) [17]. However, the mean score in this study was low compared to study among diabetic patients in Turkey [18]. The disparity in outcomes between studies could be due to the countries' developmental levels. That is, categories of development indicators like income, health, and education are better in both Malaysia and Turkey than Ethiopia. Significant differences in sample size (the study conducted in Malaysia was on 54 respondents only [17] and sampling methods. Also, only 150 respondents were selected in Turkey [18], study population, and study methodology may have influenced the opposite conclusions.

The results of this study revealed that respondents who had no formal education were found to be 81% less likely to have good knowledge when compared to those who had a diploma or higher. This result was in line with the study conducted in South Dublin, which revealed that the participants were found to be more knowledgeable about CVD if they reported attending higher education [19]. Another study from Nigeria revealed that education is significantly associated with knowledge, and participants with tertiary educational qualifications were about fifty times more likely to be knowledgeable than those with no education [20]. In line with the findings of the current study, Knowledge of cardiovascular risk factors was linked to education level, implying that social, cultural, and economic factors are important determinants of health behavior change and awareness [1]. This is because of higher education is associated with better health literacy. Moreover, health responsibility of individuals with high level of education is high when compared to other groups.

According to a community-based cross-sectional study conducted in Cameroon in 2016 among 1162 randomly selected adults, smoking was a potential risk factor for CVD [21]. In the current study, the commonest risk factor identified by the participants was smoking. In contrast to this study's results, a systematic analysis conducted in Sub-Saharan Africa found a substantial relationship between residency and knowledge of CVD risk factors, with urban inhabitants knowing more about CVD risk factors than their rural counterparts [22].

The current study found a positive correlation between CVDRFs and marital status. Consistent with the findings of this study, a study conducted in Ethiopia showed that those who were never married had lower levels of knowledge regarding CV risk factors compared to those who were married [1]. This was possibly explained as married respondents give more concern for gaining health information by sharing ideas with each other.

This study also demonstrates that duration of DM treatment, knowledge of CVDRFs, and income were found to be substantially linked with knowledge of CVD risk factors. In the study conducted in Saudi Arabia, knowledge about the Risk of Cardiovascular Disease among Adults with Diabetes was not correlated with the duration of the disease, which was contradictory to the results of the current study [16]. Individuals who have had diabetes for a long time may develop behavioral adjustments that enable them to adhere to medications and obtain critical health information, requiring them to attend checkups. As a result, they are provided with sufficient knowledge or information. These could be the underlying causes of a high level of CVDRF knowledge.

This study found that income is significantly associated with knowledge level. It's possible that patients with a larger monthly income may afford all spheres of advice, allowing them to stick to prescriptions and get essential health information, necessitating checks. As a result, they are given sufficient information or knowledge. According to the current study, those who are retired have a higher level of knowledge of CVD risk factors than those who are unemployed. This could be due to the fact that retirees have a higher educational level than unemployed people and are therefore more likely to obtain health-related information. According to this study, participants who heard information about CVD risk factors were five times more likely to have good knowledge than those who did not. This could be due to the fact that knowing about CVD risk factors improves one's understanding and influences one's behavior [23].

LIMITATIONS

Since the study was institution-based and confined to public hospitals, generalizing the findings to all DM patients is limited. This study also shared the limitations of cross-sectional studies, primarily the difficulty of establishing temporal relationships between exposure and outcome variables. Furthermore, the study is subject to the limitations of patient response bias.

CONCLUSION

This study found that diabetic patients had a good knowledge about CVDRFs in the study area. This study also identified that marital status, level of education, occupation, length of DM treatment, information of CVDs risk factors, and income were found to be substantially linked with knowledge of CVD risk factors. This study emphasizes the importance of proper treatments and strategies for equipping and empowering the general public with the information regarding CVDRFs, as well as interdisciplinary intensive effective education programs for DM patients. Furthermore, implementation of CVD prevention programs should be considered for the disease prevention policy agenda in Ethiopia.

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COMPETING INTERESTS

The authors declare that they have no competing interests.

FUNDING

Not applicable.

DATA AVAILABILITY

The original datasets generated and/or analyzed during the current study are available upon reasonable request from the corresponding author.

REFERENCES

1. Negesa LB, Magarey J, Rasmussen P et al. (2020) Patients' knowledge on cardiovascular risk factors and associated lifestyle behaviour in Ethiopia in 2018: A cross-sectional study. *Plos One* 15(6): e0234198.
2. Raal FJ, Alsheikh-Ali AA, Omar MI et al. (2018) Cardiovascular risk factor burden in Africa and the Middle East across country income categories: A post hoc analysis of the cross-sectional Africa Middle East Cardiovascular Epidemiological (ACE) study. *Archives of Public Health* 76(1): 1-9.
3. Einarson TR, Acs A, Ludwig C et al. (2018) Prevalence of cardiovascular disease in type 2 diabetes: A systematic literature review of scientific evidence from across the world in 2007-2017. *Cardiovascular Diabetology* 17(1): 1-19.
4. Grundy SM, Benjamin IJ, Burke GL et al. (1999) Diabetes and cardiovascular disease: A statement for healthcare professionals from the American Heart Association. *Circulation* 100(10): 1134-1146.

5. Mustapha N, Alias S, Yasin RM et al. (2021) Cardiovascular diseases risk analysis using distance-based similarity measure of neutrosophic sets. *Neutrosophic Sets and Systems* 47: 26-37.
6. Kilkenny MF, Dunstan L, Busingye D et al. (2017) Knowledge of risk factors for diabetes or cardiovascular disease (CVD) is poor among individuals with risk factors for CVD. *PLoS one* 12(2): e0172941.
7. Lopez AD, Mathers CD, Ezzati M et al. (2006) Global and regional burden of disease and risk factors, 2001: Systematic analysis of population health data. *The Lancet* 367(9524): 1747-1757.
8. Zheng Y, Ley SH, Hu FB (2018) Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nature Reviews Endocrinology* 14(2): 88-98.
9. Shah AD, Langenberg C, Rapsomaniki E et al. (2015) Type 2 diabetes and incidence of cardiovascular diseases: A cohort study in 1·9 million people. *The Lancet Diabetes & Endocrinology* 3(2): 105-113.
10. American Diabetes Association (2021) 13. Children and adolescents: Standards of medical care in diabetes-2021. *Diabetes Care* 44(Supplement_1): S180-S199.
11. Kengne AP, Amoah AG, Mbanya JC (2005) Cardiovascular complications of diabetes mellitus in sub-Saharan Africa. *Circulation* 112(23): 3592-3601.
12. Burger A, Pretorius R, Fourie CM et al. (2016) The relationship between cardiovascular risk factors and knowledge of cardiovascular disease in African men in the North-West Province. *Health Sa Gesondheid* 21: 364-371.
13. Nabolsi MM (2020) Perception of diabetes management and cardiovascular disease risk among men with type 2 diabetes: A qualitative study. *Nursing Open* 7(3): 832-840.
14. Wagner J, Lacey K, Chyun D et al. (2005) Development of a questionnaire to measure heart disease risk knowledge in people with diabetes: The heart disease fact questionnaire. *Patient Education and Counseling* 58(1): 82-87.
15. World Health Organization (2005) WHO STEPS surveillance manual: The WHO STEPwise approach to chronic disease risk factor surveillance (No. WHO/NMH/CHP/SIP/05.02).
16. Alduraywish SA, Aldakheel FM, Azizalrahman LA et al. (2022) Knowledge about the risk of cardiovascular disease among adults with type 2 diabetes visiting the outpatient clinics at tertiary hospital in Riyadh, Saudi Arabia: A cross-sectional study. *International Journal of Environmental Research and Public Health* 19(9): 4996.
17. Osman M and Zain NM (2021) Knowledge and practices of cardiovascular diseases prevention among patients with type 2 diabetes mellitus at hospital Universiti Sains Malaysia. *International Journal of Care Scholars* 4(1): 18-28.
18. Zehirlioglu L, Mert H, Sezgin D et al. (2020) Cardiovascular risk, risk knowledge, and related factors in patients with type 2 diabetes. *Clinical Nursing Research* 29(5): 322-330.
19. OHalloran L and Slattery M (2017) Assessing the knowledge of cardiovascular disease among young people in South Dublin. *Cardiology and Cardiovascular Medicine* 1(4): 187-194.
20. Vincent-Onabajo G and Moses T (2016) Knowledge of stroke risk factors among stroke survivors in Nigeria. *Stroke Research and Treatment*.
21. Aminde LN, Takah N, Ngwasiri C et al. (2017) Population awareness of cardiovascular disease and its risk factors in Buea, Cameroon. *BMC Public Health* 17: 1-10.

22. Boateng D, Wekesah F, Browne JL et al. (2017) Knowledge and awareness of and perception towards cardiovascular disease risk in sub-Saharan Africa: A systematic review. *PloS One* 12(12): e0189264.
23. Muhamad R, Yahya R, Yusoff HM (2012) Knowledge, attitude and practice on cardiovascular disease among women in North-Eastcoast Malaysia. *International Journal of Collaborative Research on Internal Medicine & Public Health* 4(1): 85-98.