World Journal of Medical Sciences 20 (2): 28-37, 2023
ISSN 1817-3055

DOI: 10.5829/idosi.wjms.2023.28.37

Prevalence of Comorbidities and Selected Risk Factors Associated with Diabetes Amongst Type 2 *Diabetes mellitus* in Mogadishu, Somalia: A Cross-Sectional Study

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Abstract: Diabetes patients with a high prevalence of comorbidities could become leading causes of severe morbidities and mortalities, and patients would require continuous healthcare, which could be more toxic and costly to put glycemia under control. Moreover, there is an extreme lack of existing data in the literature from Somalia, so studies like this will be worthwhile.: The aim of this study was to determine the prevalence of comorbidities and selected risk factors related to diabetes among type 2 diabetes mellitus (T2DM) patients with and without treatment at Hubal Hospital, Mogadishu, Somalia.; A cross-sectional hospital-based study was conducted among adults with type 2 diabetes with and without treatment at Hubal Hospital, Mogadishu, Somalia. Multiple logistic regression analysis was used to analyze the data and a total of 400 contributors were included.The prevalence of comorbidities was 223 (85.8%) T2DM with treatment and 118 (86.1%) T2DM without treatment, respectively. The highest comorbidities were CVD 97(37.0.%) and CKD 93(35.5%) T2DM with treatment compared CVD 51(37.0%) and CKD 40(29.0%) those without treatment. Multivariable analysis showed at selected significant risk factors associated with diabetes were the female gender AOR, CL94% 0.02 (0.06-0.04) (P = 0.001), family history of type T2DM (AOR and CI 94%, 0.15 (0.91-1.338), P = 0.001) and a long duration of being diagnosed > 15 years (AOR, CI 95%, 0.98(1.87-0.54), (P=0.001). *Conclusion:* The findings revealed a high prevalence of comorbidities in both T2DM patients in Mogadishu, Somalia. Other potential risk factors associated with diabetes were female gender being the majority effect group in the diseases with low socio-economic status, a family history of type 2 diabetes, and having type 2 diabetes for more than 15 years. This study emphasizes the need for a nationwide study to figure out the scale of the comorbidities and the need for the commencement of urgent treatment, especially for those with diseases who are not on treatment.

Key words: Diabetes · The prevalence of comorbidities · Selected risk factors related to the development and self-care management · Mogadishu · Somalia

INTRODUCTION

Diabetes mellitus (DM) is a chronic (no communicable disease) characterized by hyperglycemia because of a complete r absolute deficiency of insulin. Type 2 Diabetes Mellitus (T2DM) is frequently described as a multifactorial lifestyle disease linked to dietary habits and sedentary behaviors [1, 2]. DM has become a significant global public health threat and acute or chronic complication, which are responsible for the high morbidity and mortality of the diseases [3, 4]. The prevalence of all types of diabetes has been estimated at 415 million adults aged 20-79 years living with conditions globally [5]. Type 2 diabetes is projected to be the seventh most significant common cause of death globally by 2030 primarily because of its rapid increases in middle- and low-income countries, including Somalia. Furthermore, the number of people living with diabetes will likely double in Sub-Saharan Africa due to the rapid increase of demographic, sociocultural and economic transitions that are increasing the risk and prevalence of diabetes [6, 7].

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The Gulf region has a high prevalence of type 2 diabetes and comorbidities globally. The United Arab Emirates (UAE) alone is estimated to have 30% prediabetes and 23% type 2 diabetes [8].

Moreover, T2DM is becoming one of the leading causes of severe morbidities and disabilities such (as blindness, chronic kidney diseases, renal impairment, cardiovascular disease events and lower limb amputation).

Despite the absence of a reliable national dataset that measures the prevalence of diabetes amongst Somalis, the disease is thought to be much more widespread than in neighboring countries such as Kenya and Ethiopia. Somalia is a country in the Horn of Africa with a population of 16.4 million, of which approximately 4.5 million live in Mogadishu. However, the health indicators for Somalia are amongst the worst in Sub-Saharan Africa due to ongoing or unrest-provoking conflict, with crucial issues related to poor governance and inadequate financial resources [9]. Most of the hospitals and pharmacists in Mogadishu are owned privately after the Somali Republic collapsed in 1991, which caused all the government medical facilities, including hospitals, to fail. Therefore, patients with T2DM require ongoing, continuous medical care, support as well as persistent patients' self-management education to prevent acute complications and decrease the risk of long-term complications [10]. Given the situation in Somalia, patients with diabetes have a greater chance of managing their condition, where seven out of ten people in Somalia live under the poverty line, and Somalia is considered one of the poorest countries in Sub-Saharan Africa. According to the report published by the World Health Organisation, diabetes can be easily treated, and its potential consequence avoided or delayed by adopting proper deity, performing physical activity, using drugs, and consistently screening for complications [8]. Previous research recognized urbanization as a root cause of the increase in the risk of non-communicable diseases and their risk factors in Sub- Saharan Africa [11]. Mogadishu, the capital of Somalia, might have accepted a new inactive lifestyle, and the return of many Somali diaspores might bring the negative aspect of Western and Middle East lifestyles, which may raise the population's risk of non-infectious diseases [11]. However, information on T2DM comorbidities and the risk factors associated with its development and self-care management amongst adults with and without treatment in this region is scarce. Only one study on no communicable diseases at selected risk factors was reported at Hargeisa, the north of Somalia.

In a small pilot study conducted before this study began, several confirmed patients with diabetes were not on treatment. This situation could be due to a lack of knowledge and literacy or a cultural belief-many people in Somalia believe diabetes can be managed without medications. Therefore, in this study, patients with diabetes with and without treatment were included.

Therefore, insight into the prevalence of comorbidities and risk factors associated with diabetes and its development and self-care management is essential as the country is undergoing rapid urbanization and epidemiological transition. The present paper aimed to assess and compare the prevalence of comorbidities and risk factors related to diabetes amongst patients with T2DM with and without treatment at Hubal Hospital, Mogadishu, Somalia.

MATERIALS AND METHODS

Study Design and Sampling: A cross-sectional study was conducted amongst patients with T2DM with and without treatment at Hubal Hospital, Mogadishu, Somalia. The study was conducted between July 2022 and November 2022. The hospital is in Yaqshhid district in the southeast Banadir region of Somalia. Hubal is a well-equipped private hospital in the heart of Mogadishu with inpatient, outpatient and maternity care services. All the patients in this study were coming to the hospital for their regular screening or to collect their medication. Regular medication used to manage diabetes include the following: injections: insulin long-acting, rapid-acting and combination insulin 70/30; oral: metformin (biguanide class), dipeptidyl peptidase-4(DPP-4) inhibitors and glucagon-like peptides-1 receptor against (GLP-1 receptor against). Data were collected at outpatient clinics, where most people with T2DM go for screening, as well as hospitals for those admitted for diabetes or diabetes-related complication.

Study Participants: Participants included all confirmed cases of T2DM with and without treatment.

Operational Definitions: Cases of DM on treatment were defined as those on either oral or injectable medication for T2DM. Cases of T2DM not on treatment was described as any confirmed case of type 2 diabetes who had not received any prescribed medication from a hospital or private clinic.

Sample Size and Study Sampling: The participants were selected using simple random sampling methods. A list of all the outpatients and those admitted to the hospital was obtained from their electronic medical records. In this type

of sampling method, all the participants would have an equal chance of selection without bias. All patients who met the eligibility criteria were included. The sample size was determined using two proportional formulas, the study's power was set at 80 and the level of significance was 0.005. This study included 400 patients with T2DM including 160 who were not on treatment and 240 on therapy.

Data Collection and Measurements: Data for this study were collected using semi-structural questionnaires previously used in another research [9]. The questionnaires were slightly modified based on the interests of the Researchers. The questionnaires were translated forward and backward into Somali languages, and those who were illiterate and unable to read Somali were assisted by the principal investigators of this study. The context of the questionnaires contained four domains: the sociodemographic profile of study participants, lifestyle factors associated with self-management of patients with T2DM, and other questions for the comorbidities and complications of T2DM.

Statistical Analysis: Data were analyzed using Statistical Package of Social Science (SPSS) version 28.0 (Chicago, Illinois: SPSS Inc.). All the data were double-checked and cleaned to detect any missing value or entry error. The chi-square test was used to assess the association between social demographic characteristics and related factors associated with the development of T2DM in both groups. Simple logistic regression analysis used an association between lifestyle and risk factors for self-care practice. Furthermore, simple logistic regression was performed to investigate the variables that may be clinically and biologically significant for associated with comorbidities. Selection methods for forwarding L.R. for Multiple Logistic Regression have been applied. Multicollinearity and interaction terms of variables have been performed and did not find. The final model was presented using Adjusted OR, and differences with a p value < 0.05 were considered statistically significant. The last dates were tabulated, and footnotes were provided under each table.

Ethical Approval: This study was approved by the postgraduate research and ethics board committee at meeting number 7 (dated August 31, 2022) at Mogadishu University before it was conducted. Separate ethical approval was obtained from the head of Hubal Hospitals and the head of the medical department. Written informed consent was acquired from all the participants before they filled out the questionnaires. The study was explained to all participants, who were informed that they were free to withdraw from it at any time and at any stage. All the information from the participants was kept confidential, and the identities or names were anonymous throughout the research. Participants were informed that the outcome would be published and would not include any personally identifiable information. This study declared that no human experiments, including tissue and samples, do not apply to this study. Inform consent has been obtained from all the participants and their legal guardiancies for illiterate participants. All data and materials used in this study, such as questionnaires and all obtained Consent forms, were available and have been stored accordingly to the investigators' policy for data storage. This study did not include any children or teenagers. Therefore, we did not need to obtain guardian consent.

RESULTS

According to the researchers' best knowledge, this was the first study conducted in Somalia amongst patients with T2DM with and without treatment at one single center in the heart of Mogadishu, Somalia. This study aimed to determine the prevalence of comorbidities and selected risk factors associated with diabetes amongst adults with T2DM with and without therapy in Mogadishu, Somalia.

Table 1 compares sociodemographic characteristics amongst adults with T2DM, comprising 262 on treatment and 138 without treatment. In this study, age was classified. The age group between 40 and 59 was the most affected in T2DM with and without treatment, and a significant difference was observed between age for T2DM on treatment at 170 (64.9%) and T2DM without treatment at 90 (65.2%) ($P = 0.001$). Females were more likely than males to be affected by diseases in both groups, with 179 (68.3%) for T2DM with treatment and 108 (78.3%) for T2DM without treatment.

Most participants were married, illiterate or had no formal education except primary school. The majority of participants were employed, with 113 (43.1%) having T2DM with treatment and 67 (48.5%) having T2DM without treatment. In both groups, a statistically significant difference was noted between occupational status and full-time workers. However, those who were employed and had full-time work continued to show poor monthly income status and the lowest socioeconomic

Table 1: Comparison of Sociodemographic Characteristics amongst adults with type 2 diabetes mellitus with and without treatment (n = 400)

Variable	Type 2 DM on Treatment n (%)	Type 2 DM without Treatment n (%)	P value
Age category			
18-25	2(0.8%)	5(3.6%)	
25-39	71(27.1%)	19(13.8%)	**0.001**
40-59	170(64.9%)	90(65.2%)	
60-70	7(13.1%)	13(9.4%)	
Above 70	12(2.7%)	11(8.0%)	
Gender			
Male	83(31.7%)	30(21.7%)	0. 036
Female	179(68.3%)	108(78.3%)	
Marital status			
Single	9(3.4%)	10(7.2%)	
Married	210(80.2%)	112(81.2%)	0.193
Divorced	21(8.0%)	6(4.3%)	
Widowed	22(8.4%)	10(7.2%)	
Educational level			
Illiterate	151(57.6%)	92(66.7%)	
Primary education	102(38.9%)	41(29.7%)	0.275
Secondary education	7(2.7%)	3(2.2%)	
Diploma or Bachelors	2(0.8%)	2(1.4%)	
Masters and above	0	0	
Occupational status			
Employed	113(43.1%)	67(48.6%)	
Self-Employed	133(50.8%)	60(43.5%)	0.3
Unemployed	16(6.1%)	10(7.2%)	
Never employed	0(0.0%)	1(0.7%)	
Type of work			
Full-time workers	139(53.1%)	69(50.0%)	
Part-time workers	67(25.6%)	33(23.9%)	**0.001**
Casual workers	34(13.2%)	34(25.0%)	
On call only	22(8.6%)	2(1.5%)	
Monthly income			
Less than $100	112(42.7%)	51(37.0%)	
$100-$300	78(29.3%)	66(47.8%)	**0.002**
$300-$400	34(13.0%)	13(9.4%)	
$500 and more	38(14.5%)	8(5.8%)	

status, which irreversibly affected managing their condition.

A quarter of the study participants showed low monthly income of less than $100 in both groups. T2DM with treatment had 112 (42.7%) a higher proportion of poor income of less than

$100 monthly compared with that of T2DM without treatment 51 (37.0%). A significant difference was observed between the groups in their monthly payment (P = 0.001).

Table 2 shows the prevalence of comorbidities, complications and comparison between adults with type 2 diabetes and without treatment (n = 400).

More than half of the participants had underlying comorbidities. The prevalence of comorbidities was 223 (85.8%) for T2DM with treatment and 118 (86.1%) for

Table 2: Prevalence of comorbidities and complications amongst adults with type 2 diabetes and without treatment (n = 400)

Variable	DM type 2 on Treatment n = (262)	DM type 2 without treatment n = (138)	P value
Do you have any other underlining comorbidity apart from T2DM?			
Yes	223(85.8%)	118(86.1%)	0.921
No	39(14.2%)	20(13.9%)	
Type of Comorbidities			
Blood pressure (BP)	46(17.6%)	36(26.1%)	0.844
Cardiovascular diseases	97(37.0.%)	51(37.0%)	0.002
Kidney disease	93(35.5%)	40(29.0%)	0.146
I don't know	26(9.9%)	11(8.0%)	0.234
Complications of T2DM			
Visual impairment	117(46.1%)	48(36.1%)	
Ulcers	58(22.4%)	31(23.3%)	0.346
Frequent infection	57(22.4%)	47(35.3%)	0.008
Nerve or I don't know.	30(8.7%)	19(5.3%)	0.586
Do you have high blood sugar?			
Yes	160(61.5%)	101(73.7%)	**0.001**
No	102(385%)	37(26.3%)	
Lots of consciousness			
Yes	91(35.3%)	46(33.6%)	
No	171(64.7%)	92(66.4%)	0.736

T2DM without treatment. Unexpectedly, about 118 (86.1%) people with confirmed T2DM were not on treatment for controlling their diabetes and had a high number of comorbidities apart from their condition. The highest comorbidities were cardiovascular diseases (CVD) 97 (37.0.%) and chronic kidney diseases (CKD) 93 (35.5%) for T2DM with treatment compared CVD 51 (37.0%) and CKD 40 (29.0%) for T2DM without treatment. Furthermore, in T2DM with treatment, the most common complication was 117 (46.1%) visual impairment, followed by 58 ulcers (22.4%), whereas other groups of T2DM without treatment had 48 (36.1%) visual impairment, followed by frequent infections (36.1%). A significant difference was observed for the group with high blood sugar (P = 0.001).

Table 3 illustrates a simple logistic analysis of the association between lifestyle factors and self-care- the practice of diabetes amongst adults with type 2 diabetes with and without treatment.

Univariable analysis was applied to find the association between the dependent variable of T2DM with and without treatment and the independent variable or associated variable of lifestyle factors and other selected factors for self-care practice in patients with diabetes.

The majority of the participants did not engage in any physical activity: 136 (51.9%) were in T2DM with treatment, and 69 (50.0%) were in T2DM without treatment. Even though most ate chank food, their T2DM

Table 3: Association between lifestyle factors and self-care practice of diabetes amongst adults with type 2 diabetes with and without treatment (n = 400)

Variable	DM type 2 on Treatment n = (262)	DM type 2 without Treatment n = (138)	(b)	Crude OR (95% CI)	P value
Family history of DM					
Yes	179(68.3%)	74(53.6%)	0	1	
No	49(18.7%)	47(34.1%)	0.842	2.32(1.43-3.76)	**0.001**
I don't know	34(13.0%)	17(12.3%)	0.19	1.20(0.63-2.29)	0.562
Years diagnosed?					
<5 years	123(46.9%)	48(34.8%)	0	1	
5-10 years	129(49.2%)	83(60.1%)	0.75	2.13(1.23-3.68)	0.007
10-15 years	8(3.1%)	5(3.6%)	2.16	8.73(4.95-5.41)	**0.000**
>15 years	2(0.8%)	2(1.4%)	3.7	0.62(4.98-3.17)	**0.001**
Do you have a glucometer at home?					
Yes	169(64.5%)	85(61.6%)	0	1	
No	0.076	0.926(0.61-1.39)	93(35.5%)	53(38.4%)	0.717
Management of DM type2					
Oral drugs	136(51.9%)	0(0.0%)	0	1	
Insulin injection	126(48.1%)	0(0.0%)	-0.264	-0.768(0.23-2.54)	0.944
Traditional medicine	0(0.0%)	74(53.6%)	-0.195	-0.823(0.20-3.28)	0.666
None	0(0%)	64(46.4%)	0.052	-0.053(0.68-1.61)	0.783
Did you do a daily physical activity					
Yes	126(48.1%)	69(50.0%)	0	1	
No	136(51.9%)	69(50.0%)	0.076	0.926(0.61-1.39)	0.717
Physical activities					
Daily Walking	121(46.2%)	63(45.7%)	0	1	
Regular gyms	10(3.8%)	4(2.9%)	-0.264	0.768(0.23-0.54)	0.666
Regular exercise	7(2.7%)	3(2.2%)	-.0195	0.823(0.20-0.29)	0.783
Non	124(47.3%)	68(49.3%)	0.052	0.053(0.68-0.61)	0.811
Diet counselling?					
Yes	144(55.0%)	85(61.6%)	0	1	
No	118(45.0%)	53(38.4%)	-0.71	0.73(0.70-0.63)	0.742
Food do you eat mostly					
Sweets	31(11.9%)	18(13.0%)	0	1	
Chunk food	167(64.0%)	83(60.1%)	-0.156	0.856(0.452-1.620)	0.633
Fibres	46(17.6%)	21(15.2%)	-0.241	0.786(0.361-1.710)	0.544
Vegetables	17(6.5%)	16(11.6%)	0.483	1.621(0.661-3.972)	0.591
Weight change					
Yes	110(42.0%)	59(42.8%)	0	1	
No	152(58.0%)	79(57.2%)	-0.031	0.96(0.639-1.470)	0.882
BMI status					
19 or below	26 (9.9%)	9(6.5%)	0	1	
20-25	190(72.5%)	73(52.9%)	0.104	1.110(0.496-2.482)	0.799
25-30	17(6.5%)	29(21.0%)	1.59	4.928(1.876-12.947)	**0.001**
30 and above	29(11.1%)	27(19.6%)	0.989	2.690(1.070-6.760)	0.035
Recognise symptoms					
Yes	162(61.8%)	83(60.1%)	0	1	
No	100(38.2%)	55(39.9%)	0.071	0.073(0.704-0.637)	0.074

levels were 167 (64.0%) with treatment and 250 (62.7%) without.

Univariable analysis showed the potential significant factor association between lifestyle and self-care management of diabetes were previous family history of DM (OR = 1.20, 95% CI = 0.63-2.29, p = 0.001), years of diagnosis between 5 years and 10 years (OR = 8.73, 95% CI =4.95-5.41, p = 0.000) and BMI status (OR = 4.928, 95% CI = 1.876-12.947, P = 0.001).

Table 4 demonstrates the significant risk factors associated with the development of T2DM amongst adults with diabetes with and without treatment. Univariable and multivariable analysis showed the most significant risk factors were female gender (AOR, CI 95, 0.15 (0.91- 1.338, P = 0.001); female gender had 0.15 or 15% higher odds of developing T2DM than the male gender when other variables were controlled.

The majority of participants had a family history of T2DM; their AOR, CI95%, was 0.55 (1.14- 1.36; P = 0.001); therefore, those with a family history of T2DM had 0.55 higher odds or a 55% higher chance of developing type 2 diabetes than those without.

Table 4: Risk factors associated with development and self-care practice of diabetes in comparison between groups amongst patients with type 2 diabetes with and without treatment using simple and multiple logistic regression analysis

Variable	DM type 2 on Treatment n = (262)	DM type 2 withoutc treatment n = (138)	(b)	Crude OR (95% CI)	P value	(b)	Adjusted OR (95% CI)	P value
Gender								
Male	83(31.7%)	30(21.7%)	0	1		0	1	
Female	179(68.3%)	108(78.3%)	0.512	1.66(1.03-2.70)	**0.003**	0.155	0.15(0.91-1.338	**0.001**
Family history of DM type 2								
Yes	179(68.3%)	74(53.6%)	0	1		0	1	
No	49(18.7%)	47(34.1%)	0.842	2.32(1.43-3.76)	**0.001**	0.251	0.55(1.14-1.36)	**0.001**
I don't know	34(13.0%)	17(12.3%)	0.190	1.20(0.63-2.29)	0.562	0.063	0.33(0.06-0.12)	0.061
Comorbidity status								
Blood pressure (BP)	46(17.6%)	36(26.1%)	0	1		0	1	
Cardiovascular diseases	97(37.0%)	51(37.0%)	-0.356	2.49(0.403-1.219)	0.208	0.356	0.70(0.403-1.219)	**0.002**
Kidney disease	93(35.5%)	40(29.0%)	-0.641	1.60(0.298-0.933)	**0.002**	-0.615	0.52(0.298-0.933)	**0.001**
I don't know	26(9.9%)	11(8.0%)	-0.245	0.541(0.236-1.238)	0.146	-0.249	0.67(0.490-0.765)	0.156

The factors of comorbidities were statistically significant for CVD (AOR, CI95%, 0.70 (0.403-1.219), P = 0.002) and CKD (AOR, CI95%, 0.52 (0.298-0.933), P = 0.001); those with diabetes

and CVD had 70% higher odds of having a cardiac problem, and those with diabetes and CKD had 52% higher odds of CKD being a risk of renal failure than those who had T2DM and did not have these comorbidities.

Backward stepwise L.R. multiple was applied for selection of variables. Multicollinearity and interaction term was checked and did not find.

All the assumptions of multiple logistic regression analysis were checked throughout the research, and the final model was obtained.

Hosmer-Lemeshow test (p = 0.270), personal chi-square test (17.70), classification table (Overall correctly classified percentage (75.9%) and area under receiver opening characteristics (ROC) curve (0.54%) were checked the fit of the model and reported to be odd fit ratio (OR) (b) regression coefficient.

DISCUSSION

The current study found a high prevalence of comorbidities and complications amongst vulnerable people with T2DM in Mogadishu, Somalia. Although some of these variables were not statistically significant, visual impairment, frequent infection and ulcers were the most valuable predictors of diabetes complications amongst patients with diabetes with and without treatment. Moreover, the most significant selected potential risk factors associated with diabetes were female gender, family history of T2DM and comorbidities of T2DM.

Age was classified. Therefore, the diseases affected the age groups between 40 and 59 the most. However, any association between age and groups T2DM with and without treatment groups was not found.

This finding was consistent with other studies. A study conducted [10] found the majority affected age group, and the group that developed T2DM were aged 55-64 years (OR, 1.580; CI, 95%, 1.120-2.230; P = 0.009) and 65-74 years (OR, 2.301 CI, 95%, 1.538-3.444; P<0.001). Furthermore, females were more likely to have diabetes diseases than males, and the female gender was statistically significant between the groups. This study was similar to other studies reported in the UK and European countries [1, 12], where the female gender had a high prevalence of comorbidities, including diabetes.

The reason why females were more likely to have diabetes could be due to differences that may relate to the surveillance bias. Females were more likely to visit a general practitioner and have a recorded comorbidity diagnosis. In addition, previous studies focused on conditions regarded as diabetes-concordant, such as cardiovascular diseases and CKD.

Another possible factor could be low vitamin D levels amongst Somali women. However, the association between vitamin D deficiency and diabetes has been well described [13, 14]. The high rate of vitamin D deficiency, particularly among women in Somalia, could be another factor associated with an increased risk of developing type 2 diabetes. Although the researchers in this paper were unable to investigate the link between vitamin D deficiency and the development of T2DM, this could be due to a cultural factor in Somalia, where all women cover their bodies and do not get enough sun exposure, as well as a lack of regular screening due to the economic burden on the majority of people.

The correlation between reasonable glycaemic control and slight incidence of microvascular and

macrovascular complications in patients with T2DM has been well documented [15, 16].

This paper demonstrated that most study participants had a higher prevalence of comorbidities, particularly CVD and CKD, as well as complications. Moreover, most study participants were between 40 and 59 years old and had low socioeconomic status. However, our results were consistent with those of other international studies that found a link between older ages, a higher prevalence of comorbidities, poor glycaemic control and high obesity as the most influential risk factors for type 2 diabetes [17].

A study from the UAE [18] revealed a higher prevalence of comorbidities amongst patients with DM, which was similar to our finding from one single centre located at heart of Mogadishu, Somalia. Therefore, this work emphasised a need for screening and prevention programmes towards the early, asymptomatic identification of comorbidities and commence treatment, especially for longer disease duration.

This paper demonstrated the top risk factors associated with the development of patients with T2DM amongst Somalian participants. A family history of T2DM was the significant factor associated with the development of T2DM. More than a quarter of this study participants, 179 (68.3%), had a family history of T2DM. This finding was similar to those of other studies conducted in Spain and the Emirates [18, 19].

A strong correlation existed between the development of diabetes on the one hand and a family history of T2DM on the other hand, and this has been well documented. High BMI, a family history, less physical activity and low socioeconomic status were the main factors associated with diabetes [20]. Family history was an independent factor associated with type 2 diabetes. Those with a family history have a 1.2-fold increased risk of developing type 2 diabetes than those without. Furthermore, those with a family history and a lack of physical activity, as well as those with an uncontrolled diet and obesity, were at high risk, as are those without a family history and physical activity. Patients with a family history had a higher risk of developing T2DM. However, the diseases can be postponed or delay good quality of life, including regular physical exercise and deity.

This paper found a higher prevalence of comorbidities amongst patients with diabetes. Still, the researchers were unable to find a causal effect relationship between comorbidities and T2DM, whether the participants had their first T2DM apart from their comorbidities or the comorbidities were caused by this diabetes condition. Many studies have reported the association between noncommunicable disease syndemics, poverty, depression and diabetes among the low-income population [21].

This paper found that most participants had low income (less than $100 a month) and generally low education levels. According to previous research, Somalia has seven or more people living in poverty for every ten people. Another possible explanation is the ongoing debate about the role of depression and antidepressants due to poverty and other factors that may increase the risk of T2DM through various causal pathways. However, more research is needed [22, 23].

Internationally, diabetes intersects with chronic diseases more frequently in low-income populations because of the strong relationship between depression and poverty [24] and the stresses linked to poor access to and extraordinary costs of diabetes care [25]. A systematic review and meta-analysis have highlighted the co-occurrence of diabetes and depression, which has received extensive biomedical attention [26], often stressing an underlying biological interaction, bi directionality and economic effects of comorbidity [27]. Comorbidities and depression resulting from poverty also increase the risk of morbidity and mortality in those with diabetes, which is common among socially and economically disadvantaged populations. Therefore, substantial evidence shows the interactions and outcomes of depression and diabetes are mediated by social contexts and are particularly devastating amongst low-income people, including Somali populations [28].

Limitations and Strengths of the Study: This paper had several strengths and tangible outcomes. Firstly, this was the first study to determine the association between sociodemographic factors and the development of diabetes and lifestyle factors affecting self-care management and other comorbidities in Mogadishu, Somalia. Secondly, this study included the number of patients with diabetes who were not on treatment, which was surprising to include and report. This study also used a cross-sectional design that provided a sufficiently large sample size. Despite this strength, this study had several limitations. This study did not identify a causal effect relationship between some variables, particularly self-care behaviors, which were not assessed. Therefore, cross-sectional studies did not allow the researcher to infer causality. This study used self-reported measures for data collection and can be subject to recall bias that may affect measurement precision. Thirdly, this study's BMI

was based on self-reported weight and height, which yielded lower estimates of obesity than measured data. Thus, this study could underestimate the association between obesity and T2D incidence. Fourthly, multilingual experts translated the semi-structured questionnaires in this study into Somalia forward and backward from English to local languages. This study also did not assess a few variables related to diabetes Knowledge and self-satisfaction with diabetes treatment as well as support from family or friends. All these are the limitations of this study.

CONCLUSION

This paper revealed a high prevalence of comorbidities and complications amongst patients with diabetes in Mogadishu, Somalia. The majority of the participants came from low-income families with limited educational opportunities. The most significant risk factors associated with the development of T2DM were associated with females, who made up the majority of the effect group in both groups compared with males. Family history of T2DM and comorbidities such as CVD and CKD were significant risk factors associated with developing type 2 diabetes among Somali participants. This paper emphasized the need for nationwide research to determine the scale of the comorbidities and the need for a screening and prevention program geared towards the early detection and determination of comorbidities and the commencement of urgent treatment, especially for those with diseases that are not on treatment. Furthermore, studies must explain how diabetes self-satisfaction with diabetes treatment, self-efficacy, social support, and health literacy affect diabetes self-care.

Declarations Competing Interest: The researchers declare no competing interest in carrying out this study.

Fundings: Research declared no funding was allocated from any institute for the conduct of this study.

Consent for Publication: Declared all the participants consented to the publication of this study.

Report of Any Experimental of Human Tissue or Samples Used in this Study Declared, not applicable for that section.

Availability Data and Martials: The researchers declared, all data and materials, such as questionnaires and consent forms obtained from the participants, were available and stored.

Authors' Contributions: Anisa Abdullahi Hussein has contributed to the data collection, conceptualisation, methodology and written original manuscript draft.

Zeynab Ahmed Mohamed has also assisted in the data collection and writing of the original data of the manuscript.

Hussein Ali Osman has contributed the reviewing the essential intellectual content and editing the final draft of the manuscript.

Omar Salad Elmi has contributed, supervising the project, guiding the data collection, checking the study's central concept and reviewing the final draft of the manuscript. All the authors approved the final draft of the manuscript.

ACKNOWLEDGMENT

The researchers are grateful to all the participants in this study, the director of Hubal Hospital, our patients' clinic department and all the hospital staff. The researchers also thank the postgraduate studies board at Mogadishu University for permitting the conduct of this research.

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