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ORIGINAL RESEARCH

Poor Self-Care Practices and Being Urban Resident Strongly Predict Chronic Complications Among Patients with Type 2 Diabetes in Eastern Ethiopia: A Hospital-Based Cross-Sectional Study

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Background: Diabetes, together with its complications, has a considerable negative influence on people's quality of life and healthcare delivery and raises diabetic mortality. However, there is limited information about the diabetes-associated chronic complications in the study setting. Therefore, this study aimed to determine the burden and factors related to the chronic complications among patients with type 2 diabetes (T2D) in Eastern Ethiopia.

Methods: A hospital-based cross-sectional study was conducted among 879 patients with T2D at two public hospitals in Harar. The data were collected through interviews using a structured questionnaire. Data related to the diagnosis of chronic complications and biochemical tests were extracted from medical records. The outcome variable was the number of chronic complications that happened to the patients. A generalized Poisson regression model with robust variance estimation was used to investigate the association of independent variables with chronic complications. An adjusted prevalence ratio with a 95% CI was reported to show an association using a p-value ≤0.05.

Results: One or more chronic complications were presented in 43% of T2D (95% CI: 39.65, 46.19). Macrovascular and microvascular complications were found in 27.6% and 23.5% of patients, respectively. Urban residence (APR = 2.64; 95% CI: 1.54, 4.54), low wealth status (APR = 1.80; 95% CI: 1.17, 2.76), diabetes duration ≥5 years (APR = 1.46; 95% CI: 1.05, 2.01), hypertriglyceridemia (APR = 1.48; 95% CI: 1.07, 2.09) and poor self-care practices (APR = 1.62; 95% CI: 1.18, 2.23) were factors significantly associated with the chronic complications.

Conclusion: The burden of chronic complications was high, with nearly half of T2D patients experiencing one or more chronic complications. Almost one in ten patients suffered from multiple chronic complications. The complications were mainly influenced by being urban resident, low wealth status, and poor self-care practices. Therefore, health care providers need to educate patients and promote self-care practices and healthy lifestyles to achieve treatment goals and lower the risk of chronic complications.

Keywords: chronic complications, type 2 diabetes, Harar, Eastern Ethiopia

Introduction

Type 2 diabetes (T2D) is the most common type of diabetes that highly affects low-and middle-income countries (LMICs).[1] According to the International Diabetes Federation (IDF), an estimated 537 million adults aged 20–79 are living with diabetes while about 240 million have undiagnosed diabetes worldwide.[2]

Even though self-care practice is a key component of diabetes management to prevent patients' morbidity and premature death,[3] it is affected by patients, health care providers, and system-related barriers.[4] Moreover, prolonged hyperglycemia increased the risk of chronic complications.[5,6] These complications are broadly branded into vascular, and

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non-vascular complications.[1] The microvascular complications include neuropathy, nephropathy, retinopathy, and sexual dysfunction.[7] Macrovascular complications occur due to damage to the large vessel, resulting in a stroke, coronary artery diseases, heart failure, and peripheral artery diseases including foot ulcers, gangrene, and lower limb amputations.[8] Most vascular complications are worsened by uncontrolled blood pressure and hyperglycemia with limited access to appropriate diabetes care.[9] Gastroparesis, skin changes, hearing loss, and infections are non-vascular complications and a significant proportion of patients also had multiple chronic complications.[10–12]

Globally, about 6.7 million adults die because of diabetes-related complications.[2] Cardiovascular disease is a major cause of premature morbidity and mortality.[7,13,14] Diabetes also increases the risk of tuberculosis, pneumonia, sepsis, dental diseases, and birth complications.[15,17] Most of these complications likely occur during a productive time of life that results in extensive economic sequelae.[7,18] Diabetes also affects people's quality of life[19] and drains healthcare systems.[18] Specifically, vascular complications, hyperlipidemia, obesity, and erectile dysfunction are rampant in Sub-Saharan Africa including Ethiopia.[16,20–22]

The Ethiopian Federal Ministry of Health has made several steps to mitigate its impacts, through developing a national strategic plan for prevention and control,[23] conducting a countrywide survey to identify common risk factors for non-communicable diseases (NCDs),[24] and advocating for small-scale studies that would generate local evidence.[12,21,25] Following that, studies conducted in different parts of the country showed a considerable burden of chronic complications, ranging from 24.5% to 42.5% among adult patients with diabetes.[10,11,26] Other studies also found that sociodemographic, clinical, and behavioral factors influence diabetes complications.[10,11,27–31]

Some of the studies done so far in Ethiopia largely focused on microvascular complications[32–35] while one study assessed only hypertensive heart diseases, heart failure, and stroke from numerous macrovascular complications.[36] To the best of our literature review, both macrovascular and non-vascular complications remained less explored. There was also a scarcity of information about factors relevant to chronic complications in the study area. Therefore, this study aimed to determine the burden, and factors related to chronic complications among patients with T2D on follow-up in Harar, Eastern Ethiopia. The findings of this study are thought to have significant implications for health planners, and implementers to draw tailored strategies that prevent, and mitigate the impact of diabetes-associated chronic complications.

Materials and Methods

Study Setting and Design

A cross-sectional study was conducted among patients with T2D at two public health hospitals in Harar over four months until March 30, 2021. Harar city is in eastern Ethiopia, which is 526 kilometers away from Addis Ababa. Hiwot Fana Specialized Comprehensive Hospital and Jugal General Hospital are public hospitals that offer health services in each department for the entire community of Eastern Ethiopia and neighboring regions and zones. In addition to other services, there are established chronic follow-up clinics that provide services such as regular blood glucose tests, medication refills, and complication screening for 1985 diabetes patients (1333 T2D were attending their care at Jugal General hospital, whereas 652 were attending their care at Hiwot Fana Specialized Comprehensive Hospital). Nurses are among the frontline team of allied disciplines involved in delivering care for patients with diabetes.

Population, Sample Size, and Sampling Strategy

The sample was recruited from adult T2D patients (age ≥18 years) who had at least three follow-up appointments at Hiwot Fana Specialized Comprehensive Hospital and Jugal General Hospital for pharmacological therapy and blood glucose monitoring. However, two patients with T2D with severe illness and hearing impairment were excluded from the study as they might not accurately respond to our questions and could not give valid consent. The required sample size was estimated by Epi Info version 7 using single and double population proportion formula, where Zα/2=1.96; d=0.05; P= 61%,[21] and the sample size was 402 with a 10% non-response rate. Then the sample was also estimated for the subsequent objective using a 95% confidence level, 80% power, 1.59 odds ratio, one-to-one ratio, 34.6% (unexposed), and 45.7% (exposed). The calculated sample size was 712, which was higher than the initial, but less than other

objectives of our project. As a result, the largest sample size was taken for this study; that was 891. Then, based on the caseloads of each hospital, a proportional allocation was done. Accordingly, 598 T2D patients were selected from 1333 patients on follow-up at Jugal General Hospital, whereas 293 were selected from 652 T2D patients on follow-up at Hiwot Fana Specialized Comprehensive Hospital. Finally, utilizing a systematic random sampling technique, study participants were randomly selected every two cases after the first case was nominated by the lottery method.

Measurements, and Data Collection Methods

We employed three data collection strategies. Firstly, participants' demographic information, clinical characteristics (diabetes duration, family history of diabetes, current regimen, and comorbidity),[37,38] and self-care practice (physical activities, dietary plan, medication adherence, blood glucose monitoring, foot care, smoking behaviors, and alcohol use) were collected by interviewing eligible participants using pre-tested, semi-structured questionnaires developed after reviewing various literature.[39] A wealth score was computed using principal component analysis (PCA) from 23 variables including household assets, farmland, and animals.[40]

Secondly, blood pressure (BP) measurements were carried out using a digital automated BP monitor (Model UA-767F/UA-767FAC, manufactured by A and D Company, Limited, Japan) while patients were sitting after resting for at least 15 minutes. The measurement was performed on a left arm with the elbow supported and the palm facing upward. BP measurements were taken three times in a 3-minute interval, and the mean of the second and third readings was recorded.[41] BP measurement ≥140/90 mmHg indicates raised BP or hypertension.[42]

Anthropometric data such as height, body weight, hip circumference, and waist circumference were collected using standard procedures and calibrated instruments at the end of the interview. The height was measured using a stadiometer with the patient barefoot, hair gear removed, and the patient's face away from the wall, looking straight ahead with their heels together and the back as straight as possible. The head, shoulders, buttocks, and heels were kept in contact with the vertical surface, and the height measurement was recorded to the nearest 0.1cm. Similarly, the body weight was measured with the patient barefooted and wearing light clothes using a Seca 803 digital body weight scale made in Japan and measuring to the nearest 0.1 kg. BMI was calculated as a patient's weight in kilograms; divided by height in meters squared (kg/m^2) after data collection. BMI was categorized into four: underweight (BMI <18.5 kg/m^2), normal (BMI=18.5–24.9 kg/m^2), overweight (BMI=25.0–29.9 kg/m^2), and obese (BMI ≥30 kg/m^2).[41]

Waist circumference (WC) was measured in centimeters using a fixed tension tape at the midpoint of the line between the lower margin of the last palpable (12th) rib and the top of the iliac crest (hip bone) over the light clothing without compressing the skin. The measurement was taken at the end of an expiration with the arms relaxed at the sides, and the measurement was recorded to the nearest 0.1 cm. The WC measurements were classified based on cutoffs recommended by the WHO into three health risk categories: low risk (men, WC =93.9 cm or less; women, WC =79.9 cm or less); increased risk (men, WC =94.0–101.9 cm; women, WC =80.0–87.9 cm); and high risk (men, WC =102.0 cm or more; women, WC =88.0 cm or more). Hip circumference (HC) was taken around the maximum circumference of the buttocks while the patients were standing with their feet together with weight evenly distributed over both feet and holding their arms relaxed at the sides. The hip circumference was measured using an inelastic measuring tape and recorded to the nearest 0.1 cm. Then waist-hip ratio (WHR) is calculated by dividing WC by HC in centimeters. The cutoff point used for WHR was ≤0.9 for males and ≤0.85 for females.[41]

Thirdly, biochemical data (fasting blood glucose, lipid profile), current regimen, diabetes-associated complications, and other co-morbidity were collected from the respective patients' medical records using the checklist. Three most recent fasting blood glucose measurements were collected to determine glycemic levels, which were classified into two categories: optimal glycemic control (average fasting blood glucose of 80–130 mg/dL), and suboptimal glycemic control (average FPG of <70 mg/dL and >130 mg/dL).[43]

A chronic complication was the outcome variable of the study, and related data were collected through medical record review. All kinds of chronic complications diagnosed and recorded on the patient's chart by a physician were collected to pre-designed checklists. The presence of at least one vascular or non-vascular complication was considered to have a chronic complication. In addition, the data on chronic complications were computed and count data were generated for further analysis. Microvascular complications include neuropathy, nephropathy, sexual dysfunction, and retinopathy.

Hypertension, angina, myocardial infarction, stroke, transient ischemic attack, heart failure, foot ulcers, skin, and feet/leg problems are macrovascular complications whereas non-vascular complications include gastroparesis, hearing loss, skin problems, infections other than skin, tooth, and gum problems.[10,44,45] The absence of any of these chronic complications was taken as no complication.

Statistical Analysis

The data were entered into Epidata software version 3.1. The statistical analysis was done using Stata version 14.0. Descriptive statistics were used to summarize the overall data. The data about chronic complications were computed to generate numbers of chronic complications (count data) ranging from zero to four. A Poisson regression model was fitted to identify the independent predictors of chronic complications in patients with T2D. Poisson regression model assumes that the mean and variance are the same. However, the data showed under dispersion, meaning the variance is smaller than the mean. Therefore, generalized Poisson (GP) is recommended for under-dispersed count data.[46,47] Adjusted Prevalence Ratio (APR) with a 95% confidence interval was used to report association. A statistical significance was declared at a p-value ≤0.05. Hosmer and Lemeshow goodness-fit-tests indicated model fitness (P-value=0.6588). The mean-variance inflation factor was 1.17 which did not demonstrate the existence of collinearity/multicollinearity among independent variables.

Results

Socio-Demographic Characteristics

Most of the study participants, 493 (56.1%) were females. The mean age was 52.7±13.3 years. Four hundred forty-seven (50.9%) were older than 55 years while 352 (40.0%) had not received formal education. More than four-in-five of the participants, 714 (81.2%) were married, and a little above three in four, or 684 (77.8%) were urban residents. Five hundred seventy-seven (65.6%) had health insurance for their medical expense (Table 1).

Clinical Related Characteristics

Of all patients with T2D, six hundred-eighty (77.4%) had a diabetes duration of fewer than five years. Almost three-in-four, (74.1%) of patients with T2D had co-morbid conditions. Seven hundred thirty-nine, (84.1%) had no hypertension co-morbidity. About three-in-four (74%) of them had a suboptimal level of glycemic control. Three hundred-eighty (43.2%) patients with T2D were on combination therapy of oral glycemic agents. More than half, (55.5%) were overweight and obese, and 30.3% of them had high total cholesterol levels (≥240mg/dL). In the same manner, about one-third (35.8%) of Patients with T2D had high to very high triglyceride levels (≥200mg/dL). Five hundred-eight (57.8%) had moderate social support (Table 2).

Burden and Patterns of Chronic Complications

Chronic complications were found in 43% of patients with T2D (95% CI:39.65, 46.19), while 12.4% of them had more than one chronic complication (Figure 1).

Among all patients with T2D, 243 (27.6%), 206 (23.5%), and 76 (8%) of them had macrovascular, microvascular, and non-vascular complications respectively. Hypertension was identified in 15.9% of T2D patients, and peripheral neuropathy was found in 6.8%. Non-vascular complications were less common, accounting for only 4.5% of all cases (Table 3).

Factors Associated with Chronic Complications Among Patients with T2D

Bivariate Poisson regression analysis identified that being female, urban resident, having no formal education, low wealth status, disease duration ≥5 years, low social support, use of single oral glycemic agent (OGA), hypertriglyceridemia (>200mg/dL), and poor self-care practices were significantly associated with chronic complications in patients with T2D.

After adjusting for confounding variables, the prevalence of chronic complications was 1.8% higher (APR= 1.80; 95% CI:1.17, 2.76) among low wealth status patients with T2D compared to the high wealth quintile patients.

Table 1 Demographic Characteristics of Patients with Patients with T2D in Eastern Ethiopia, 2020/21 (n=879)

Variables	Category	Frequency	Percent (%)
Sex	Male	386	43.9
	Female	493	56.1
Age, mean ±SD (years)	52.7±13.3		
	18–34	83	9.4
	35–44	128	14.6
	45–54	221	25.1
	55+	447	50.9
Educational level			
	No formal education	352	40.0
	Primary (Grade 1–8)	216	24.6
	Secondary (Grade 9–12)	171	19.5
	Tertiary (12^{+})	140	15.9
Marital status			
	Never married	72	8.2
	Married	714	81.2
	Others (divorcee, widowed)	96	10.6
Occupation			
	Paid employee	209	23.7
	Merchant	74	8.4
	Farmer & Daily laborer	203	23.1
	House-wife	295	33.6
	Others*	98	11.2
Residence			
	Urban	684	77.8
	Rural	195	22.2
Wealth index			
	Low	296	33.7
	Medium	345	39.4
	High	237	26.9
Health insurance			
	No	577	65.6
	Yes	302	34.3

Note: *Others: non-employee, students, and retired.

Similarly, the prevalence of chronic complications was 2.64% higher (APR=2.64; 95% CI:1.54, 4.54) among urban dwellers compared to their counterparts who dwelled in rural. Those who experienced diabetes for five or more years were 1.5 times more likely to develop the number of chronic complications than those with diabetes duration <5 years (APR=1.46;95% CI:1.05, 2.01). The prevalence of chronic complications was 1.5% higher (APR=1.48;95% CI:1.06, 2.08) among T2D patients with hypertriglyceridemia (>200mg/dL) compared to patients who had a normal range of triglycerides level (150–199 mg/dL). Patients with poor self-care practices were 1.6 times (APR=1.62;95% CI: 1.18, 2.23) more likely to develop chronic complications than those with good self-care practices (Table 4).

Discussion

The study found that nearly one in every two patients with T2D experienced one or more chronic complications. A slightly more than one in ten had multiple chronic complications. Each of the vascular complications, macrovascular

Table 2 Clinical Related Characteristics of Patients with T2D in Eastern Ethiopia, 2020/21 (n=879)

Variables	Category	Frequency	Percent (%)
DM duration, years	<5 years	680	77.4
	≥5 years	199	22.6
Co-morbidity	No	656	74.1
	Yes	223	25.4
Hypertension	No	739	84.1
	Yes	140	15.9
Current regimen	Insulin monotherapy	217	24.7
	Insulin + OGAs*	133	15.1
	OGA monotherapy	149	17.0
	OGA combination therapy	380	43.2
Glucometer	No	699	79.5
	Yes	180	20.5
Glycemic control	Optimal	208	24.0
	Suboptimal	671	76.0
BMI	Under weight	13	1.5
	Normal	378	43.0
	Overweight & Obese	488	55.5
Total cholesterol	Normal (<200mg/dL)	517	58.8
	Border line(200–239mg/dL)	96	10.9
	High (≥240mg/dL)	266	30.3
Triglycerides	Normal (150–199mg/dL)	304	36.9
	Border line (150–199mg/dL)	240	27.3
	High & very high (≥200mg/dL)	315	35.8
Social support	Low	101	11.5
	Moderate	508	57.8
	High	270	30.7

Abbreviation: *OGAs, oral glycemic control agents.

and microvascular accounted for one-fourth of the cases. This implies that the burden of chronic complications among the cohort of patients with T2D was considerably high, endangering their lives in various ways. Primarily chronic complications significantly increase the need for medical care, which places an undue strain on families[7] and degrades patients' productivity, quality of life, and life expectancy.[48,49] Aside from that, complications further raise the expense of care, and risks of admission, and result in premature death.[50]

This finding was comparable with the previous studies conducted in Mettu, and Addis Ababa, Ethiopia where 38.5% and 42.5% of patients had chronic complications.[11,26] The similarity could be attributed to the presence of a significant proportion of patients with similar co-morbid conditions and suboptimal glycemic control across the studies, typically associated with chronic complications in T2D patients.[25,51,52] However, the result of this study was lower than other studies conducted in northern Ethiopia, and Nairobi, Kenya.[12,34,53,54] This could be because more than three-quarters of the patients in the current study had shorter diabetes durations, which may minimize the likelihood of chronic complications, and other potential risk factors such as alcohol and smoking were not present. Multiple co-morbidity was also less rampant even if diabetes care quality and efforts towards early detection were inadequate.[55]

Hypertension and peripheral neuropathy were found to be the most common macrovascular and microvascular complications among patients with T2D, respectively. Urban residence, low wealth status, diabetes duration ≥5 years, hypertriglyceridemia (>200mg/dL), and poor diabetes self-care practices were associated with the number of chronic complications.

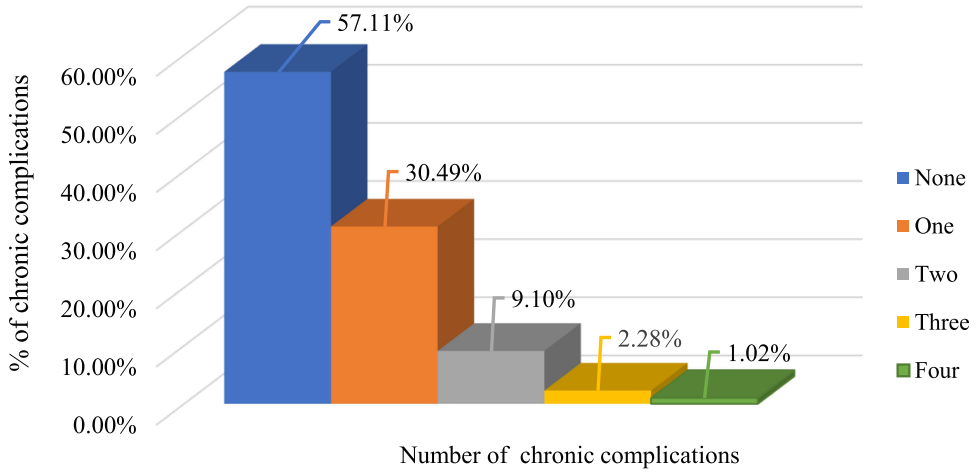

Figure 1 The numbers of chronic complications among patients with T2D in Eastern Ethiopia, 2020/21 (n=879).

The current study's finding demonstrated that low wealth status was found to be associated with chronic complications, which was consistent with a Japanese study that revealed patients with a middle and low income had microvascular complications.[56] A systematic review and a study conducted in China also reported the correlation between a low level of income and vascular, and non-vascular complications in patients with T2D.[27,57] In contrast, longitudinal research in the East of Scotland found no link between socioeconomic status and retinopathy.[58] The measurement of economic status and study design might mediate this difference.

Urban residence was a strong predictor of chronic complications. This finding was supported by a previous study conducted in Ethiopia that showed a significant association between urban residence and chronic complications,[11] whereas studies conducted in Bangladesh and China also reported increased metabolic risk factors with urban residency.[31,59] The similarity might be because people who live in an urban setting have a sedentary life, unhealthy eating practice, less physical activity, and a high rate of obesity which amplify the risk of chronic complications.[59,60] In

Table 3 The Distributions of Chronic Complications Among Patients with T2D in Eastern Ethiopia, 2020/21 (n=879)

Variable	Frequency	Percent
Microvascular complications		
Peripheral neuropathy	60	6.8
Retinopathy	55	6.3
Nephropathy	34	3.9
Sexual dysfunction	57	6.5
Macrovascular complications		
Hypertension	140	15.9
Heart Failure	37	4.2
Coronary heart diseases	30	3.4
Stroke and trainset ischemic attack (TIA)	24	2.7
Peripheral arterial diseases, and diabetes foot	12	1.4
Non-vascular complications		
Tooth and gum problems	37	4.2
Infections other than skin*	26	3.0
Skin problems	13	1.5

Note: *Tuberculosis, and frequent urinary tract infections.

Table 4 Factors Associated with Chronic Complications Among Patients with T2D in Eastern Ethiopia, 2020/21 (n=879)

Variables	n (%)	Chronic Complications	
		CPR (95% CI)	APR (95% CI)
Sex			
Male	386(43.9)	1	1
Female	493(56.1)	1.10(1.05, 2.25)	0.96(0.71, 1.31)
Educational level			
No formal education	352(40.0)	1.08(1.01, 1.19)	1.30(0.81, 2.07)
Primary (Grade 1–8)	216(24.6)	0.99(0.74, 1.33)	0.89(0.56, 1.42)
Secondary (Grade 9–12)	171(19.5)	079(0.56, 1.13)	0.99(0.60, 1.60)
Tertiary (12+)	140(15.9)	1	1
Residence			
Urban	684(77.8)	1.05(1.01, 1.38)	2.64(1.54, 4.54) **
Rural	195(22.2)	1	1
Wealth index			
Low	296(33.7)	1.12(1.04, 2.49)	1.80(1.17, 2.76) *
Moderate	345(39.4)	1.08(1.05, 1.42)	1.19(0.86, 1.66)
High	237(26.9)	1	1
Diabetes duration			
<5 years	680(77.4)	1	1
≥5 years	199(22.6)	1.02(1.00, 1.35)	1.46(1.05, 2.01) *
Current regimen			
Insulin monotherapy	217(24.7)	1.13(0.84, 1.51)	1.46(1.01, 2.12)
Insulin + OGA	133(15.1)	1.09(0.78, 1.53)	1.46(0.96, 2.21)
OGA monotherapy	149(17.0)	1.42(1.05, 1.92)	1.01(0.65, 1.57)
Combination of OGAs	380(43.2)	1	1
Triglycerides			
Normal(150–199mg/dL)	304(36.9)	1	1
Border line(150–199mg/dL)	240(27.3)	1.23(0.89, 1.68)	0.91(0.63, 1.34)
High & very high(>200mg/dL)	315(35.8)	2.04(1.56, 2.66)	1.48(1.07, 2.09) *
Diabetes self-care practice			
Poor	531(65.7)	1.22(1.01, 1.46)	1.62(1.18, 2.23) **
Good	277(34.3)	1	1
Social support			
Low	101(11.5)	1.98(1.37, 2.84)	1.30(0.83, 1.97)
Moderate	508(57.8)	1.21(0.93, 1.57)	0.78(0.53, 1.14)
High	270(30.7)	1	1

Note: Statistical significance: **p<0.001, *P<0.05.
Abbreviation: OGA, oral glycemic agent.

the current study, there was a higher proportion of overweight, obesity, physical inactivity, and suboptimal glycemic control. However, the role of length of residence/urban exposure in increasing the risk of complications among patients with T2D needs further study.

Diabetes duration ≥ 5 years showed an association with chronic complications in this study which was in line with previous studies.[61,62] It was congruent with the finding of the local studies in Debre Tabor, Nekemte Ethiopia, and Sri Lanka where longer duration of diabetes was a predictor of vascular complications.[10,60,63] This might be because as

a disease duration increases, there is increased exposure of blood vessels to hyperglycemia and a cluster of other risk factors which can lead to vascular complications.[64]

Hypertriglyceridemia (>200mg/dL) was associated with chronic complications, which was consistent with the findings of several large studies that found hypertriglyceridemia increased the risk of chronic complications (CVDs).[65] Another study conducted in India reported that triglycerides were significantly associated with neuropathy and retinopathy.[66] This could be due to the inability of large triglyceride-rich chylomicrons to enter the arterial wall which causes endothelial dysfunction, subclinical atherosclerosis, and increase the risk of CVDs.[67] On the other hand, lower triglyceride levels were associated with better endothelial function.[68]

Poor diabetes self-care practices appeared to be another strong predictor of chronic complications. Evidence showed that all dimensions of proper self-care practice were positively associated with optimal glycemic control, lowering the risk of complications and improving the patients' quality of life.[69] Recent studies showed that better diabetes self-care practices improve glycemic control which in turn reduces the incidence of microvascular complications.[70–74] On the other hand, a study revealed that patients with poor diabetes self-care practices had higher rates of microvascular complications such as nephropathy and neuropathy.[75]

Strength and Limitations of the Study

This study has several strengths. It examined the burden and predictors of chronic complications, reflecting the true problem of patients with T2D in the study area. We also used an adequate sample size with robust statistical analysis. However, the study was not without limitations. Causal inferences and temporality could not be established because of the cross-sectional nature of the study. The study employed a review of medical records to determine the burden of chronic complications rather than making a direct diagnosis. Therefore, the inadequacy of records might constrain the study.

Conclusion

Nearly one in every two patients with T2D had one or more chronic complications, influenced by urban residence, low wealth status, longer diabetes duration, hypertriglyceridemia, and poor diabetes self-care practices. The findings suggested the necessity of health policies that reduce socioeconomic disparities to lower the incidence of chronic diabetes complications. It is also crucial to devise an intervention that targets both general risk factors and the social determinants of health. Health care providers should also offer ongoing health information on potential risk factors related to chronic complications for diabetic patients. Moreover, promoting diabetes self-care behaviors demands systematic and integrated approaches.

Ethical Approval

The study protocol was approved by the Institutional Health Research and Ethical Review Committee of the College of Health and Medical Sciences, Haramaya University with Ref. No: IRERC/217/2020). The study participants were recruited voluntarily after receiving sufficient information about the study. All those volunteer participants signed written informed consent. The interview and anthropometric measurements were taken in a separate room to maintain the participants' privacy. Personal identifiers were never used, and all information was kept confidential. We also checked that this study complies with the Helsinki Declaration.[76]

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no conflicts of interest.

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