Research Article

Diabetic Complications among Adult Diabetic Patients of a Tertiary Hospital in Northeast Ethiopia

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Background. The diabetic complications are becoming common community problems. The outcomes of diabetic complications are increased hospitalization, increased direct patient costs, and mortality. In Dessie, the prevalence of the diabetic complications is not well studied so far. Thus, the aim of this study is to assess prevalence of diabetic complications and associated factors among adult diabetic patients of Dessie Referral Hospital, Northeast Ethiopia. *Methods.* Cross-sectional study was conducted in the diabetic clinic of Dessie Referral Hospital from April to May 31, 2013. All diabetic patients who visited the clinic during the study period were included. Data was collected using interview guided self-administered questionnaire. Presence of complications and the type of medications the patient was on were identified through review of patient records. Data were cleaned, coded, and entered into SPSS for Windows version 17.0. Descriptive statistics and chi-square tests were carried out to meet the stated objective. *The Results.* Overall 129 (59.7%) of the patients were found to have been affected by one or more of the diabetic complications. Complications were identified mainly among type II diabetic patients. The age of patients (P value-0.048), type of diabetes (P value-0.00), and medication (P value-0.00) were strongly associated with the occurrence of diabetic complication but self-reported adherence, attitude, and knowledge level of patients and the family history were not associated with the presence of complication. *Conclusion.* The prevalence of complications among diabetic patients in Dessie Referral Hospital was high. Targeted counseling and health information provision to the patients by the clinical staff will be helpful in reducing avoidable morbidity and mortality in the patients.

1. Introduction

Diabetes mellitus (DM) is a group of common metabolic disorders that share the phenotype of hyperglycemia, which are caused by a complex interaction of genetics and environmental factors. It is the leading cause of end-stage renal disease (ESRD), traumatic lower extremity amputations, and adult blindness. It also predisposes to cardiovascular diseases. With an increasing incidence worldwide, DM will be a leading cause of morbidity and mortality in the foreseeable future. The goal of treatment for DM is to prevent mortality and complications by normalizing blood glucose level. But blood glucose level might be increased despite appropriate therapy resulting in complications, such as disturbances in fat metabolism, nerve damage, and eye disease [1–5].

Different studies, in fact, of different methodological quality [6] have documented the complications of diabetes in different setups including hospitals and the community [7–9] including its contributing factors like poor attitude [10–13] and adherence [14–17]. These all affect the treatment outcome and may lead to complications and thus to death [18, 19].

Studies have reported that diabetes and its complications are among the common reasons for inpatient admissions, accounting for about 4.4% [18] of total admissions leading to about 3.4% [20] to 32.5% [19] total deaths. The prevalence of chronic complications varies from 52.0% to 74.2% [7,

TABLE 1: Characteristics of the diabetic patients in Dessie Referral Hospital, 2013.

Variable	Frequency (%)
Sex	
Male	125 (57.9)
Female	91 (42.1)
Total	**216 (100)**
Age	
≤30	53 (24.5)
31–45	51 (29.6)
≥45	112 (51.9)
Total	**216 (100)**
Religion	
Muslim	157 (72.7)
Orthodox	58 (26.9)
Protestant	1 (0.5)
Total	**126 (100)**
Ethnicity	
Amhara	204 (94.4)
Oromo	6 (2.8)
Tigrie	3 (1.4)
Others	3 (1.4)
Total	**216 (100)**
Educational status	
Illiterate	99 (45.8)
1–8	63 (29.2)
9–12	31 (14.4)
Higher education	23 (10.6)
Total	**160 (100)**
Marital status	
Never married	94 (43.5)
Married	93 (43.1)
Divorced	11 (5.1)
Widowed	18 (8.3)
Total	**216 (100)**
Current Job	
Gov't employee	17 (11.8)
Merchant	11 (7.6)
Farmer	43 (29.9)
Retired	12 (8.3)
Housewife	23 (16.0)
Others[**]	38 (26.4)
Total	**144 (100)**
Duration since diagnosed	
<5	93 (43.1)
5–9	79 (36.6)
10–14	24 (11.1)
15–19	8 (3.7)
≥20	12 (5.6)
Total	**216 (100)**
Monthly income	
<100 birr	185 (85.6)
100–199 birr	6 (2.8)
200–299 birr	4 (1.9)

TABLE 1: Continued.

Variable	Frequency (%)
300–499 birr	12 (5.6)
>500 birr	9 (4.2)
Total	**216 (100)**

Others: [**] *student, mechanic, daily laborer.*

TABLE 2: The regimen and specific drugs used to manage types I and II diabetes in Dessie Referral Hospital, 2013 (*n* = 216).

	Frequency (%)
Regimen	
Oral hypoglycemic agents	111 (51.4)
Insulin only	102 (47.2)
Oral hypoglycemic agents and insulin	3 (1.4)
Specific drugs	
NPH[**] insulin	102 (47.2)
Glibenclamide and metformin	62 (28.7)
Metformin	31 (14.4)
Glibenclamide	18 (8.3)
Metformin and NPH insulin	3 (1.4)
Total	**216 (100)**

NPH[**] *neutral protamine Hagedorn.*

8, 21, 22]. The most common chronic complications were erectile dysfunction (64%) [23], visual disturbance (33.8%) [7], and cardiovascular disorders (30.1%) [22], though hypertension alone was (68%) [24], neuropathy (29.5%) [7], and nephropathy (15.7%) [7]. Likewise acute complications had similar trend which ranges 30.5% among which diabetic ketoacidosis (DKA) was 71%, followed by hypoglycemia (19.4%) but hyperosmolar hyperglycemic state (HHS) was insignificant [7]. The common risk factors for occurrence of complications were gender [10], long duration with diabetes [21], poor and inadequate glycemic control [9], negative attitude towards diabetes [9, 11, 25, 26], poor treatment adherence [14, 27, 28], and poor knowledge about the disease and its management [9, 11]. Thus, better understanding of perceptions and attitudes among both patients and providers is needed to guide initiatives to improve the management of diabetes [6, 16].

Hence, the common causes of diabetic complications are poor control of diabetes either due to nonadherence, poor attitude towards the disease and its complications, unhealthy diet, and insufficient physical activity, and due to poor management by the health care professionals [10, 18, 29, 30]. On top of these complications diabetes can predispose the patient for different infections [7, 19, 21, 31, 32]. The final outcome of diabetes is a disability, and/or death [19, 21, 29, 32], and of course has great economic impact which is direct (medical and treatment costs) and indirect (costs of hospitalizations, loss of vision, lower extremity amputations, kidney failure, and cardiovascular events) [33, 34]. Thus, prevention is most cost effective than treatment and management of diabetic complications [35, 36].

Most of the studies cited above are from the developed countries [30, 35, 37]; to our knowledge such studies are

TABLE 3: Distribution of variables based on the type of diabetes in Dessie Referral Hospital, 2013 ($n = 216$).

S. no.	Variables	Type of diabetes		Total
		Type I (%)	Type II (%)	
1	**Is there complication?**			
	Yes	24 (35.8)	105 (70.5)	129 (59.7)
	No	43 (64.2)	44 (29.5)	87 (40.3)
	Total	**67 (100)**	**149 (100)**	**216 (100)**
2	**Sex of patients**			
	Male	41 (61.2)	84 (56.4)	125 (57.9)
	Female	26 (48.8)	65 (43.6)	91 (42.1)
	Total	**67 (100%)**	**149 (100)**	**216 (100)**
3	**Age category**			
	<30	31 (46.3)	22 (14.8)	53 (24.5)
	31–45	24 (35.8)	27 (18.1)	51 (23.6)
	>45	12 (17.9)	100 (67.1)	112 (51.9)
	Total	**67 (100)**	**149 (100)**	**216 (100)**
4	**Family history of patients**			
	Present	17 (25.4)	16 (10.7)	33 (15.3)
	No family history	47 (70.1)	124 (83.2)	171 (79.2)
	I don't know	3 (4.5)	9 (6.0)	12 (5.6)
	Total	**67 (100)**	**149 (100)**	**216 (100)**
5	**Category of duration (in years)**			
	<5	21 (31.3)	72 (48.32)	93 (43.1)
	5–9	37 (55.2)	42 (28.2)	79 (36.6)
	10–14	7 (10.4)	17 (11.4)	24 (11.1)
	15–19	0	8 (5.4)	8 (3.7)
	>20	2 (3)	10 (6.7)	12 (5.6)
	Total	**67 (100)**	**149 (100)**	**216 (100)**
6	**Overall knowledge scores**			
	Good	37 (55.2)	71 (47.7)	108 (50)
	Negative/poor	30 (44.8)	78 (52.3)	108 (50)
	Total	**67 (100)**	**149 (100)**	**216 (100)**
7	**Self-reported adherence**			
	Good	19 (28.4)	47 (31.5)	66 (30.6)
	Poor	48 (71.6)	102 (68.5)	150 (69.4)
	Total	**67 (100)**	**149 (100)**	**216 (100)**
9	**Overall attitude scores**			
	Good	37 (55.2)	75 (50.3)	112 (51.9)
	Negative/bad	30 (44.8)	74 (49.7)	104 (48.1)
	Total	**67 (100)**	**149 (100)**	**216 (100)**

lacking in Ethiopia and other similar settings. Thus, this study is aimed at determining the prevalence of diabetes related complications and associated risk factors among diabetic patients of a referral hospital in Northeastern Ethiopia.

2. Methods and Materials

2.1. Study Setting. A cross sectional study was conducted from April to May 31, 2013, in the diabetic clinic of Dessie Referral Hospital, located in Dessie town, northeast Ethiopia, 400 km from Addis Ababa. This hospital is the only referral hospital in the Northeastern part of Ethiopia. There are 165 health professionals working in the hospital. In the hospital there are different clinics among which the diabetic followup clinic is the one serving for treatment and followup of diabetic patients coming to the hospital. The service is provided in the clinic twice a week on every Tuesday and Thursday.

2.2. Study Participants. All diabetic patients visited the adult diabetic clinic of the hospital during the study period. Since all diabetic patients were included in the study, sample size determination and sampling techniques were not used.

2.3. Data Collection Process. Pretested data was collected by four nurses trained for the purpose of the data collection. All

Table 4: Distribution of chronic diabetic complications in Dessie Referral Hospital, April–June, 2013.

S. no.	Complications	Frequency (%)
1	Hypertension	39 (43.3)
2	Visual disturbance	26 (28.9)
3	Neuropathy	13 (14.4)
4	Foot ulceration	4 (4.4)
5	Foot ulceration	4 (4.4)
6	Nephropathy	2 (2.2)
7	Impotence	2 (2.2)
8	Total	**90 (100)**

patients visiting the hospital during the three-month period of data collection period were given the self-administered questionnaires and get interviewed if they do not read and write. Patients who visited the hospital for the second time were excluded from study and the first visit's data was taken. The questionnaire contains 18 knowledge, 19 attitude, and 16 practice related questions in addition to 16 general and sociodemographic questions. In addition the last one-month adherence was assessed based on the patients report. Diagnosis of diabetic complications was done by physician and complications and laboratory results were taken from patient cards. The collected data were cleared and checked every day for completeness and consistency before processing.

2.4. Data Processing and Analysis. Collected data were edited, coded, and entered into SPSS for Windows version 17. Descriptive statistics was computed to determine frequency, means, and standard deviations whereas chi-square tests were carried out to determine the association between variables.

2.5. Ethical Consideration. Prior to the study ethical approval was obtained from the ethical review board of Wollo University. The management of the Hospital was requested for cooperation with a formal letter from Wollo University (WU). During and after the data collection process all hospitals and patient-related data were kept confidential. Each study participant signed written consent to participate in the study.

2.6. Operational Definition and Terms

(i) *Good self-reported adherence*: patients who answered correctly more than or equal to mean score.

(ii) *Poor self-reported adherence*: patients who answered below the mean score.

(iii) *Good attitude*: patients who answered correctly more than mean score.

(iv) *Poor/negative attitude*: patients who answered below the mean score.

(v) *Good knowledge*: patients who answered correctly more than mean score.

(vi) *Poor knowledge*: patients who answered below the mean score.

(vii) *Acute complications*: including diabetic ketoacidosis and hyperosmolar hyperglycemic.

(viii) *Chronic complications*: including vascular (microvascular and macrovascular) and nonvascular complications of diabetes.

3. Results

3.1. Sociodemographic Characteristics of Diabetic Patients. Two hundred and sixteen (216) diabetic patients who came to the followup clinic during the 2-month period of data collection were included in the study. The majority of the patients (57.4%) were males, Amhara by ethnic group (94.4%) and Muslims by religion (72.7%). The median age of the patients was 45 (±17.677) and they were known diabetic patients for the mean duration of 5.00 (±5.70) years (Table 1).

The majority of the patients, 145 (67.1%), were of type II with the remaining 71 (32.9%) being type I patients. The medications used for the treatment of diabetes were oral hypoglycemic agents, 111 (51.39%), either in combination or alone. But it was noted that insulin was used for both type I and II diabetics to manage the complications (Table 2).

3.2. Prevalence of Diabetic Complications among Diabetic Patients. The overall complications were 129 (59.7%) of which 105 (48.6%) were from type II patients. When we see the type specific complications, 105 (70.5%) and 24 (35.8%) were among types II and I diabetes, respectively. Attitude 37 (55.2%) and knowledge levels 37 (55.2%) are better among the type I diabetic patients when compared to type II patients (Table 3).

More than half, 129 (59.7%), of the patients have experienced at least one complication. About 90 (58.8%) and 63 (41.2%) of patients have experienced chronic and acute complications, respectively. Hypertension 39 (43.3%), visual disturbance 26 (28.9%), and neuropathy 13 (14.4%) were the three most common chronic complications in the diabetic clinic (Table 4), whereas the three most common acute diabetic complications were DKA 43 (68.3%), hypoglycemia 15 (28.3.7%), and HHS 5 (7.9%).

3.3. Factors Associated with Diabetic Complications. The age of patients, type of diabetes, the regimen, and specific medications the patient is taking were strongly associated with the presence of complication but it has to be noted that self-reported adherence, attitude and knowledge level of patients, as well as the average blood glucose level, and the family history, were not associated with the presence of complication (Table 5). Close to nine in ten, 183 (86.11%), the three-month average blood glucose level is still elevated.

4. Discussion

This study examines diabetic complications in the diabetic clinic in referral hospital. It is highlighted that diabetic complications are common in the Ward in which the majority were among type II patients and around 41% of patients have

TABLE 5: Association of specific factors with presence of complications among diabetic patients in Dessie Referral Hospital, 2013 ($n = 216$).

Variables	Is there complication?			P value
	Yes	No	Total	
Age of patients				
<30	25	28	53	
31–45	29	22	51	0.048
>45	75	37	112	
Sex				
Male	75	50	125	0.517
Female	54	37	91	
Type of diabetes				
Type I	24	43	67	0.00
Type II	105	44	149	
The regimen the patient is taking				
Oral hypoglycemic agents	78	33	111	
Insulin only	48	54	102	0.001
Oral hypoglycemic agents and insulin	2	1		
Specific drugs				
Glibenclamide	17	1	18	
Metformin	29	2	31	
Glibenclamide and metformin	39	23	62	0.00
NPH insulin	42	60	108	
Metformin and NPH	2	1	3	
Self-reported adherence				
Good	36	30	66	0.303
Poor	93	57	150	
Overall attitude scores				
Good	65	47	216	0.35
Negative/bad	64	40	104	
Overall knowledge scores				
Good	61	47	108	0.203
Poor	68	40	108	

microvascular complications alone or with other macrovascular complications. It is indicated that different factors have been implicated as risks for occurrence of the complications.

In this study, 59.7% of diabetic patients had at least one diabetic complication. This was lower than the finding reported from Jimma, Ethiopia, where 83.00% of the patients had complications [7]. The majority of the complications (48.6%) in this study were among type II patients, which is similar to another study in Jimma (52.5%) and Taiwan (52.6%) [7, 38]. The fact that a diagnosis of complications was made by general practitioners, the sociocultural differences in health seeking behavior and disclosing complications like sexual problems might result in the differences.

In this study, 70.5% of type II patients have at least one complication. This was similar to other studies in Libya (68.7%), Iran (74.2%), and Russia (70.7%) [8, 21, 39]. But it was higher than another study in China (52.0%) [22]. The difference might lie at the level of practice and the attitude and knowledge gap between the patients.

Acute complications occurred in 28.24% of the patients of which 61.71% had diabetic ketoacidosis as a complication at least once. Similar findings were reported by an earlier study in Jimma, Ethiopia [7]. Moreover, diabetic ketoacidosis occurred in both types of diabetic patients [7, 40, 41]. This indicated that diabetic ketoacidosis is the problem of both types I and II diabetes. Hyperosmolar hyperglycemic state occurred in 7.9% of patients in this study. This is high when compared with other studies in different studies which was insignificant or none [7, 8, 22]. The reason might be due to the type of medications to control the blood glucose level and poor integrated effort in the management of patients on top of poor knowledge and attitude of patients.

In this study, chronic complication occurred in more than a third of the patients (58.8%). This is almost comparable with other reports in Jimma (52.5%) and China (52%) [7, 22] but it was lower than reports in Iran (75%) and Libya (68.7%) [8, 22]. Hypertension (43.3%), visual disturbance (25.68%), and neuropathy (14.4%) were the commonest chronic complications in this study. Except hypertension this was similar with the study in Ethiopia (visual disturbance (33.8%), neuropathy (29.5%), and hypertension (24.9%)) but its pattern is totally different than in China [7, 22]. The difference in management

practitioners and the screening practices in different hospitals might have contributed to differences in occurrences of complications doubling with medication selection, poor knowledge, and attitude of patients.

In this study, age of patients, type of diabetes, antidiabetic drugs, and type of diabetes were significantly associated with the occurrences of diabetic complications in the clinic. This was similar with other studies in Ethiopia, Jordan, Libya, and Taiwan, [7, 9, 21, 38].

As limitation of study, it must be noted that this study did not determine severity of complications, and outcomes of the complications. Protein concentration, HbA1c, and direct ophthalmoscopy to detect retinal changes were not performed. Moreover, clinical findings and questionnaire based approaches were used to determine complications and the factors that could affect their occurrences.

In Conclusion. Diabetic complications in Dessie Referral Hospital were prevalent. Type II patients were more prone to complications in the hospital. The contributing factors for occurrences of complications were multiple. There should be training on the management of the diabetic patients and of course screening of complications should soon be starting. Thus, integrated effort should be in place to prevent the development of complications and manage the disease progression.

Conflict of Interests

The authors declare that they have no conflict of interests.

Authors' Contribution

Asrat Agalu Abejew was involved in the design of the study, data analysis, and interpretation of the findings, report writing, review of the report, and paper preparation. Abebe Zeleke Belay was involved in the data analysis and interpretation of the findings, and writing and review of the report. Mirkuzie Woldie Kerie was involved in the review of the final paper. All authors read and approved the final paper.

Acknowledgments

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