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# Diabetic Complications among Follow-up Patients: A Cross-sectional Study at Jimma University Specialized Hospital Diabetic Clinic

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## Abstract

Diabetes mellitus refers to a group of common metabolic disorders that share the phenotype of hyperglycemia. Diabetic complications can be acute or chronic. Acute complications are Diabetic ketoacidosis and Hyperglycemic hyperosmolar state. This study aimed to assess the prevalence of diabetic complications with its associated factors among follow-up patients. A hospital based cross-sectional study was conducted from July 27, to August 11, 2015 at Jimma University specialized hospital, Ethiopia. A total of 160 diabetic patients were included. The study was approved by the university ethical review board. Male to female ratio was 1.86:1, 58.8% of the patients were from rural area and almost half (48.1%) have normal body mass index values. Majority (82%) of the patients were married and 28.2% of the study population were farmers. Type II diabetes was identified in 56.2%, while the rest were with Type I. Poly-symptoms was seen in 61.7% patients initially. Majority (77.5%) of them don't have first and second degree family history of diabetes. Drug adherence, presence of infection and chronic medical conditions were the factors responsible for development of complications. A patient centered educational intervention needs to be done to reduce the complication among patients on follow-up.

**Keywords:** Diabetic complications; Metabolic disorders; Diabetic patients; Diabetic clinic; Jimma

## Introduction

Diabetic Mellitus (DM) refers to a group of common metabolic disorders that has a main characteristic feature of hyperglycemia [1]. It has two broad classifications designated as type I and type II diabetes. Both types of diabetes are preceded by a phase of abnormal glucose homeostasis as the pathologic processes progress [2] Type I DM is the result of complete or near total insulin deficiency. Type II DM is a heterogeneous group of disorders characterized by variable degrees of insulin resistance, impaired insulin secretion, and increased glucose production [3].

The number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014 [4]. The global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014. Diabetes prevalence has been rising more rapidly in middle and low-income countries [5]. Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation [6].

Taking the current trend of the disease more than 360 million individuals will have diabetes by the year 2030. The number of cases of diabetics in Ethiopia was about 800,000 in 2000 and projected that it would increase to about 1.8 million by the year 2030.

Uncontrolled diabetes can lead to a number of short and long-term health complications, including hypoglycemia, heart disease, nerve damage, and amputation, and vision problems [7]. The majority of these diabetes-related conditions occur as a result of uncontrolled blood glucose levels, particularly elevated blood sugar over a prolonged period of time [8,9].

The diverse spectrum of complications are divided traditionally into two main subtypes: the first is the diabetes-specific microvascular complications of retinopathy, nephropathy and neuropathy; the second is the thrombotic macrovascular complications of myocardial infarction, hypertension and peripheral arterial disease. Moreover, as many as 25% of people with type 2 diabetes have evidence of diabetic complications at the time of initial diagnosis [10].

Effective management of diabetes requires sustained glycemic control over many years to lower the risk of macro and microvascular complications in people with diabetes. The UK Prospective Diabetes Study (UKPDS) found that every 1% reduction in glycated hemoglobin (HbA1c) was associated with a 37% decrease in microvascular disease and a 14% reduction in myocardial infarction (MI).

Both acute and chronic complications of DM are causing significant mortality morbidity in developing and developed countries. Chronic complications of DM if once developed are irreversible but early detection and good glycemic control can slow the progression [11].

Diabetes can therefore be a major public health problem. So this study aimed to measure the prevalence of complication among patient on follow-up with those associated factors for better intervention and case management. There can be an early recognition of complications for that slow progression of already established diabetes complication. Based on the findings possible to develop an intervention to make patients aware of the complication for early recognition and improved quality of life on their follow-up [12,13].

## Materials and Methods

### Study Setting

The study was conducted on diabetic patients who have a follow-up at Jimma University Specialized Hospital (JUSH) diabetic clinic. The hospital is situated in Jimma town south west Ethiopia, 335 km away from the capital Addis Ababa to south west of the country. The hospital gives both inpatient and outpatient services through different specializations; of which internal medicine is one with an estimated number of 85 beds and outpatient departments. Chronic care is one of the services given by the hospital [14]. The hospital has an average attendance of 551 patients on follow-up visiting the clinic and out of this 138 are diabetic patients. A facility based cross-sectional study design was used and data were collected from July 27-August 11, 2015.

### Study population

All diabetic patients who have follow-up in Jimma university specialized hospital were taken as a source population and from this selected diabetic patients who visited the diabetic clinic for follow-up and who fulfil the inclusion criteria were included as a study population [15]. Taking the follow-up treatment for at least six months and able to provide consent and communicate with data collectors were the inclusion criteria for this study. Those diabetic patients who did not give consent as well as who were critically ill and unable to communicate were excluded from the study.

### Sample size determination and sampling technique

The sample size was calculated using a single population proportion formulae considering the parameters such as prevalence of DM in Ethiopia as 3.5% [16], at 95% CI and a margin of error 5%. Accordingly the sample size was calculated as 160 including a 10% non-response rate.

$$n = Z\alpha/2(p) (1-p)/d^2$$

Where  $p=0.035$  (prevalence of DM in Ethiopia is 3.5%)

$$D=0.3$$

$$n = 1.962 \times 0.035 (1-0.035) = 145$$

$$0.032$$

When 10% non-response rate is added

$$n = 145 + 15 = 160$$

A systematic random sampling technique was used taking the list of DM patients as a sampling frame from the updated DM clinic registry of the hospital.

### Variable definitions

The outcome variable used in this study was complications of DM, while the independent variable includes sociodemographic characteristic (age, sex, religion, ethnicity, educational status, occupation, place of residence and marital status), family history, medical conditions (types of medications used, treatment adherence, type of DM, duration of diagnosis for DM, history of repeated admissions, age at first diagnosis of DM, other comorbidities)

### Measurement

The data were collected using a pre-tested structured questionnaire that has two parts. The first part was on socio demographic characters and part two was on risk factors for development of DM complications with closed ended questions [17]. The data were collected by four medical interns who were trained about the objectives of the study and the data collection procedures. The instrument was translated in to the local language of Afan Oromo and Amharic then it was back translated to check for its consistence.

### Data Quality Control

The data collection instrument was pre-tested on 20 diabetic patients to ascertain the contents and clarity of the questionnaire. The questions were designed based on one-to one interview. Initially the data were assessed to understand its quality challenges. Data were checked on daily basis for its completeness [18].

### Data Analysis

The data entry and analysis were performed using IBM statistical package for social science (SPSS) version 20. Descriptive statistics such as frequencies, percentage and charts were used. Chi-square or Fischer's exact test statistical methods were used as appropriate to test association between categorical variables. Multivariable logistic regression analysis, adjusting for age was performed to predict factors associated with complications of diabetic complication. P value less than 0.05 was considered to declare s statistically significant associations [19,20].

### Ethical considerations

Before the data collection an ethical clearance was obtained from Jimma university ethical review committee. Medical school coordinating office of the university also sent a letter of cooperation for the hospital. All higher officials in the hospitals were communicated about the study objectives. Participation was on voluntary basis. All patient related date were kept confidential and only summary measure were used than personal identifiers.

## Limitations of the Study

Some patients were not cooperative because of their health conditions and the overcrowding appointment. The cross-sectional nature of the study may not suitable to establish a cause effect relationship between variables regarding the complications of DM.

## Results

A total of 160 diabetic patients were included in the study and from this 65% of the patients were male, while the rest were female. More than half (58.8%) of them were from rural area and 47.8% were in the age group between 18-49 and the rest 46.7% were above 50 years.

Nearly half (51.3%) of the patients were Muslim, Majority (65%) were Oromo. Majority (81.9%) of the patients were married and 28.2% were farmers in their occupation. Regarding their educational status 22.5% were illiterate, while, 30% were in grades 1-8. Almost half (48.1%) of the study population have normal BMI value, 11.25 % of them are under weight, 31.25% were overweight, 8.1% are obese and the rest 1.3% were extremely obese (Table 1).

**Table 1:** Sociodemographic characteristics of diabetic patients who have follow-up in JUSH, Jimma town, SW Ethiopia.

Parameters	No	%
Female	56	35
Male	104	65
Urban	66	41.2
Rural	94	58.8
Illiterate	36	22.5
Read write	20	12.5
Grade 1 – 8	48	30
Grade 9 – 12	29	18.1
Grade >12	27	16.9
<18 yrs.	9	5.6
18 – 49 years	76	47.5
>49	75	46.9
Muslim	82	51.3
Orthodox	62	38.7
Protestant	16	10
Oromo	104	65
Amhara	25	15.6
Gurage	11	6.9
Dawro	7	4.4
Yem	7	4.4
Others	6	3.7

Under weight	18	11.25
Normal	77	48.1
Over weight	50	31.25
Obese	13	8.1
Extremely obese	2	1.3
Single	16	10
Married	131	81.9
Divorced	9	5.6
Widowed	4	2.5
Farmer	45	28.2
House wife	36	22.5
Government employee	33	20.6
Private sectors	20	12.5
Retired	5	3.1
Student	9	5.6
Other	12	7.5

From the total of 160 patients who are on follow-up in JUSH diabetic patients 22.5% of them have first or second degree family history of diabetes and 77.5% don't have family history. 56.2% of the study population are diagnosed to have Type 2 DM and 43.8 % are Type 1 Diabetics. 6.9% of the patients know that they are diabetic since a year back, most of them (75%) stayed with the illness for 1–10 years and the rest 17.3 patients are diabetic for more than 10 years.

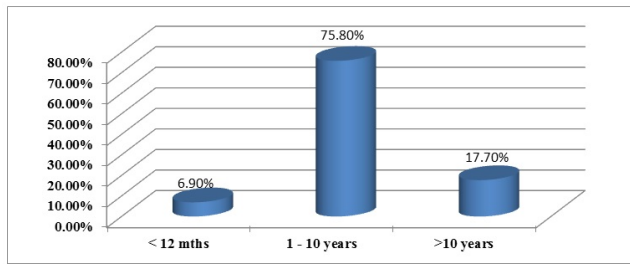
Majority (61.9%) of the patients were initially diagnosed to have diabetes when they visited health institutions for poly symptoms, 21.9% of them presented with complications of diabetes like DKA and foot ulcer and the rest 16.2% were diagnosed to have diabetes while they visit health institutions for other reason.

Regarding the type of medications patients are using, 36.9% of them are taking insulin, 53.1% are taking oral glucose lowering agents and the rest 10% of the patients are taking both insulin and PO medications. 73.75 % of the patients have good drug adherence, 25% have fair and only 1.25% of them have bad drug adherence (Figure 1).

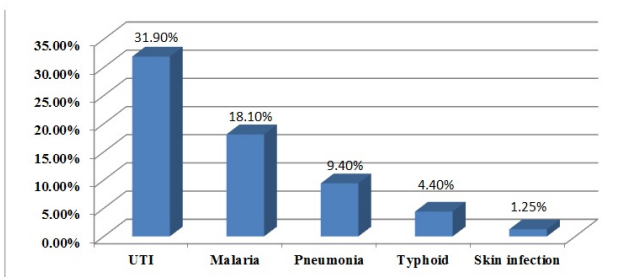
Among the patients on follow-up 38.75 % have hypertension and 2.5% percent have Asthma and 1.25% of them has cardiac problem. In the study chronic co morbidities have found to be associated with the development of DKA (Figure 2). Out of 160 patients 31.9% of them were diagnosed to have UTI and 18.1% have at least one malarial attack. 5.6% of the patients have undergone major surgery.

All documented acute complications of DM in JUSH diabetic clinic is DKA. The prevalence of DKA in this study is 22.5% and 18.1% of the total study population has developed DKA only once and other 4.4% has developed DKA twice (Figure 3).

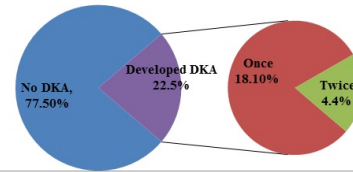
Among those who developed DKA, in 68.75% of them it was the initial presentation diabetes, 3.75% developed DKA after 1-12 months of diagnosis of DM and the rest 29.4% developed one year after DM diagnosis. From those who developed DKA 13.75% of patients were taking oral glucose lowering agents, 10% insulin and 7.5% were taking other herbal medications and on dietary modification before developing DKA (Figure 4).



**Figure 1:** Duration of diabetes among diabetic patients who are in follow-up, JUSH, Jimma town, Oromia region, SW Ethiopia.

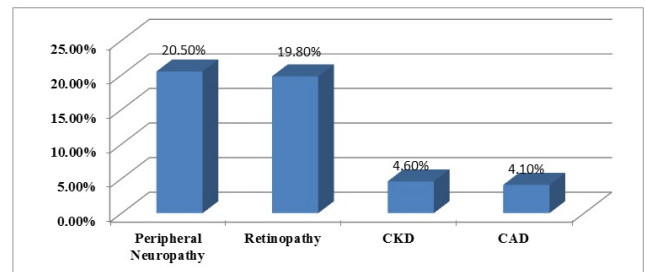


**Figure 2:** Prevalence of infections among diabetic patients who have follow-up in JUSH, Jimma town, Oromia region, SW Ethiopia.



**Figure 3:** Prevalence of DKA among diabetic patients who are on follow-up in JUSH, Jimma town, Oromia region, SW Ethiopia.

Among major chronic complication in patients who are on follow-up peripheral neuropathy accounts for 20.5% patients, retinopathy accounts for 19.8% and CKD accounts for 4.6% (Table 2).



**Figure 4:** Prevalence of chronic complications of diabetes among diabetic patients who has follow-up in JUSH diabetic clinic, Jimma town, Oromia region, SW Ethiopia.

The study showed that there is significant association between DKA and the patients' drug adherence, type of diabetes and presence and absence of infections. In the study place of residency, literacy status, body habitus and presence of chronic medical condition are shown not to be associated with development of DKA (Table 3).

**Table 2:** Association between acute DM complication and Sociodemographic characteristics among diabetic patients who have follow-up in JUSH, Jimma town, Oromia region, SW Ethiopia.

Parameters	Acute complication	No acute complication	Total	P Value	OR
Urban	13	53	66	0.4768	0.7572
Rural	23	71	94		
Illiterate	6	30	36	0.1098	
Read and write	9	11	20		
Grades 1-8	10	38	48		
Grades 9-12	7	22	29		
12 completed	4	23	27	0.0002	
Good adherence	20	95	115		
Fair adherence	15	28	43		
Bad adherence	1	1	2		

Type 1 DM	24	46	70	0.0016	3.3913
Type 2 DM	12	78	90		
Normal BMI	15	62	77	0.3783	0.7143
Abnormal BMI	21	62	83		
Has co morbidities	17	48	65	0.3599	1.4167
No co morbidities	19	76	95		
Infections present	28	40	68	0.0000	7.35
No infections	8	84	92		

According to the study level of patients' drug adherence, the type of diabetes and presence of chronic co morbidities have affected the development of chronic diabetes complications and

on the other hand place of residency, educational status, body habitus and presence or absence of infection were no associated with the development of chronic diabetic complication.

**Table 3:** Association between chronic DM complication and Sociodemographic characteristics among diabetic patients who have follow-up in JUSH, Jimma town, Oromia region, SW Ethiopia.

Parameters	Chronic complication	No chronic complication	Total	P value	OR
Urban	19	47	66	0.8948	0.9529
Rural	28	66	94		
Illiterate	7	29	36	0.5477	
Read and write	5	15	20		
Grades 1–8	16	32	48		
Grades 9–12	9	20	29		
12 completed	10	17	27	0.0103	
Good adherence	27	91	118		
Fair adherence	19	21	40		
Bad adherence	1	1	2	0.0001	0.2019
Type 1 DM	9	61	70		
Type 2 DM	38	52	90	0.8589	1.0471
Normal BMI	23	54	77		
Abnormal BMI	24	59	83	0.0019	2.9872
Has co morbidities	28	37	65		
No co morbidities	19	75	95	0.7190	1.1342
Infections present	21	47	68		
No infections	26	66	92		

## Discussions

The study showed that almost two third (65%) of the patients who came for follow-up are male. In a survey done on different hospitals in Ethiopia there is proportional distribution in some places and in others the proportion inclined to either one of the sexes [21-22]. In this study among patients at Jimma University specialized hospital 67% of the patients were male. These differences, however, might be explained by the availability of study subjects during study period.

About two third of the patients initially presented with poly symptoms and other quarter of them presented with complication of DM. This data is comparable with world other studies that poly symptoms are the commonest presenting symptom [23].

More than half (56.2%) of the study population are diagnosed to have Type 2 DM and 43.8 % are Type 1 Diabetics. In a study done in Minilik II hospital, Addis Ababa Ethiopia, from a total of 283 patients about 43.1% of the patients were Type 1 diabetic

and the rest 56.9% were Type II. The finding is almost similar with this study [24].

Urinary tract infection is the commonest infection seen those patients included in this study. In a study conducted in different parts of Ethiopia showed that UTI is the commonest infection but the prevalence is a little higher in this hospital [9-11]. In this study DKA is more associated with Type 1 DM. Type 1 diabetic patients are more prone to develop DKA because to develop DKA absolute insulin deficiency is necessary and in Type 2 DM it is relative deficiency of insulin with insulin resistance.

In the study drug adherence is significantly associated with the development of DKA. Omission of drugs or discontinuation of follow-up and medications are one of the precipitating causes of DKA. Infections are significantly associated with the development of DKA. Most of the time infections of different origin are associated with the development of DKA. Also the study showed that DM patients with high rate of infection are at greater risk of developing DKA.

Peripheral neuropathy accounts for 20.5% patients, retinopathy 19.8% and CKD accounts for 4.6%. When this result is compared with other similar study findings retinopathy accounts for 20% to 40% of chronic diabetic complication. And 50% of diabetic patients will develop neuropathy in their life time. Incidence of retinopathy is comparable with the above data and the discrepancy between the developments of neuropathy is that the above figure is life time risk but this study findings is prevalence at a given time. Drug adherence has significant association to the development chronic diabetic complications in this study. Development of chronic complications depends on duration of diabetes and degree of hyperglycemia which in turn depends on the patients' drug adherence.

The type of diabetes and presence of chronic medical conditions have affected the development of chronic complications among diabetes patients on follow-up in Jimma University specialized hospital. Medical condition including hypertension has similar chronic complication as diabetes. So co-existence of this two medical condition has additive effect on the development of chronic diabetic complication. Since chronic complications need at least a decade to develop, it's not possible for type one diabetic patient to develop this complication at the time of diagnosis. But chronic complications are common at the time of diagnosis of type two diabetes due to the chronicity of the disease before diagnosis.

## Conclusions

Most of the patients included in the study were male and almost all are above 18 years of age. More than half of the study population were Muslims and Oromo. Type of diabetes and treatment adherence has affected the development of both acute and chronic diabetic complications. Presence of infection has significantly affected development of acute complications while chronic medical conditions have association with chronic diabetic complications.

Place of residency, educational status and body habitus are associated with development of neither acute nor chronic diabetic complications in Jimma University specialized hospital diabetic patients.

Only quarter of the study population have first and second degree family history of DM and in three fourth of the patients the duration of illness in between 1-10 years. Poly symptoms are the commonest initial presentation of diabetes.

Type 1 diabetes is more common than type 2 and oral glucose lowering agents are the commonly prescribed drugs. Most of the patients have good drug adherence.

The prevalence of acute diabetic complication among the study population was 22.8% while that of chronic complication is 29.4%. Peripheral neuropathy, retinopathy and CKD are the most prevalence chronic complications of diabetes while DKA is the most prevalent acute diabetic complication.

## Recommendations

As many of the episodes of DKA are preventable, regular health education, tight metabolic control, with adequate provision of insulin will reduce number of cases of DKA. Jimma University specialized hospital and Jimma zone health bureau should work on health education about medication adherence, infection prevention, good control of chronic co morbidities because the data showed that this conditions have strong association with the development of both acute and chronic diabetes complications. The physician in charge of a suspected patient should take as much history as possible and do exhaustive physical examination, determine routine investigations to identify the precipitating cause as it is important for the current and subsequent management of the cause.

## References

1. Fostor DW (2012) Harrison's principle of internal medicine (18th edtn), Diabetic Mellitus 2060-2087.
2. Teshome D (1992) Diabetic keto acidosis precipitating factors and clinical profile. A children's Hospital Ethip Med J 30: 7-11.
3. John P, Williams G (1987) Textbook of diabetes. Public health problems of diabetes and its cost to the community. Blackwell scientific publications 30-35.
4. Alberti KG, Hockaday TD (1977) Diabetic coma: A reappraisal after five years. Clin Endocrinol Metab 6: 421-455.
5. Liment P (1978) Diabetes in pacific population a price for westernization in proceeding of the 6th Asia and oceania congress of the endocrinology, Singapore: 256- 265.
6. Litwak L, Goh SY, Hussein Z, Malek R, Prusty V, et al. (2013) Prevalence of diabetes complications in people with type 2 diabetes mellitus and its association with baseline characteristics in the multinational study. Diabetol Metab Syndr 5: 57.
7. (1985) WHO study group. Diabetes Mellitus Technical report series No 727, WHO Geneva.
8. Gebre MW (2013) Diabetes mellitus and associated diseases from Ethiopian perspective: Systematic review. Ethiop J Health Dev 27.

9. Laser FT (1988) Diabetic ketoacidosis in Addis Abeba hospital: Precipitating factors and prognosis. *Ethiop Med J* 2.
10. Ijigu A (2000) Patterns of chronic complications of diabetic patients in Menelik II hospital, Ethiopia. *Ethiop J of Health Dev* 14: 113-116.
11. Mengistu W (2004) Unpublished data JUSH.
12. Worku D, Hamza L, Woldemichael K (2010) Patterns of diabetic complications at jimma university specialized hospital, Southwest Ethiopia. *Ethiop J Health Sci* 20: 33-39.
13. Abejew AA (2015) Diabetic complications among adult diabetic patients of a tertiary hospital in northeast ethiopia. *Adv Pub Health* 7.
14. Heydaria I (2010) Chronic complications of diabetes mellitus in newly diagnosed patients. *Int J Diab.*
15. Butalia S, Johnson JA, Ghali WA, Rabi DM (2013) Clinical and socio-demographic factors associated with diabetic ketoacidosis hospitalization in adults with Type 1 diabetes. *Diabet Med* 30: 567-573.
16. Lester FT (1984) Clinical pattern of diabetes mellitus in Ethiopians 6-10. *Diabetes Care* 7: 6-11.
17. Arefaina F (1981) Analysis of diabetic patients. A student research.
18. Peters WH (1982) A study on the prevalence of diabetes mellitus in North Ethiopia (Gonder survey). *Dtsh Gesundheitswee* 38: 1283-1288.
19. (1994) WHO study group. Prevention of diabetes mellitus WHO Technical report series No. 844. Geneva 11.
20. Molineaux L, Plord J, Dasony J (1969) Analysis of Medical admissions to Gonder hospital 1963-65. *Ethiopia Med J* 5: 47-65.
21. Brhane S, Jemal A, Fissheatseon G, Bekele A (1999) Analysis of diabetic patients, Tikuranbesa Hospital 1987-1994. *Ethiop J Health Dev* 13: 9-13.
22. Savage MW, Dhatariya KK, Kilvert A, Rayman G, Rees JAE, et al. (2011) Joint British Diabetes Societies guideline for the management of diabetic ketoacidosis. *Diabet Med* 28: 508-515.
23. Tractenberg DE (2005) Diabetic Ketoacidosis. *Am Fam Physician* 71: 1705-1714.
24. Umpierrez GE, Murphy MB, Kitabchi AE (2002) Diabetic ketoacidosis and hyperglycemic hyperosmolar syndrome. *Diabet Spec* 15: 28-36.