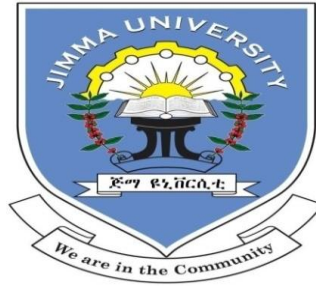


Reasons for hospitalization, treatment outcome and predictors in adult diabetic patients at Jimma University Specialized Hospital, Southwest Ethiopia: A prospective observational study



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Jimma, Ethiopia

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Abstract

Back ground: Diabetes Mellitus is a global public health problem, with the major increases in prevalence expected to occur in developing countries. It has been reported that diabetic patients had frequent hospitalization compared with non-diabetics and associated with increased morbidity, mortality and health care expenditure. Despite this, there is scarcity of data on hospitalization pattern and treatment outcome among diabetic patients in Ethiopia, particularly at Jimma University Specialized Hospital.

Objective: The objective of this study was to assess reasons for hospitalization, treatment outcome and their predictors in adult diabetic patients at Jimma University Specialized Hospital

Method: A hospital based prospective observational study was conducted at medical and surgical wards of Jimma University Specialized Hospital from February 21 to June 30, 2015. The study outcome variables were reason for hospitalization, treatment outcome and predictors. All adult patients with the diagnosis of diabetes who meet the inclusion criteria were included in the study. Data was collected using pretested abstracting format. Logistic regression was used to determine predictors of diabetes related hospitalization and treatment outcome by taking statistical significance of $p < 0.05$.

Result: A total of 89 patients admitted to medical (84.27%) and surgical (15.73%) wards were enrolled in the study, of which 59.55% were male, with the mean age 46.86 ± 15.52 years. Type 2 diabetic patients accounted for 74.16%. One third (33.71%) of patients were hospitalized with diabetic ketoacidosis. Other common reasons for hospitalization were infections (19.10%) and cardiovascular diseases (17.98%). Duration of hospital stay ranged from 1 to 88 days, with median duration of 9 days. Seventy six percent of patients were discharged with improvement and in hospital mortality rate was 11.24% which was higher in patients admitted due to infections. Type 1 diabetes was found to be an independent predictor of diabetes related admissions (AOR=5.23, 95%CI: 1.36-20.11) while knowledge of complications (AOR=3.33, 95% CI: 1.22-9.09), insulin (AOR=4.55, 95%CI: 1.29-16.03) and enalapril (AOR= 5.78, 95%CI: 1.69-19.75) therapy before admission were inversely related with diabetes related admission. Diabetic related admission was an independent predictor of good treatment outcome (AOR=5.69, 95%CI: 1.42-22.90).

Conclusion: In general, patients were commonly hospitalized due to diabetic complications primarily due to diabetic ketoacidosis. The other two common reasons for hospitalizations were infections and cardiovascular diseases. In hospital mortality was high in patients admitted with infections. Diabetic related admission independently predict outcome.

Keywords: reasons, hospitalization, diabetic patients, Ethiopia

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Abbreviations and Acronyms

ACEIs: Angiotensin Converting Enzyme Inhibitors

ADA: American Diabetes Association

AOR: Adjusted Odd Ratio

BG: Blood Glucose

CHF: Congestive Heart Failure

CI: Confidence Interval

COR: Crude Odd Ratio

CVDs: Cardiovascular Diseases

DKA: Diabetes Ketoacidosis

DM: Diabetes Mellitus

JUSH: Jimma University Specialized Hospital

IDF: International Diabetes Federation

IHD: Ischemic Heart Disease

HHS: Hyperglycemic Hyperosmolar State

HONK: Hyper osmolar non ketotic coma

MMAPS: Morisky Medication Adherence Predictor Scale

RBS: Random Blood Sugar

SPSS: Statistical Package for Social Sciences

STTIs: Skin and Soft Tissue Infections

T1DM: Type 1 Diabetes Mellitus

T2DM: Type 2 Diabetes Mellitus

WHO: World health organization

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1. Introduction

1.1. Background

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia with disturbance of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both (1). Diabetes mellitus is a complex, chronic illness requiring continuous medical care with multifactorial risk reduction strategies beyond glycemic control. Ongoing patient self-management education and support are critical to prevent acute complications and to reduce the risk of long-term complications (2).

Diabetes mellitus is a growing public health problem that adversely affects the lives of millions of individuals around the world. It causes significant physical and psychological morbidity, disability and premature mortality among those affected patients and imposes a heavy financial burden on health services (3). People with diabetes require at least two to three times the health-care resources compared to people who do not have diabetes, and diabetes care may account for up to 15% of national health care budgets globally (4).

According to the International Diabetes Federation (IDF), 387 million people were estimated to live with diabetes worldwide in 2014, with world prevalence of 8.3%, out of which about 22 million were from Africa with estimated prevalence of 5.1%. The number is expected to be raised to 592 million worldwide and 41.5 million in Africa by the year 2035. Although Africa has the lowest prevalence of DM, it contributes the highest percentage of deaths as compare with the other regions. Ethiopia, which is one of the developing nations, is at a risk of increased diabetes incidence; 4.84% (1.9 million) of the population is estimated to live with diabetes in 2014 (5).

Diabetes mellitus leads to the development of a number of complications. The etiology of each diabetic complication is multifactorial (6). Complications of DM have become a major public health problem globally (3). Diabetes can affect many different organ systems in the body and, over time, can lead to serious complications. Complications from diabetes can be classified as microvascular or macrovascular. Microvascular complications include neuropathy, nephropathy and retinopathy. Macrovascular complications include cardiovascular disease, stroke, and

peripheral vascular disease. Peripheral vascular disease may lead to bruises or injuries that do not heal, gangrene, and, ultimately, amputation. Diabetes-related complications are a significant cause of increased morbidity and mortality among people with diabetes (7). Diabetes is one of the leading causes of visual impairment and blindness in developed countries (8).

People with diabetes are 2 to 4 times more likely to develop stroke than people without diabetes. More than 70% of people with diabetes have high blood pressure or are being treated with medications for hypertension(7,9). Acute infections are more prevalent in diabetic than non-diabetics, since there is impaired immune system of diabetic patients and dysregulated inflammatory response (10–12). In addition, the risk of tuberculosis is three times higher among people with diabetes, specifically T2DM was found to be independent risk factor for TB according to nationwide studies conducted in Taiwan (13).

WHO report on leading cause of death indicates that DM is 8th leading cause of death in 2012 worldwide while it was 10th leading cause by the year 2000 which shows increase in burden of diabetes mortality over years. Although diabetes related mortality is relatively low in developing countries like Ethiopia, there is significant increment in death from year 2000 to 2012 (14). According to IDF the number of deaths attributed to diabetes in Ethiopia reached 34,262 in 2014 (5). Cardiovascular diseases causes up to 65% of all deaths in people with diabetes. Ischemic heart disease and stroke account for the greatest proportion of morbidity associated with diabetes. In addition, mortality rates due to heart disease are 2 to 4 times higher among people with diabetes compared with those without diabetes (7,9).

Hospitalization is more common for people with diabetes than for those without diabetes. In addition, patients with diabetes are more likely to be hospitalized for a longer period of time than those without diabetes (15,16). Diabetes is considered an ambulatory care-sensitive condition, and many hospitalizations are potentially preventable. The pattern of hospital admissions can be used to determine the effectiveness of outpatient care of DM (15).

1.2. Statement of the problem

Prevalence of diabetes mellitus is increasing worldwide, with the major increases expected to occur in developing countries (15). Patients with diabetes are admitted twice as often as the general population and stay longer (17).

Diabetic related complications contribute to number of hospital admissions. Several factors are identified for diabetic related admissions which might be due to acute complications of the disease, treatment or comorbid conditions. In USA, study reported that ischemic heart diseases, infections, stroke, hyperglycemia and hypoglycemia were found to be the common reasons for hospital admissions of diabetic patients (18). The study conducted in Spain revealed that individuals with diabetes have a high risk of hospital admission compared with individuals without diabetes (9). UK prospective diabetes study reports on the impact of diabetes related complications also revealed that patients with a history of complications appeared to have a higher probability of hospitalization compared with those who did not experience any complication(19). Another multicenter study conducted in Australia showed that 24.7% of hospitalized patients had diabetes (20).

Management of admitted diabetes incurs substantial cost and diabetes patients occupy hospital beds for prolonged period of time. This is supported by systemic review. According to this review, the per capita hospitalization cost for people with diabetes was significantly higher than for people without the disease (US\$ 1,628 vs. US\$ 833 in 2004). The total annual direct cost per capita of hospitalized patients was higher than that of non-hospitalized ones(US\$ 2,908 \pm 262 vs. 473 \pm 10) which is statistically significant (21).

Having high risk of hospitalization, prolonged hospital stay and accompanied high cost of management of diabetes patients, knowing reasons for hospital admission can provide valuable data so that effort will be made to minimize hospitalization. Hospitalization pattern may also be the reflection of services given at ambulatory clinic. Strengthening ambulatory care and improving medication adherence (22) are helpful to decrease hospitalization and hence the subsequent morbidity, mortality and cost. Limited data are available regarding hospitalization of diabetic patients in Ethiopia, specifically in Jimma. To our knowledge there is study conducted to examine hospitalization patterns of diabetes patients in JUSH. The investigators, therefore,

aimed to assess hospitalization patterns and treatment outcome and to identify contributing factors for diabetic patients at JUSH.

2. Review of literatures

2.1. Reasons for hospitalization

Retrospective study of urban Africa Americans showed that the most common diagnosis of hospitalized diabetic patients were disease of circulatory system (29%), endocrine and metabolic disorders (17.1%) and infections (16%). With respect to specified diagnosis the commonest were congestive heart failure, ketoacidosis or uncontrolled diabetes, coronary atherosclerosis and pneumonia. According to this study, the most common infections attributed for hospitalization were pneumonia, urinary tract infections (UTIs), prosthetic device associated infections; cellulitis and abscess of leg and postoperative infections (23).

Cross-sectional study of medical hospital admission in Kuwait revealed that Diabetes was the primary or secondary diagnosis in 40.6% of hospitalizations. Unrecognized diabetes or new hyperglycemia was found in 12.9% of the patients. The most common reasons for hospitalizations in patients with diabetes were diseases of the cardiovascular system (53.6%) and diseases of the respiratory system (22.8%). The five most frequent specific causes for hospitalizations in patients with medical history of diabetes as a secondary diagnosis were acute coronary syndrome (27.2%), pneumonia (14.3%), heart failure (11.2%), cerebrovascular accident (10.3%), and chronic obstructive airway disease (3.6%) (24).

A prospective study of admitted diabetic patients in Nepal showed that infections were the commonest causes of hospital admissions followed by cardiovascular system diseases and uncontrolled blood glucose. The commonest infections were UTIs (20%), septicemia (14%), typhoid fever (14%), acute gastroenteritis (11%) and TB (8%). Coronary artery disease and heart failure were common cardiac diseases which together contributed to 20% of total hospital admission of diabetic patients. Uncontrolled blood glucose contributed to 14% of total diabetic admissions (25).

Retrospective analysis of 5 years medical records in Nigeria indicated that of the total 2,696 medical admissions, 118 (4.4%) were diabetes related. Majority (37.29%) of the patients were admitted for diabetic foot ulcer. Other major reasons for admission were severe hypertension (13.56%), uncontrolled hyperglycemia (13.56%), hyperglycemic emergencies (11.86%) and stroke (10.17%) (15). Another retrospective review of 4 years medical records in the same

country showed that uncontrolled DM was the commonest indication for admission accounting for 62.1% of the total admissions. Hyperglycemic emergencies accounted for 18.7% of the total admissions (26).

The study conducted in Ethiopia, retrospective review of medical records from January 2005-December 2009 at Tikur Anbessa and St. Paul's Specialized University teaching hospitals, found a total of 720 admissions of diabetic patients, of which 375 patients were Type 1 diabetes, while the remaining 345 were Type 2 diabetes. Commonest cause for admission was DKA (71.1%), followed by who had infections (36.3%). Among those with infection, pneumonia occurred in 67 (9.9%), UTI occurred in 55 (8.1%), diabetic foot ulcer in 70 (9.7%), tuberculosis in 42 (5.5%) other infections in 10 (1.4%) of patients. Cardiovascular diseases occurred in 18.4% and hypertension was found in 34%, hypoglycemia in 1.2% of diabetic patients. Diabetic nephropathy, retinopathy, and neuropathy accounted 32%, 15.5% and 12.4% respectively. In each year of the studied period, DKA persisted to be the leading cause for admission followed by infections (27).

2.2. Factors associated with hospitalization

Of the studies done to examine the possible contributing factors for hospitalization of diabetes patients, hospital discharge record review from 1993-2006 in United States showed that age and sex were significantly associated with hospitalization. Overall, women had higher rates of hospitalizations associated with diabetes compared with men, but there was evidence of an age by sex interaction, with higher rates of hospitalizations among women in the younger age groups and among men in the older age groups (28). With respect to gender, similar result was found from retrospective cohort conducted in Canada which revealed females with diabetes have a greater risk of mortality and CVD hospitalization than males with diabetes (29).

Review of administrative claims data from managed care organization in US among type 2 diabetic patient who were on oral hypoglycemic agents showed that non adherence to oral hypoglycemic agents was significantly associated with increased risk of hospitalization (22).

Review of medical records in New Zealand diabetic patients showed that patients admitted with diabetes complications had significantly higher triglyceride levels and duration of diabetes than patients not admitted. In Type 2 patients; age, obesity, HDL levels and treatment with insulin or

oral medication were all associated with increased odds of admission (30). Another retrospective cohort of type 2 diabetic patients in UK indicated that the risk of all-cause hospitalization increased with hospitalization in the previous year, insulin use and the presence of major comorbidities. The risk of a diabetes-related hospitalization increased with age, female gender, chronic renal insufficiency, hypoglycemia and diabetes related hospitalization in the previous year (31).

On the other hand, the study conducted in Canada showed that physical inactivity and former or current smoking were significantly associated with an increased likelihood of hospitalization for those with type 2 diabetes (32). Another study conducted in Japan revealed that risk of hospitalization was associated with irregular physician visit. The irregular visit group had a significantly higher risk of hospitalization for acute myocardial infarction (AMI), ischemic heart diseases (IHDs) except AMI, all IHDs, all strokes and diabetic macrovascular complications than did the regular visit group (33).

2.3. Treatment outcome

Analysis of hospital episode statistics in England that compares treatment outcome of diabetes and non-diabetes identified that diabetes independently exerts negative impact on hospital stay. Inpatients with recorded diabetes stay in hospital for 100% longer on average; are 50% less likely to be treated as day cases and are almost 100% more likely to be readmitted as an emergency (34). On the other hand research done in Nigeria revealed variable duration of hospital stay ranging from 1 to 107 days with a mean duration of 17.5 ± 9.2 days. Mean duration of hospital stay was the longest (25.3 ± 23.9 days) for those admitted for diabetic foot ulcer (15).

The retrospective study of 196 Iranian patients admitted due to diabetic foot infection showed that 79.59% of patients were discharged with recovery after medical therapy and surgical intervention. Amputation was performed for 89 patients (45.40%). Treatment failure, which encompasses lack of response to medical and/or surgical intervention and discharge against medical advice, was 14.79%. The mortality rate was found to be 5.61% (35).

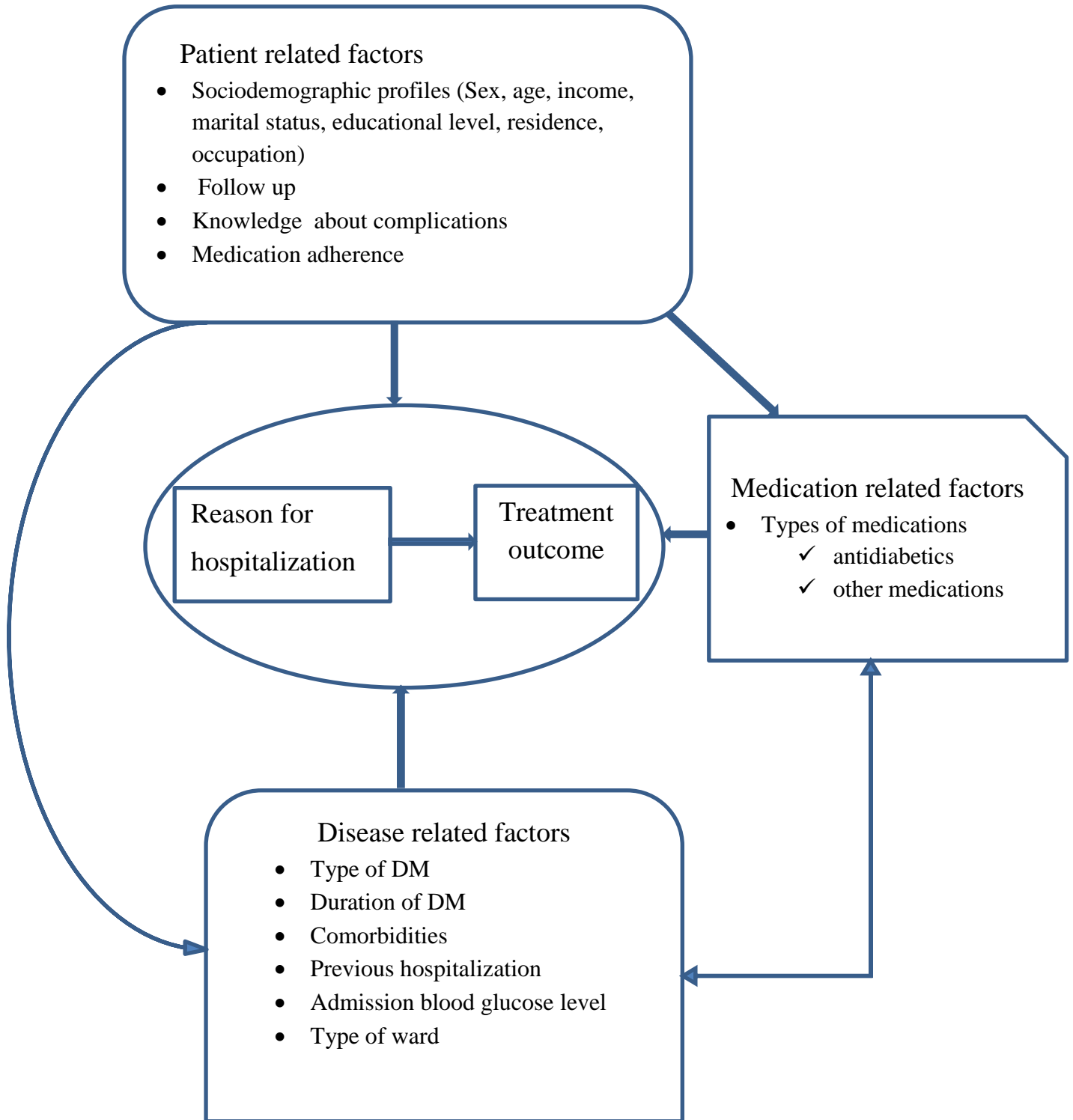
The study conducted in Nigeria on 407 admitted diabetic patients identified 33 total number of death giving overall mortality rate of 8.1%. The gender difference in diabetic deaths (21 males versus 12 females) is statistically significant. The commonest cause of death was hyperosmolar

non ketotic coma (HONK) accounting for 24.2% of all deaths. It was also the commonest cause of death amongst the male gender (28.5%), while DKA was the most common cause in females (33.3%) The mortality for DKA in the study was 10.3% (16.6% for females and 4% for males), while the mortality for HONK was 30.3% (15.3% for females and 45.4% for males). The mortality for DM foot ulcer was 17.6%(26). Another study that reviewed a 5 year records of medical admission, of which 118 were diabetic, 88(74.55%) of admitted patients were treated and discharged. There were 26 (22.05%) patients who left against medical advice, and they did so after they had been hospitalized for a period between 2 and 40 days (mean, 12 days); majority (53.8%) of these patients were admitted for diabetic foot ulcer. There were 4 deaths, accounting for a mortality rate of 3.4%. These deaths occurred within 6 days of admission in males older than 70 years. Mortality rate in patients admitted for stroke and hyperglycemic emergencies was 1.7% for each (15).

2.4. Significance of the study

This study was aimed to assess reasons for hospitalization among diabetic patients and treatment outcome at discharge so that it can provide valuable data on common reasons of admission. Knowing the reasons helps to minimize hospitalization by strengthening follow up at chronic care and promoting good glyceic control to minimize complications that might contribute to hospitalization. The result of the study will provide data that can support decision of hospital management and the health care system in general in such a way that strategies will be devised and implemented to strengthening diabetes care, educating the patient on avoidable risk factors that may increase hospitalization. The study also provided information on predictors of hospitalization and treatment outcome, knowing this in turn helps to decrease modifiable determinants. The study, finally, has laid backgrounds for future studies on related topics.

2.5. Conceptual framework



3. Objectives

3.1. General objective

To assess reasons for hospitalization, treatment outcome and their predictors in adult diabetic patients at Jimma University Specialized Hospital

3.2. Specific objectives

- To identify reasons for hospitalization among diabetic patients
- To assess treatment outcome of hospitalized adult diabetic patients
- To determine predictors of diabetes related hospitalization and good treatment outcome

4. Methods and participants

4.1. Study area and period

The study was conducted at Jimma university specialized hospital (JUSH), Oromia region, Southwest Ethiopia from February 21 to June 30, 2015. JUSH was established in 1937 as military rehabilitation center during Italian occupation. The hospital is located in Jimma town 350 km Southwest of Addis Ababa. Currently, JUSH is the only teaching and referral hospital in the southwestern part of the Ethiopia. It provides specialized health services through its 9 medical and other clinical and diagnostic departments for approximately 9,000 inpatient and 80,000 outpatient attendances a year. It has the catchment population of over 15 million, bed capacity of over 500 and a total staff of about 1000. It serves as a referral hospital mainly for 3 regional states including: Oromia, Southern nations, nationalities and peoples and Gambella (36). The research was conducted at medical and surgical ward of JUSH. The internal medicine department of the hospital has over 80 beds for inpatients and provides services with 14 internists and 25 residents, whereas the surgical department has over 125 beds and runs by 6 general surgeons and 31 residents.

4.2. Study design

A hospital based prospective observational study was conducted.

4.3. Study participants

4.3.1. Source population

All adult patients admitted to JUSH with new or previously diagnosed diabetes mellitus.

4.3.2. Study population

Patients admitted to JUSH medical and surgical ward during study period and who fulfill the eligibility criteria were included in the study.

4.4. Sampling technique

All diabetic patients admitted at medical and surgical ward during data collection period who meet the inclusion criteria was consecutively recruited in the study and followed till discharge or referral to facilities outside JUSH or death.

4.5. Inclusion and exclusion criteria

4.5.1. Inclusion criteria

- Age 14 years or older
- Patients who were admitted for ≥ 24 hrs

4.5.2. Exclusion criteria

- Patients with symptomatic psychiatric comorbidity
- Patients who were not giving full consent
- Gestational diabetes mellitus

4.6. Study variables

4.6.1. Independent variables

- Age
- Sex
- Marital status
- Educational status
- Occupation
- Monthly income
- Residence
- Regular follow up
- Knowledge about DM complications
- Antidiabetics
- Other medications (for comorbidities, primary or secondary prevention of Coronary artery disease)
- Medication adherence
- Type of DM
- Duration of DM since diagnosis
- Admission blood glucose level
- Comorbidities
- Previous history of admission

- Type of ward

4.6.2. Dependent variable

- Reasons for hospitalization
- Treatment outcome

4.7. Data collection and procedures

4.7.1. Data collection tool and collectors

Data abstraction checklist was developed to collect relevant information from patient chart about current diagnosis, comorbidities, diabetic complications, blood glucose, medication given, laboratory results and other investigation results. Structured questionnaire was used to obtain patient demographics, disease duration, and adherence. Morisky Medication Adherence Predictor Scale (MMAPS) was utilized to collect information necessary to assess medication adherence. MMAPS is part of the WHO case management adherence guideline assessment tools and it is a validated scale mostly used to classify patients on medication as either high or low on motivation and knowledge domain, thus a commonly used self-report method to assess patients' adherence to existing therapy. MMAPS is an 8-item question with dichotomous responses (Yes/No) for the first seven questions and multiple choices for the last question, which enable to assess unintentional and intentional non-adherence behaviors. Numerical value of 1 was given for 'Yes' and 0 was given for 'No'. If the patient answered 'never' or 'almost never' for the last question it was scored as 0 and 1 otherwise. Adherence level was classified by taking the sum of 8 questions response and grouped as high, medium or low, if the total score was 0, 1 to 2 and greater than or equal to 3 respectively.

Two pharmacists and 2 BSc nurses were recruited for data collection and one first year clinical pharmacy post graduate student supervised the data collection process.

4.7.2. Data analysis and interpretation

Epi Info version 7.0 was used to enter, encode and clear data. Then the data was exported to SPSS for analysis. The Statistical Package for Social Science (SPSS) programs version 21.0 for Windows was employed to analyze the collected data. Descriptive statistics, such as frequency, percentage, mean and standard deviation was used to summarize patients' baseline

characteristics. Univariate logistic regression was used to identify independent variables that were candidate for multivariable logistic regression. Multivariable logistic regression model was fitted to determine independent predictors of diabetic related hospital admissions or treatment outcome when the p-value is less than or equal to 0.1 on univariate analysis. Statistical significance was considered at p-value of less than 0.05.

4.7.3. Data quality assurance

To ensure good quality of data, a half day training of data collectors and the supervisor was carried out before proceeding to collection. The training was given to them regarding the appropriate use of the data collection tool focusing on uniform interpretation of questions, strict use of study criterion, explanation of study objectives & getting written consents from study patients, and confidentiality of collected data. Data abstraction format and questionnaire were pretested on 4 DM patients to standardized and check suitability before actual data collection. During data collection process, principal investigator closely supervised and checked for completeness and consistency of collected data.

4.8. Ethical consideration

This study was conducted after securing ethical clearance and approval from Institutional Review Board (IRB) of Jimma University. Official permission was obtained from the hospital clinical director before data collection began. Written informed consent was secured from all participants. Data collection was done anonymously by coding data collection formats using non-identifiable codes and was remain anonymous.

4.9. Dissemination plan

The study will be submitted to Jimma University hospital management, department of pharmacy, and school of graduate study. The summary of the research finding will be submitted to department of internal medicine and surgery. The result will be presented to the university community and further effort will also be made to present the result of this study on scientific conferences and publish on reputable local or international journal.

4.10. Operational definitions and definitions of terms

Adequate knowledge about DM complications: The knowledge regarding the complications of diabetes was considered adequate when a patient could mention $\geq 3/5$ complications as mentioned in the data collection tool (37).

Comorbidity: any medical condition that may coexist in diabetic patient and not considered as immediate cause of admission.

Diabetes related admission: admission attributed to short term (hyperglycemia, hypoglycemia) or long term complications of diabetes.

Good treatment outcome: admitted patient discharged with improvement which is decided by health care team.

High Adherence to medication: A patient who scored 0 for the MMAPS was considered as highly adherent to antidiabetic medications.

Low adherence to antidiabetic medications: A patient who scored ≥ 3 for the MMAPS was considered low adherence level to antidiabetic medications.

Moderate adherence to antidiabetic medication: A patient who scored 1-2 for the MMAPS was considered moderate adherence level to antidiabetic medications.

No knowledge about DM complications: The knowledge regarding the complications of diabetes was considered no when a patient could not mention at least one of the five major DM complications mentioned in the data collection tool (37).

Poor treatment outcome: in hospital death, self-discharge and referral was considered as poor outcome.

Reason for hospitalization: any factor that is considered as immediate cause of hospital admission of diabetic patient.

Referral: patients referred to other health facility for better management of primary reason for hospitalization.

Self-discharge: patients discharge themselves against medical advice.

Some knowledge about DM complications: The knowledge regarding the complications of diabetes was considered some when a patient could mention 1-2/5 complications as mentioned in the data collection tool (37).

Treatment outcome: is the condition of the patient at the end of hospital stay.

5. Results

5.1. Sociodemographic characteristics of participants

A total of 1721 patients were admitted to medical and surgical ward during the study period, of which 93 (5.40%) were diabetics. Among those, 89 were included in the analysis (**figure 1**). Fifty three (59.55%) of them were males. The mean age of the participants was 46.86 ± 15.52 years with range of 15 to 87 years; half of them were older than 50 years (50.56%). Over one third of them (34.83%) were farmers and 36(40.45%) were illiterate (**Table 1**).

Table 1: Socio-demographic characteristic of diabetic patients admitted to Jimma University Specialized hospital medical and surgical wards, February 21-June 30, 2015

Variables	Frequency, N=89 (%)
Sex	
Male	53(59.55)
Female	36(40.45)
Age (years)	
14-29	14(15.73)
30-39	15(16.85)
40-49	15(16.85)
50-59	24(26.97)
≥ 60	21(23.60)
Marital status	
Single	8(8.99)
Married	75(84.27)
Widowed	6(6.74)
Educational level	
Illiterate	36(40.45)
Primary	29(32.58)
Secondary	9(10.12)
College and above	15(16.85)
Occupation	
Farmer	31(34.84)
Housewife	19(21.35)
Merchant	13(14.61)
Government employee	12(13.49)
Unemployed	4(4.49)
Retired	4(4.49)
Others*	6(6.74)

Table 1 cont'd...

Monthly income in Birr	
≤500	23(25.84)
501-1500	39(43.81)
1501-2500	10(11.24)
2501-3500	9(10.12)
≥3501	8(8.99)
Adherence level to antidiabetics**	
Medium	14(25.45)
Low	41(74.55)

*mechanic, daily laborer, student; ** valid N=55

5.2. Knowledge about diabetes complications

Thirty five patients (39.33%) knew at least one diabetic complication. Of this, knowledge about foot ulcer accounted the highest rank by which 28 patients reported as they knew it. Twenty nine (32.58%) and 6 (6.74%) patients had found to have some and adequate knowledge about diabetic complications respectively (**Table 2**).

Table 2: Knowledge about diabetic complications of diabetic patients admitted to Jimma University Specialized hospital medical and surgical wards, February 21-June 30, 2015

Variables	Frequency (%)
Know at least one diabetic complication	
Yes	35(39.33)*
No	54(60.67)
Knowledge about specific DM complication(N=35)	
Foot ulcer	28(80.00)
CVD	12(34.28)
Kidney complications	9(25.71)
Neuropathy	8(22.86)
Retinopathy	7(20.00)
Other**	1(2.86)

*29 had some knowledge, 6 had adequate knowledge, **hypoglycemia

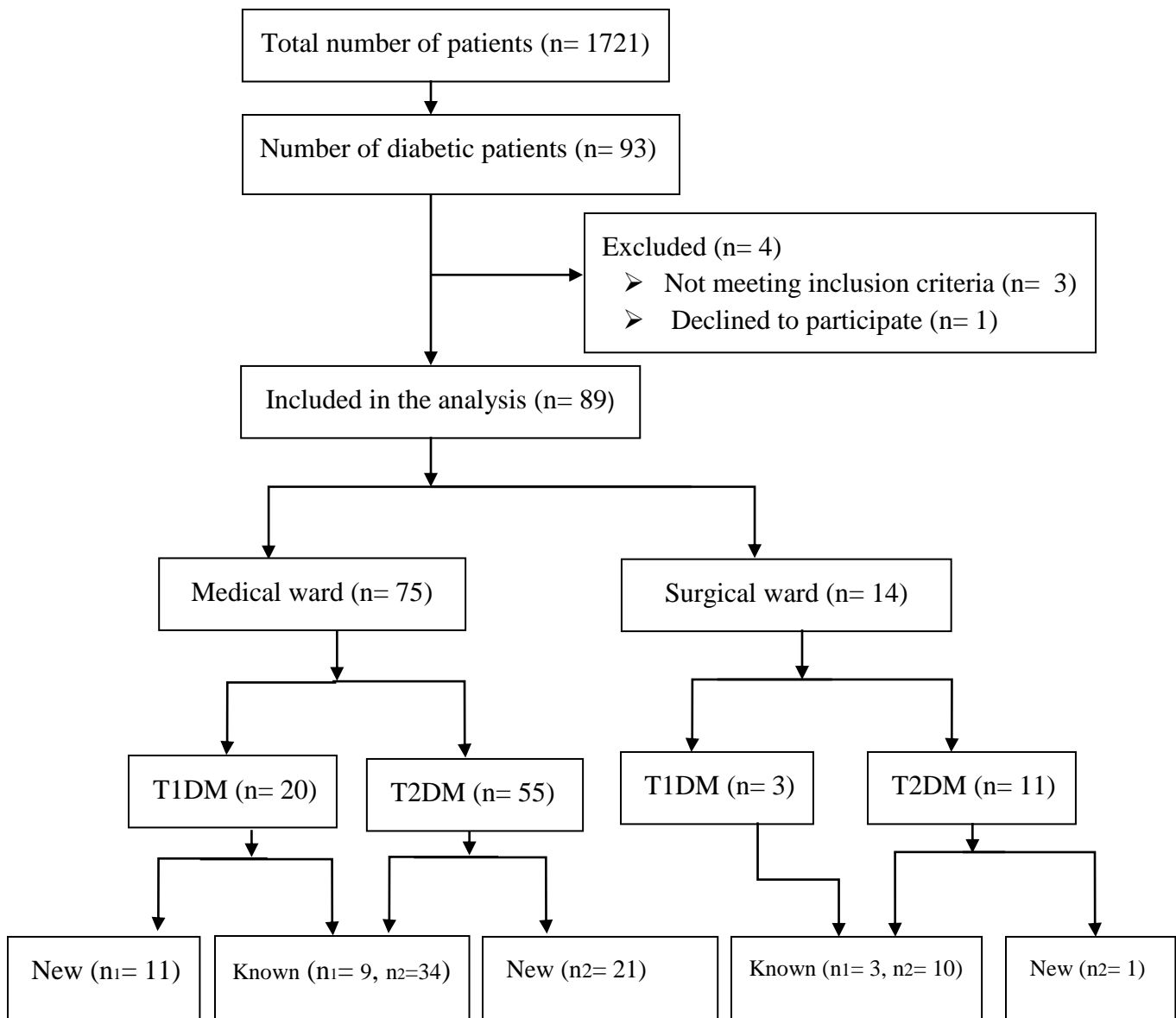


Figure 1: Flow chart of enrollment of diabetic patients admitted to Jimma University

Specialized hospital medical and surgical wards, February 21-June 30, 2015 (n₁= number of T1DM, n₂= number of T2DM)

5.3. Clinical characteristics

5.3.1. Disease related factors

Out of 89 patients, 66 (74.16%) were type 2 diabetic patients. Fifty six patients (62.92%) were known diabetics, while 33 (37.08%) were newly diagnosed (**figure 1**). The mean duration of diabetes for known diabetics was 7.53 ± 6.26 years; most of them were diagnosed in the last 5 years (**Figure 2**). Forty eight patients out of 56 known diabetics had regular follow up, but 8 patients had no regular follow up. Fifteen patients had attended follow up every month, 23 patients every 2 months, 9 patients every 3 months and 1 patient every 6 months. Forty four (49.44%) had at least one prior history of hospital admission. Among these, 16, 18 and 10 had 1, 2, 3 history of prior admission respectively.

Overall, 59 (66.29%) patients had at least one acute or chronic comorbidity, hypertension being the commonest type of comorbidity, 31(34.83%) followed by infections, 22(24.72%). Twenty five patients had one comorbidity only, while 34 patients had 2 or more comorbidities (**figure 3**).

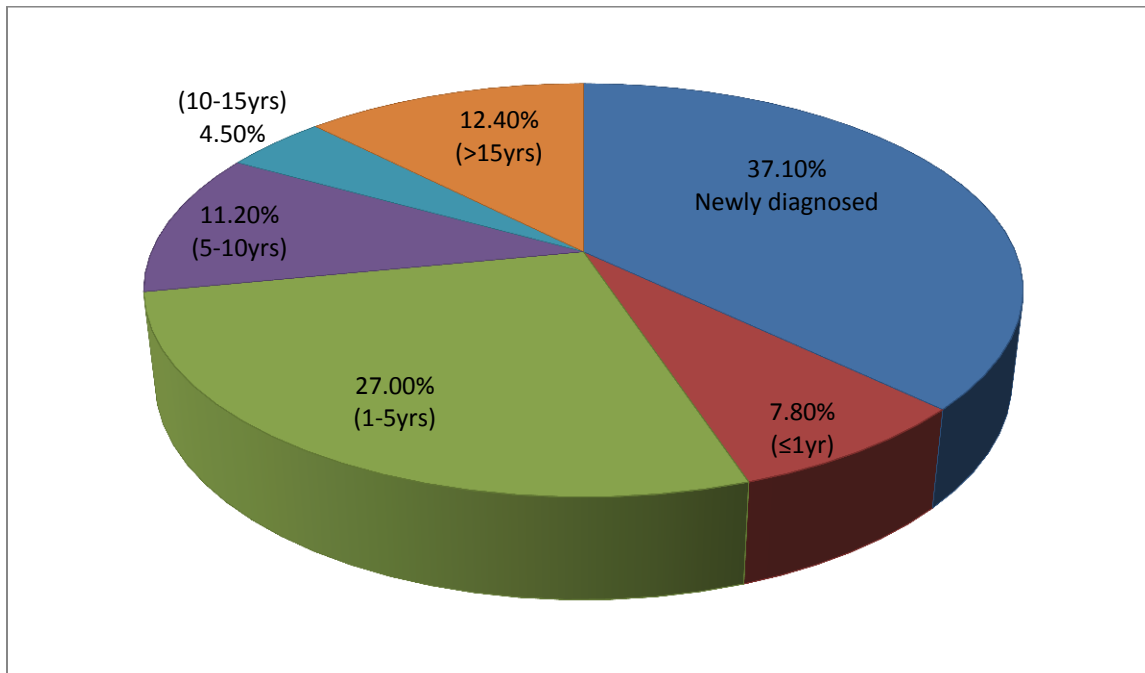


Figure 2: Duration of diabetes among patients admitted to Jimma University Specialized Hospital medical and surgical wards, February 21-June 30, 2015.

Table 3: Prevalence of comorbidities among diabetic patients admitted to Jimma University specialized hospital medical and surgical wards, February 21-June 30, 2015

Variables	Frequency, N=89(%)
Presence of comorbidities	
No	30(33.71)
Yes	59(66.29)
Specific type of comorbidities(N=59)	
Cardiovascular diseases	
Hypertension	31(52.54)
Ischemic heart diseases	12(20.34)
Hypertensive heart disease	5(8.47)
Hyperlipidemia	5(8.47)
Stroke	4(6.78)
Deep venous thrombosis	2(3.40)
Other CVDs*	5(8.47)
Metabolic syndrome	8(13.56)
Anemia	4(6.78)
Infections	
SSTI	8(13.56)
Urinary tract infection	7(11.86)
Pneumonia	5(8.47)
Tuberculosis	4(6.78)
Others [†]	6(10.17)
Kidney diseases [‡]	7(11.86)
Gastrointestinal diseases [¶]	6(10.17)
Other comorbidities [‡]	9(15.25)

*bradyarrhythmia, CHF, hypovolemic shock, Peripheral artery disease

[†]Spontaneous bacterial peritonitis, acute gastroenteritis, pyogenic liver abscess, retroviral infection, perianal abscess

[‡] Acute kidney injury, nephrolithiasis, chronic kidney disease,

[¶]chronic cholecystitis, colonic cancer, chronic liver disease, dyspepsia, hepatic cyst, peptic ulcer disease

[‡]asthma, bed sore, cervical cancer, flexor tendon injury, hypertensive retinopathy, hyperkalemia, hyponatremia

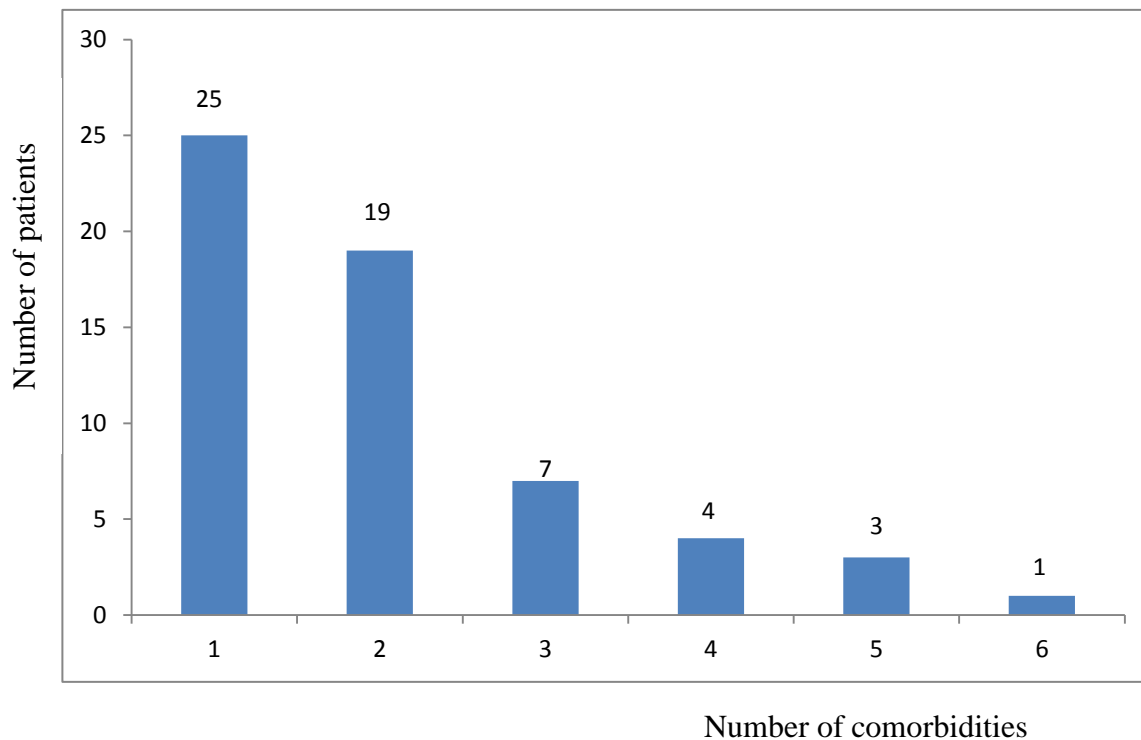


Figure 3: Number of comorbidities among adult diabetic patients admitted to Jimma University Specialized hospital medical and surgical wards, February 21-June 30, 2015

On the other hand screening of admitted patients revealed that 22 patients (24.72%) had at least one long term diabetic complication (**table 4**).

Table 4: Prevalence of long term diabetic complications among diabetic patients admitted to Jimma University Specialized hospital medical and surgical wards, February 21-June 30, 2015

Variables	Frequency, N=89(%)
Presence of long term diabetes complications	
No	67(75.28)
Yes	22(24.72)
Specific types of complications(N=22)	
Diabetic foot ulcer	10(45.45)
Neuropathy	7(31.82)
Nephropathy	4(18.18)
Retinopathy	3(13.64)

5.3.2. Medication related factors

Excluding 33 patients who were newly diagnosed, 29 patients were on insulin, 17 patients on metformin, 4 on glibenclamide and 7 patients were on combination of two antidiabetic agents (4 on metformin and insulin, 3 metformin and glibenclamide). With regard to non antidiabetic medication before admission, 21 patients were on aspirin, 25 patients on enalapril, 9 patients were taking statins, 4 patients on furosemide, 3 patients on hydrochlorothiazide and 1 patient each on methyldopa, atenolol and spironolactone. Five patients had discontinued their antidiabetic medication (3 of them insulin, 1 metformin and 1 glibenclamide) and 1 patient discontinued furosemide before admission.

Insulin was used to manage hyperglycemia after admission in 88 patients while metformin alone used only in one patient. In addition, metformin and glibenclamide were initiated in 12 and 3 patients as home medication at discharge respectively.

Besides antidiabetics, a number of medications were used in the management of hospitalized diabetic patients. Among those, anti-infectives were the commonest which prescribed in 59.55% of patients followed by cardiovascular drugs used in 42.70% of patients (**table 5**).

Table 5: Patterns of medication use among diabetic patients admitted to Jimma University Specialized hospital medical and surgical wards, February 21-June 30, 2015

Types of medications*	Frequency, N=89(%)
Anti-infectives	53(59.55)
Cephalosporins	46(51.69)
Pencillins	23(25.84)
Metronidazole	23(25.84)
Chloramphenicol	11(12.36)
Floroquinolones	8(8.99)
Vancomycin	6(6.74)
Clindamycin	4(4.45)
Antituberculars	4(4.45)
Antivirals	2(2.25)
Other anti-infectives [†]	4(4.45)

Table 5 cont'd...

Cardiovascular drugs	38(42.70)
Beta blockers	25(28.09)
ACEIs	22(24.72)
Antilipedimic agents	19(21.35)
Diuretics	18(20.22)
Drugs affecting blood	34(38.20)
Antiplatelets	24(26.97)
Anticoagulants	12(13.48)
Antianemics	4(4.45)
Analgesics	25(28.09)
Drugs affecting GIT	9(10.12)
Antiulcer	7(7.86)
Antiemetics	3(3.37)
Cathartics and laxatives	3(3.37)
Antacids	1(1.12)
Vitamins	6(6.74)
Bronchodilators	4(4.45)
Others[‡]	5(5.62)

*drug grouped based on list of medicines for Ethiopia

† Doxycycline, azithromycin, cotrimoxazole, itraconazole

‡ beclamethasone, cetirizine, dexamethasone, hydrocortisone, propyl thiouracil

5.4. Reasons for hospitalization

Diabetic ketoacidosis (DKA) was the commonest reason for hospitalization which attributed for admission of 30(33.71%) patients followed by infections, 17(19.10%), and diseases of circulatory system, 16(17.98%). The most common infections responsible for admission were skin and soft tissue infections (SSTIs) followed by meningitis whereas the commonest cardiovascular disease attributed for admission was congestive heart failure (CHF). Forty three (48.31%) patients were admitted due to direct diabetes related conditions (**table 6**).

Table 6: Reasons for hospitalization of adult diabetic patients admitted to Jimma University
Specialized hospital medical and surgical wards, February 21-June 30, 2015

Reason for hospitalization	Frequency(N=89)	Percent
Metabolic diseases	43	48.31
Diabetic ketoacidosis	30	33.71
Diabetic foot ulcer	7	7.86
Hyperglycemic hyperosmolar state	3	3.37
Hypoglycemia	2	2.25
Hyperglycemia	1	1.12
Infections	17	19.10
Skin and soft tissue infections	7	7.86
Meningitis	4	4.45
Acute pyelonephritis	3	3.37
Severe community acquired pneumonia	1	1.12
Aspergilloma	1	1.12
Appendiceal abscesss	1	1.12
Diseases of circulatory system	16	17.98
Congestive heart failure	8	8.99
Ischemic heart disease	4	4.45
Stroke	3	3.37
Deep venous thrombosis	1	1.12
Diseases of digestive system	5	5.62
Cholecystitis	2	2.25
Acute appendicitis	1	1.12
Variceal bleeding	1	1.12
Intussusception	1	1.12
Diseases of blood	2	2.25
Severe anemia	1	1.12
Pancytopenia	1	1.12
Diseases of genitourinary system	3	3.4
Acute kidney injury	2	2.2
Urinary incontinence 2 ^{ndry} to BPH	1	1.1
Diseases of respiratory system	2	2.25
Acute exacerbation of asthma	1	1.12
Pulmonary edema	1	1.12
Diseases of central nervous system	1	1.12
Paraparesis 2 ^{ndry} to spinal artery syndrome	1	1.12

The mean admission blood glucose was 347.83 ± 158.77 mg/dl which ranges from 31 to 600 mg/dl. Three patients had hypoglycemia ($RBS < 70$ mg/dl) whereas 75 patients had hyperglycemia ($RBS > 180$ mg/dl) at the time of hospital admission (**table 7**).

Table 7: Admission blood glucose level of diabetic patients admitted to Jimma University Specialized hospital medical and surgical wards, February 21-June 30, 2015

	Diabetes status		
	Newly diagnosed	Known diabetic	
Admission blood glucose	≤ 70	0	3
	71-180	1	10
	181-250	1	9
	251-350	12	14
	351-450	7	7
	451-599	6	9
	≥ 600	6	4

5.5. Treatment outcome

Out of 89 patients participated in this study, 68 were discharged from the hospital with improvement, 10 died (6 male, 4 female) with in hospital mortality rate of 11.24% and 5 patients referred to other institutions while 6 patients self-discharged. Of 10 patients died, 4 were admitted due to infections (3 due to meningitis, 1 aspergilloma), 2 CHF and 1 each for DKA, HHS, hemorrhagic stroke and uremic pulmonary edema. Seven patients died with 5 days of admission while the remaining 3 after 10 days of hospitalization (**table 8**). The mean time to death after hospitalization was 10.20 ± 13.21 days since from date of admission (**figure 3**).

The median length of hospital stay was 9 days (interquartile range of 14 days) which ranged 1 to 88 days. Forty (44.94%) patients stayed more than 10 days in the hospital. The mean duration of hospital stay was longer for those who were admitted to surgical ward (24.93 ± 27.90 days) than medical ward (13.21 ± 13.56 days) which was statistically significant ($p=0.017$, 95%CI: [2.16-21.27]). The mean duration of hospital stay was longest for those who had diabetic foot ulcer

(24.8 ± 26.02 days) but not statistically significant as compared with patients without ulcer ($p=0.053$).

Table 8: Treatment outcome of adult diabetic patients admitted to Jimma University Specialized hospital medical and surgical wards, February 21-June 30, 2015

		Length of hospital stay in day		
		<5	5-10	>10
Treatment outcome	Improved	9	24	35
	Self-discharged	3	1	2
	Referred	5	0	0
	Died	7	0	3

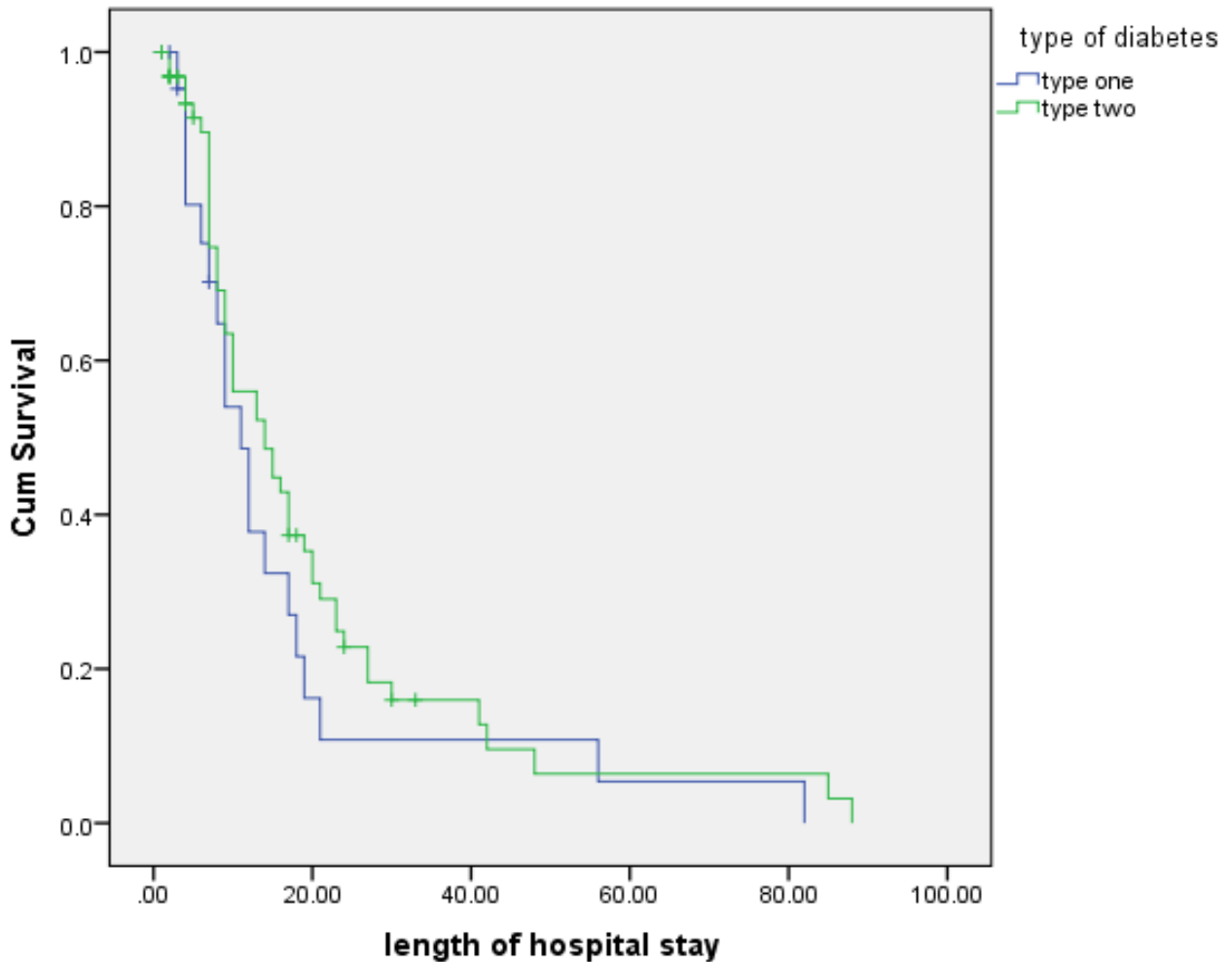


Figure 4: Kaplan-Meier survival curve of adult diabetic patients admitted at Jimma University Specialized hospital, February 21-June 30, 2015

The mean time to be urine ketone free for patients admitted with DKA was 31.27 ± 38 hours. The mean discharge blood glucose was 192.58 ± 70.20 mg/dl; 53.20% had discharge blood glucose above 180mg/dl (**figure 5**). In general, 21(23.60%) patients had poor treatment outcome at discharge.

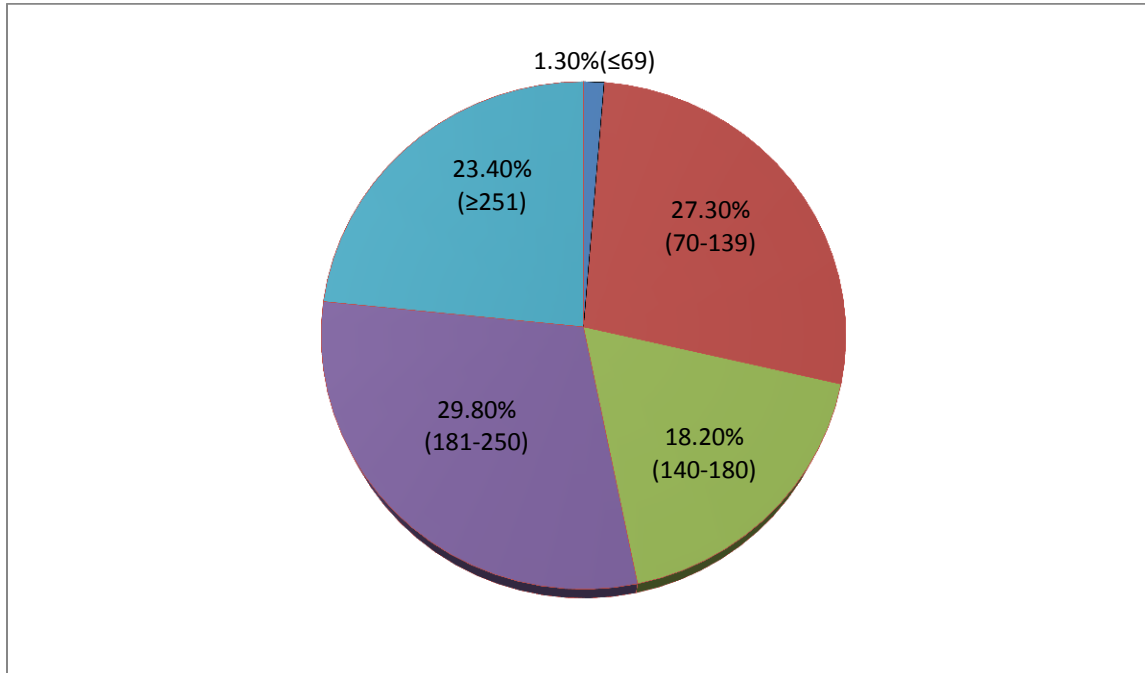


Figure 5: Discharge blood glucose (mg/dl) of adult diabetic patients admitted to Jimma University Specialized Hospital, February 21-June 30, 2015 (N=77)

5.6. Predictors of diabetes related hospitalization and treatment outcome

5.6.1. Predictors of diabetes related hospitalization

The result of univariate binary logistic regression analysis of sociodemographic factors and diabetes related admission showed that rural residence and age group (14-29 years) were significantly associated with diabetes related admission (COR=2.42, 95%CI: 1.01-5.82, COR=7.33, 95%CI: 1.53-35.11 respectively). On the other hand, house wife (COR=0.25, 95%CI: 0.08-0.85), income level between 2501-3500 ETB (COR=0.08, 95%CI: 0.01-0.76) and patients who knew at least one DM complication (COR=0.20, 95%CI: 0.08-0.52) were associated with less rate of diabetes related admission.

Among disease related factors, T1DM (COR=4.36, 95%CI: 1.52-12.50) and being newly diagnosed patients (COR=5.19, 95%CI: 2.02-13.36) were associated with diabetes related

hospitalization. However, patients with prior history of admission were found to have less tendency of hospitalization with diabetes related causes (COR=0.26, 95%CI: 0.11-0.62).

During univariate analysis, it was revealed that an inverse association existed between hospitalizations and being on insulin (COR=0.24, 95%CI: 0.1-0.62), metformin (COR=0.34, 95%CI: 0.12-0.97), enalapril (COR=0.12, 95%CI: 0.04-0.40) and aspirin (COR=0.18, 95%CI: 0.05-0.58) therapy before admission.

Although number of variables were associated with diabetes related hospitalization, only knowledge of complication, diabetes type, insulin and enalapril therapy were remained as independent predictors of hospitalization on multivariable analysis. Accordingly, patients who did not know at least one DM complications are 3.33 times more likely to be hospitalized than their counter parts (AOR=3.33, 95% CI: 1.22-9.09). Likewise, patients who were not on insulin or enalapril are 4.55 (AOR=4.55, 95%CI: 1.29-16.03) and 5.78 times (AOR= 5.78, 95%CI: 1.69-19.75) more chance of hospitalization with diabetic related causes, respectively. In addition, T1DM patients had more than five times more likely of hospitalization with diabetes related admission than T2DM patients (AOR=5.23, 95%CI: 1.36-20.11) (**table 9**).

Table 9: Predictors of diabetic related admission of diabetic patients admitted to Jimma

University Specialized hospital medical and surgical wards, February 21-June 30, 2015

Variables	Diabetes related admission		Univariate analysis		Multivariable analysis	
			<i>P</i>	COR(95%CI)	<i>P</i>	AOR(95%CI)
	Yes	No				
Sex						
Male	29	24	1.00	1.00		
Female	14	22	0.14	0.53(0.22-1.25)		
Age in years						
14-29	11	3	0.01	7.33(1.53-35.11)	0.53	2.15(0.19-24.11)
30-39	10	5	0.05	4.00(0.98-16.31)	0.67	1.57(0.20-12.39)
40-49	6	9	0.68	1.33(0.34-5.27)	0.72	0.68(0.08-5.84)
50-59	9	15	0.77	1.20(0.35-4.09)	0.95	0.94(0.16-5.72)
≥60	7	14	1.00	1.00	1.00	1.00
Residence						
Rural	21	13	0.04	2.42(1.01-5.82)	0.71	0.65(0.07-6.12)
Urban	22	33	1.00	1.00	1.00	1.00

Table 9 cont'd...

Marital status							
Single	7	1	0.15	7.00(0.50-97.75)			
Married	33	42	0.78	0.77(0.15-4.15)			
Widowed	3	3	1.00	1.00			
Educational status							
Illiterate	19	17	0.41	1.68(0.49-5.69)			
Primary	12	17	0.93	1.06(0.30-3.77)			
Secondary	6	3	0.21	3.00(0.53-16.90)			
College and above	6	9	1.00	1.00			
Occupation							
Farmer	20	11	1.00	1.00	1.00	1.00	
Government employee	5	7	0.18	0.39(0.10-1.54)		1.00	0.00
Merchant	6	7	0.26	0.47(0.13-1.76)		0.99	0.00
Housewife	6	13	0.027	0.25(0.08-0.86)		0.98	0.00
Retired	2	2	0.58	0.55(0.07-4.46)		1.00	0.00
Unemployed	1	3	0.16	0.18(0.02-1.98)		0.98	0.00
Other	3	3	0.51	0.55(0.09-3.20)		0.99	0.00
Monthly income							
≤500	14	9	1.00	1.00	1.00	1.00	
501-1500	20	19	0.46	0.68(0.24-1.93)		0.12	4.02(0.69-23.32)
1501-2500	4	6	0.27	0.43(0.09-1.95)		0.62	1.85(0.16-20.71)
25001-3500	1	8	0.027	0.08(0.01-0.76)		0.82	1.45(0.06-35.42)
≥3501	4	4	0.59	0.64(0.13-3.43)		0.421	2.70(0.24-30.20)
Knowledge of DM complications							
Yes	9	26	1.00	1.00	1.00	1.00	
No	34	20	0.001	4.91(1.92-12.55)		0.019	3.33(1.22-9.09)
Adherence level							
Medium	6	8	0.35	1.82(0.517-6.35)			
Low	12	29	1.00	1.00			
Type of diabetes							
T1DM	17	6	0.006	4.36(1.52-12.50)		0.016	5.23(1.36-20.11)
T2DM	26	40	1.00	1.00	1.00	1.00	
Diabetes status							
Newly diagnosed	24	9	0.001	5.19(2.02-13.36)		0.78	1.40(0.13-15.40)
Known diabetic	19	37	1.00	1.00	1.00	1.00	

Table 9 cont'd...

Duration of diabetes							
≤1	27	12	0.019	6.00(1.35-26.65)	0.74	0.63(0.04-10.39)	
1-5	7	17	0.91	1.10(0.22-5.40)	0.18	0.13(0.01-2.54)	
5-10	5	5	0.29	2.67(0.43-16.39)	0.45	0.28(0.01-7.56)	
10-15	1	4	0.76	0.67(0.05-8.64)	0.29	0.09(0.001-7.67)	
≥15	3	8	1.00	1.00	1.00	1.00	
Regular follow up							
Yes	14	34	1.00	1.00	1.00	1.00	
No	5	3	0.08	4.05(0.85-19.28)	0.47	2.01(0.31-13.03)	
History of admission							
Yes	14	30	1.00	1.00	1.00	1.00	
No	29	16	0.003	3.88(1.61-9.37)	0.66	0.70(0.14-3.38)	
Insulin before admission							
Yes	9	24	1.00	1.00	1.00	1.00	
No	34	22	0.003	4.12(1.62-10.50)	0.018	4.55(1.29-16.03)	
Metformin before admission							
Yes	6	15	1.00	1.00	1.00	1.00	
No	37	31	0.04	2.98(1.03-8.62)	0.55	1.60(0.34-7.41)	
Glibenclamide before admission							
Yes	2	5	1.00	1.00			
No	41	41	0.29	2.50(0.46-13.63)			
Enalapril before admission							
Yes	2	5	1.00	1.00	1.00	1.00	
No	41	41	0.00	8.19(2.51-26.69)	0.005	5.78(1.69-19.75)	
Aspirin before admission							
Yes	4	17	1.00	1.00	1.00	1.00	
No	39	29	0.004	5.72(1.74-18.80)	0.67	0.54(0.03-9.45)	
Statins before admission							
Yes	3	6	1.00	1.00			
No	40	40	0.35	2.00(0.47-8.56)			
Comorbidity							
Present	25	34	1.00	1.00			
Absent	18	12	0.12	2.04(0.83-4.99)			

5.6.2. Predictors of treatment outcome

Among sociodemographic factors only income level was found to have statistically significant association with good treatment outcome on univariate regression, by which income of ≥ 3500 ETB was associated with good treatment outcome as compared with those with income level of below 500ETB (COR=6.67, 95%CI:1.06-42.06).

Patients admitted with DKA as primary reason for admission had good treatment outcome (COR=3.95, 95%CI: 1.06-14.72) which was similar with the result when other diabetic related admission were taken into account (COR=4.05, 95%CI: 1.33-12.33). Of the infectious causes of admission, patients who were admitted with meningitis were significantly associated with poor treatment outcome than patients with other causes of admission (COR=0.90, 95%CI: 0.009-0.91).

However, on multivariable analysis only diabetes related admission remained independent predictors of treatment outcome. Accordingly, patients hospitalized due to diabetic related causes had 5.69 times more likely to be discharged from hospital with improvement than patients admitted due to any other causes (AOR=5.69, 95%CI: 1.42-22.90) (**table 10**).

Table 10: Predictors of treatment outcome of diabetic patients admitted to Jimma University Specialized hospital medical and surgical wards, February 21-June 30, 2015

Variables	Treatment outcome		Univariate analysis		Multivariable analysis	
	Good	Poor	P-value	COR(95%CI)	P-value	AOR(95%CI)
Sex						
Male	38	15	1.00	1.00		
Female	30	6	0.21	1.97(0.68-5.70)		
Age in years						
14-29	11	3	0.64	1.47(0.30-7.19)		
30-39	12	3	0.56	1.60(0.33-7.77)		
40-49	12	3	0.56	1.60(0.33-7.77)		
50-59	18	6	0.79	1.20(0.32-4.50)		
≥ 60	15	6	1.00	1.00		
Residence						
Rural	26	8	1.00	1.00		
Urban	42	13	0.99	0.99(0.36-2.72)		

Table 10 cont'd...

Marital status							
Single	6	2	0.999	0.00			
Married	56	19	0.999	0.00			
Widowed	6	0	1.00	1.00			
Educational status							
Illiterate	26	10	0.94	0.94(0.24-3.67)			
Primary	24	5	0.47	1.74(0.39-7.79)			
Secondary	7	2	0.81	1.27(0.18-8.89)			
College and above	11	4	1.00	1.00			
Occupation							
Farmer	23	8	1.00	1.00			
Government	8	4	0.62	0.70(0.16-2.95)			
Merchant	8	5	0.40	0.56(0.14-2.20)			
Housewife	16	3	0.41	1.86(0.43-8.09)			
Retired	4	0	1.00	0.00			
Unemployed	3	1	0.97	1.04(0.09-11.52)			
Other	6	0	1.00	0.000			
Monthly income							
≤500	20	3	1.00	1.00	1.00	1.00	
501-1500	29	10	0.25	0.44(0.11-1.78)	0.97	0.92(0.09-9.84)	
1501-2500	7	3	0.26	0.35(0.06-2.15)	0.77	1.74(0.04-69.78)	
25001-3500	8	1	0.88	1.20(0.11-13.32)	0.22	19.89(0.16-2441.1)	
≥3501	4	4	0.04	0.15(0.02-0.95)	0.68	0.53(0.02-11.38)	
Site of admission							
Medical ward	55	20	0.15	0.21(0.03-1.72)			
Surgical ward	13	1	1.00	1.00			
Type of diabetes							
T1DM	19	4	0.42	1.64(0.49-5.33)	0.49	1.97(0.29-13.27)	
T2DM	49	17	1.00	1.00	1.00	1.00	
Diabetes status							
Newly diagnosed	29	4	0.06	3.16(0.96-10.39)	0.25	2.87(0.47-17.63)	
Known diabetic	39	17	1.00	1.00	1.00	1.00	
Duration of diabetes							
≤1	33	6	0.14	3.14(0.70-14.16)			
1-5	18	6	0.49	1.71(0.37-7.97)			
5-10	7	3	0.76	1.33(0.21-8.29)			
10-15	3	2	0.89	0.86(0.10-7.51)			
≥15	7	4	1.00	1.00			

Table 10 cont'd...

Admission BG(mg/dl)						
≤70	2	1	0.35	0.22(0.01-5.26)	0.74	0.53(0.01-23.58)
71-180	4	7	0.02	0.06(0.01-0.70)	0.38	0.18(0.004-7.99)
181-250	9	1	1.00	1.00(0.05-18.57)	0.32	8.12(0.14-483.73)
251-350	23	3	0.90	0.85(0.08-9.30)	0.34	5.26(0.18-155.56)
351-450	12	2	0.76	0.67(0.05-8.55)	0.81	1.4560.07-30.03)
450-599	9	6	0.13	0.17(0.02-1.68)	0.58	0.44(0.02-8.26)
≥600	9	1	1.00	1.00	1.00	1.00
Reason for admission						
DKA						
Yes	27	3	0.04	3.95(1.06-14.72)	0.30	6.56(0.19-231.18)
No	41	18	1.00	1.00	1.00	1.00
Hypoglycemia						
Yes	1	1	0.40	0.30(0.02-4.99)		
No	67	20	1.00	1.00		
Foot ulcer						
Yes	7	0	1.00	1.00		
No	61	21	0.999	0.000		
HHS						
Yes	2	1	1.00	1.00		
No	66	20	0.70	1.62(0.14-18.87)		
Infections						
Yes	12	5	1.00	1.00		
No	56	16	0.53	1.46(0.45-4-76)		
Meningitis						
Yes	1	3	0.042	0.09(0.01-0.91)	0.32	0.17(0.005-5.77)
No	67	18	1.00	1.00	1.00	1.00
CVDs						
Yes	8	4	1.00	1.00		
No	60	17	0.40	1.76(0.47-6.58)		
Diabetic related admission						
Yes	38	5	0.014	4.05(1.33-12.33)	0.014	5.69(1.42-22.90)
No	30	16	1.00	1.00	1.00	1.00
Comorbidity						
Present	43	16	1.00	1.00		
Absent	25	5	0.28	1.86(0.61-5.69)		
DM complication						
Present	16	6	1.00	1.00		
Absent	52	15	0.18	2.12(0.71-6.29)		

6. Discussion

In the present study, uncontrolled diabetes which includes DKA, HHS and hyperglycemia was responsible for majority of admission of diabetic patients. It accounts for 38.20% of the total admissions, of which DKA takes the lion share. This is higher than result obtained in Kingdom of Saudi Arabia by Akbar and Al-Gamdi where high blood glucose accounts for 21% of total admissions (38). This finding is also higher than the result of the research done in Nigeria by Ajayi by which uncontrolled hyperglycemia and hyperglycemic emergencies caused admissions of 25.42% of hospitalized diabetics (15). This discrepancy might be attributed to that majority of patients admitted due to hyperglycemic conditions were newly diagnosed, which comprises 67.65% of patients admitted due to uncontrolled hyperglycemia. The overall diabetic related admission was 48.31%, which is comparable with 50.8% of diabetes related admission in England (31), but higher when compared with the result reported in Barbados which was 33.6%. In JUSH most of diabetes related admissions were due to DKA while diabetic foot disease was the principal diagnosis in Barbados (39). On other hand, our result is lower than the research done in Nigeria where 62.71% of admissions were due to diabetic related causes, by which diabetic foot ulcer contributed for 37.29% of total admissions (15), but only 7.86% in this result. One possible reason for this might be the difference in duration of diabetes, which determines the occurrence of long term diabetic complication like foot ulcer.

Infections were the second leading causes of admissions of diabetic patients in JUSH. It was found that 19.10% of admissions were attributed for infections. In addition to this, 33.71% of episodes of infections were identified as comorbidities where there was more than one infection per patient. These comorbid infections were implicated as precipitant for many hyperglycemic states. Among those, SSTIs were the prevalent one, which consist of 41.18% of infectious admissions and 13.56% of overall comorbidity. Meningitis and acute pyelonephritis were the second and the third leading causes of infections that accounts for 23.53% and 17.65% of infectious admission respectively. Overall prevalence of infections in our study was higher than the prevalence of infections reported in Addis Ababa, 36.3% (27), but lower as compared with reports from Nepal where infections were seen in 84.1% of patients, of which urinary tract infections, typhoid fever, septicemia and pneumonia was the most common infections reported accounting 20, 14, 14 and 14% each respectively (25). These differences can be partly explained

by the fact that most of patients in Nepal were females (56.5%) where UTIs are prevalent as compared with our study, where male were majorities. In addition, infections that might be treated in outpatient were also reported in Nepal like typhoid fever and pneumonia. This finding was comparable with research done in America where infections caused 16% of admissions (23).

Cardiovascular diseases take third position as the cause of admission of diabetic patients, which accounted for 17.98% of the total admissions. In addition to this, hypertension was the most common comorbidity diagnosed in 34.84% of patients. This result is much lower than the result of Kuwait study, by which disease of circulatory system accounted for 53.6% of admissions (24). Our result is in line with the finding of Adem, et al in Addis Ababa, where CVDs reported in 18% of patients and hypertension in 34% of patients (27).

Two patients were admitted due to hypoglycemia, with blood glucose level of 31 and 34 mg/dl. Their blood glucose levels were within range of severe hypoglycemia which is defined as blood glucose level of <40mg/d (40). One of the patient was on insulin while the other on metformin before admission. Both patients were elderly, 60 and 66 years, where patients in the older age-groups are especially vulnerable to hypoglycemia. Age-related declines in renal function and hepatic enzyme activity may interfere with the metabolism of sulfonylureas and insulin, thereby potentiating their hypoglycemic effects. The vulnerability of the elderly to severe hypoglycemia may be partially related to a progressive age-related decrease in β -adrenergic receptor function (41). The prevalence of hypoglycemic admission in JUSH was 2.25% which is higher than reported from Japan where it was 4.1 per 1000 patients (42), but it was in line with the finding in United kingdom where 2.3% of patients admitted with severe hypoglycemia (43). In addition to hypoglycemia at the time of admission, eight (8.99%) patients develop inpatient hypoglycemia.

Of 89 patients admitted to the hospital, 76.40% were discharged to home with improvement, 11.24% died, 5.62% referred to other institutions and 6.74% left against medical advices. Among patients who were died, 90% were T2DM and 70% were above age of 50 years. T2DM patients and elderly patients were usually present with complications and multiple comorbidities which might contribute to increased death in these groups. Eighty percent of died patients were known diabetics. Patients who were referred to other institution were admitted primarily due to non-diabetic reasons which include stroke, pancytopenia, severe anemia secondary to chronic kidney disease, variceal bleeding and ST-segment elevation myocardial infarction. Out of patient who

self-discharged; half of them were below age of 40 and the remaining was above 50, especially the lower and upper age groups had high self-discharge rate.

The discharge rate with improvement was comparable with the research done in Nigeria which was 74.6% but the rate of self-discharge was much lower as compare with the result of the same research which was 22.05%(15). In hospital mortality was comparable with 10.60% reported from Addis Ababa (27), but higher as compared with results from Nigeria by which mortality rate was 3.4% (15). Another report from Nigeria revealed that mortality was 8.1% which was slightly lower than this result but discharge improvement was higher, 89.4%, with corresponding low self-discharge rate, 2.4%, (44) as compared with our finding. These variations may be attributed to institutional difference in care of hospitalized diabetic patients, severity of the disease and even reason for admission. In our hospital the major causes of death were infections which contributed to 40% of total death, while the Nigerian reported that 39.3% of deaths caused by hyperglycemic emergencies and infections accounted for 18% of deaths (44). Meningitis was the primary infections identified as cause of fatality where 3 out of 4 patients admitted with meningitis were died. Twenty percent of death was caused by hyperglycemic emergencies and 20% by CHF. The remaining deaths were contributed by hemorrhagic stroke and pulmonary edema.

Hyperglycemia control in hospitalized patients is vital since it affects outcome and length of hospital stay. According to American Association of Clinical Endocrinologist and American Diabetes Association consensus, inpatient pre-meal blood glucose target for non-critically ill patients is 70-140 mg/dl and blood glucose target for critically ill patients is 140-180 mg/d. In order to achieve glycemic target insulin therapy is preferred over other agents both in T1DM and T2DM. Noninsulin agents are inappropriate in most hospitalized patients. Continued use of such agents may be appropriate in selected stable patients who are expected to consume meals at regular intervals (40). In this study 98.88% of patients received insulin while the rest remained on oral antidiabetic. In addition there was poor glycemic control in hospitalized patients where 53.20% of patients had blood glucose level of >180mg/dl at discharge and the mean discharge blood glucose was above the recommended level. On the other hand, in patients admitted with DKA literatures showed that the average time to be ketone free is 12hrs (45) but it was over 31hrs in our study. This difference may be due to the variability in DKA management protocol

and measurement of ketone level. In other set up, serum ketonimia was measured, whereas urine ketone level in this hospital which might be cleared lately than ketonimia.

Duration of hospital stay ranged from 1 to 88 days, with a mean duration of 15.06 ± 16.97 days. The duration of hospital stay was lower than reported from Nigeria (15). The cause of this discrepancy may be due to the difference in prevalence of foot ulcer between studies where foot ulcer is more common in Nigerian study than this study. Most of death, referral and self-discharge occurred with the first 5 days of admission; 70% of deaths occurred with the first 5 days of admission. This might implies the difference in severity and delayed presentation of patients from the outset.

Although a number of sociodemographic and disease related factors were statistically association with diabetes related admission in univariate regression, only knowledge about diabetic complication, type of diabetes and treatment with insulin and enalapril were independent predictors on multivariable logistic regression. Accordingly, there was inverse relationship between knowledge of diabetic complications and treatment with insulin and enalapril before admission with hospitalization. When patients had knowledge about complications that rise from poor glycemic control, they attempt to adhere to their antidiabetic medication and also use other non-pharmacologic approaches like exercise and diet to control blood glucose. Similarly, they might actively involve in self-care which helps them to detect complication early and seek medical attention so that it can be managed in the outpatient that subsequently decrease hospitalization.

On the other hand, T1DM patients had more than five times increased admission than T2DM patients. This difference may be due to the variation in rate of admission in acute diabetic complications, by which large proportion of T1DM patients were admitted due to DKA than T2DM patients ($p=0.00$, $COR=6.38$, $95\%CI: 2.27-17.92$). In addition T2DM patients were older who tends to be adherent to antidiabetic medication (46) and had multiple disease conditions implicated for hospitalization.

Insulin therapy was inversely related with diabetic related admission. As per the result of this study, those patients who were not on insulin had 4.5 times more chance of hospitalization. This finding was against the result reported in England and New Zealand (30,31). This may probable

due to the difference in study population, by which both reported hospitalization of known diabetic patients only while our study included both group of patients. In this study 55.81% of patients admitted due to diabetic related causes were newly diagnosed. However, enalapril therapy was associated with decreased in odds of hospitalization, which was found that patients without enalapril had six times increased probability of hospital admission. Hypertension is a common diabetes comorbidity that affects the majority of patients; a major risk factor for both CVD and microvascular complications which may leads to subsequent hospitalization. In type 1 diabetes, hypertension is often the result of underlying nephropathy, while in type 2 diabetes it usually coexists with other cardiometabolic risk factors (2). In people with diabetes, inhibitors of the renin-angiotensin system may have unique advantages for initial or early treatment of hypertension. Meta-analysis of randomized control trial supports benefits of ACEIs in patients with diabetes. ACEIs reduced all-cause mortality, cardiovascular mortality and cardiovascular events in patients with DM (47,48).

Diabetes is cardiovascular risk equivalent that associated with increased risk of coronary artery diseases. Lipid-lowering therapy significantly reduces cardiovascular risk in patients with diabetes and is the recommended primary prevention strategy against macrovascular complications for patients with diabetes and other cardiovascular risk factors. ADA and blood cholesterol guidelines recommend the use of statins in patients with diabetes who are 40 years and above irrespective of cholesterol level (2,49). Although the use of statin has a number of benefits, there was underutilization in this studied population. Among patients who were candidates for statin, only 22.5% were on statin therapy.

In this study it was found that income level, use of insulin, admission blood glucose, admission due to DKA, meningitis, and diabetic related admission with treatment outcome on univariate logistic regression. Accordingly, there was positive relationship between income level, knowledge of complication and diabetic related admission including DKA with treatment outcome. But, insulin therapy before admission, admission due to meningitis and admission blood glucose was inversely associated with good treatment outcome.

On multivariable logistic regression only diabetes related admission remained independent predictor of treatment outcome with P-value of 0.014. Patients admitted due to diabetic related

causes were more likely to go well to home and less mortality and referral to other institutions. This was not in line reported from Nigerian study where DKA and HONK were attributed for most deaths (26). Particularly, HONK was associated with high mortality rate (24.5%) but, it was not diagnosed in our study population.

The prospective nature of the study provides better data quality and comprehensive information. This study, however, has the following notable limitations. First, self-reported method was used to assess adherence, it might underestimate patients' non adherence status when compared to other conventional objective methods such as pill counts or biological assays. Second, the study looked at only a single facility so extrapolation should be done in caution. Third, the study sample size was small.

7. Conclusion

The study revealed that the three common reasons for hospitalization of diabetic patients were diabetic related reasons, infections and CVDs. DKA was the most common specific cause of admission. Infectious diseases were common among diabetics hospitalized at JUSH as primary reason for admission as well as comorbidity. Over two third of patients were discharged with improvement while one tenth of admitted patients died. Knowledge about diabetic complications, T1DM and treatment with enalapril and insulin therapy before admission were independent predictors of diabetic related hospitalization. Diabetic related admission was independent determinants of good treatment outcome.

8. Recommendations

Based on our finding we would like to note the following recommendations:-

- ✓ Federal ministry of health should consider devising strategies for screening of asymptomatic patients before complications and causing admission.
- ✓ The JUSH should strengthen patient education on glycemic control, consequences of hyperglycemia and different modalities of maintaining normoglycemia.
- ✓ The JUSH chronic care clinic should promote enalapril therapy in patients with hypertension and other cardiac comorbidities.
- ✓ The JUSH health professionals should give due attention to hospitalized diabetic patients during first five days of admission so that worse outcome can be minimized.
- ✓ Finally, nationwide study should be conducted to identify the overall hospital admission patterns of diabetic patients.

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Annexes

I. Data collection tool

Section 1: Sociodemographic characteristics of patient			
1. Sex	<input type="checkbox"/> Male	<input type="checkbox"/> Female	
2. Age (years)			
3. Residence	<input type="checkbox"/> Rural	<input type="checkbox"/> Urban	
4. Marital status	<input type="checkbox"/> Single	<input type="checkbox"/> Married	<input type="checkbox"/> Divorced <input type="checkbox"/> Widowed
5. Educational background	<input type="checkbox"/> Illiterate <input type="checkbox"/> Read and write only	<input type="checkbox"/> Primary	<input type="checkbox"/> Secondary <input type="checkbox"/> College and above
6. Occupation	<input type="checkbox"/> Farmer <input type="checkbox"/> Government	<input type="checkbox"/> Merchant <input type="checkbox"/> Daily laborer <input type="checkbox"/> Student	<input type="checkbox"/> House wife <input type="checkbox"/> Retired <input type="checkbox"/> Other(specify)_____
7. Monthly Income (birr)			
Section 2: Patient knowledge and practice			
8. Do you know about DM complications?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> NA
9. If your answer for Q8 is 'Yes' which complication do know? (More than one option is possible)	<input type="checkbox"/> Kidney disease <input type="checkbox"/> Stroke <input type="checkbox"/> Retinopathy	<input type="checkbox"/> CV disease <input type="checkbox"/> Tingling/numbness <input type="checkbox"/> Foot ulcer	<input type="checkbox"/> Other _____
Medication adherence (for previously known diabetic patients): MMAPS			
		Yes	No
10. Do you sometimes forget to take your diabetes medication (s)?			

11. In the last two weeks, was there any day when you did not take your diabetes medication?		
12. Have you ever stopped taking your medications or decreased the dose without first warning your doctor because you felt worse when you took them?		
13. When you travel or leave the house, do you sometimes forget to take your medications?		
14. Did you take your diabetes medication yesterday?		
15. When you feel your diabetes is controlled, do you sometimes stop taking your medications?		
16. Have you ever felt distressed for strictly following your diabetes treatment?		
17. How often do you have difficulty to remember taking all your diabetes medications? Never/ Almost never / Sometimes/ Frequently/ Always		
Section 3: hospital admission and treatment outcome		
18. Admission date		Card No: _____ Ward: _____
19. Types of diabetes	<input type="checkbox"/> Type1	<input type="checkbox"/> Type 2
20. Duration of DM in years	<input type="checkbox"/> Newly diagnosed	<input type="checkbox"/> Known diabetes (write the duration)_____
21. Regular follow up at diabetic clinic?	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> NA
22. If yes for Q 21 how frequent you attend follow up?	<input type="checkbox"/> Monthly	<input type="checkbox"/> Every 2 months <input type="checkbox"/> Every three months <input type="checkbox"/> Other_____
23. Blood glucose at admission		
24. Prior history of admission	<input type="checkbox"/> Yes	<input type="checkbox"/> No
25. If 'Yes' for Q24 how many times?		
26. Diagnosis/assessment of current admission		
27. Reason for admission (current admission)	<input type="checkbox"/> DKA <input type="checkbox"/> Hypogycemia <input type="checkbox"/> Nephropathy	<input type="checkbox"/> Foot ulcer <input type="checkbox"/> HHS <input type="checkbox"/> PAD <input type="checkbox"/> Infection_____ <input type="checkbox"/> CVD_____ <input type="checkbox"/> Other_____
28. Antidiabetic medication before admission	<input type="checkbox"/> No medication <input type="checkbox"/> insulin	<input type="checkbox"/> Metformin <input type="checkbox"/> Glibenclamide <input type="checkbox"/> Other_____

29. Non Antidiabetic medication before admission	<input type="checkbox"/> No medication	<input type="checkbox"/> Atorvastatin	<input type="checkbox"/> HCTZ
	<input type="checkbox"/> Lovastatin	<input type="checkbox"/> Aspirin	<input type="checkbox"/> Amlodipine
	<input type="checkbox"/> Simvastatin	<input type="checkbox"/> Enalapril	<input type="checkbox"/> Other _____
30. Did the patient discontinue any of his/her medication before admission?	<input type="checkbox"/> Yes		<input type="checkbox"/> No
31. If the answer for Q 30 is 'Yes' which medications and since when?			
32. Comorbidities (more than one option possible)	<input type="checkbox"/> None	<input type="checkbox"/> CAD	<input type="checkbox"/> Obesity
	<input type="checkbox"/> hypertension	<input type="checkbox"/> Hyperlipidemia	<input type="checkbox"/> PAD
	<input type="checkbox"/> CKD	<input type="checkbox"/> Stroke	<input type="checkbox"/> Other _____
33. Presence of diabetic complications	<input type="checkbox"/> None	<input type="checkbox"/> Nephropathy	<input type="checkbox"/> Neuropathy
	<input type="checkbox"/> Retinopathy	<input type="checkbox"/> Foot ulcer	<input type="checkbox"/> Other _____
34. Discharge date		Length of hospital stay	
35. Treatment outcome	<input type="checkbox"/> Discharge with improvement	<input type="checkbox"/> Referral	<input type="checkbox"/> Self discharge
			<input type="checkbox"/> Death
36. Discharge blood glucose			
37. If died, date of death			
Section 4: Medication prescribed after admission			
38. Medication	Dosage regimen	Start or regimen modification date	Discontinuation date (if any)
Section 5: Laboratory data and vital signs			
39. Pertinent laboratory results			
Date			

Blood glucose							
Vital signs	Temp						
	BP						
	RR						
	PR						
CBC	WBC						
	WBC differential						
	RBC						
	Hgb						
	MCV						
	MCH						
	MCHC						
	PLT						
RFT	Scr						
	BUN						
LFT	AST						
	ALT						
	Bilirubin						
U/A							
Lipid panel	TC						
	TG						
	LDL						
	HDL						
Other diagnostic procedure							

II. Patient information sheet

Name of investigators: Adane Teshome, Tesfahun Chanie, Dr. Esayas Kebede

Name of study area: JUSH

Research budget covered by: Jimma University

Research objective: To assess reasons for hospitalization of adult diabetic patients and their treatment outcome at medical and surgical wards of JUSH.

Study procedure: The data collectors will interview patients using questionnaire after obtaining consent from the patient. Other relevant data will be extracted from patient's chart.

Risks: this study will not impose any risk on participants except the time you will spend for interview.

Participant's right: The patient has a full right to stop the interview at any time and not to allow review of his/her chart, or to skip any question that he/she does not want to answer.

Benefits: The study is beneficial for patient's quality service delivery for future encounters and on spot intervention during data collection.

Incentives: Patient will not be provided any specific incentive for taking part in the research other than acknowledgment.

Confidentiality: The study result will not include patient's name, address and any personal details that may leads to identification of patient.

Agreement: Patients are expected to be fully voluntary to participate in the study.

Contact: if you want any detail information and encounter inconveniences about the study you can contact with:

Adane Teshome. Cell Phone: +251921465244 or email address: adanet2011@gmail.com

III. Patient informed consent

My name is Adane Teshome. I am doing my thesis for partial fulfillment of master degree for Clinical pharmacy on “Reasons for hospitalization, treatment outcome and predictors in adult diabetic patients JUSH.” This study is aimed to identify common causes of hospital admission of diabetic patients and treatment outcomes and predictors of hospitalization and treatment. The study will provide data that will strength treatment and improve quality of diabetic patient so that hospitalization will be minimize in the future. The result of the study will helps individual patients as well as the health care providers to identify avoidable risk factors for hospitalization and factors that might influence treatment outcome which in turn helps to minimize hospitalization of other diabetic patients and future readmission of the same patient.

To achieve all these research objectives your cooperation and involvement is crucial. The information you provide will not affect the service you get from the institution; the confidentiality of your information will be kept securely and only used for this research purpose. Your name, address and personal detail that leads to personal identification will not be included in the data collection process. You have the right not to participate in this study, not to allow review of your medical record, to skip any question you are not interested to answer and withdraw from the research at any time.

Knowing the objective of the study and the data collection process, I am happy and acknowledge your voluntariness to be part of this research.

I understand and agreed to participate in the study

Name_____ Signature_____

Thank you for your cooperation!

IV. Data collection tool Afan oromo version

Kutaa 2: Haala hawwasuuma			
1. Saala	<input type="checkbox"/> Dhiira	<input type="checkbox"/> Dhalaa	
2. Umurii (waggaa dhaan)			
3. Bakka jireenyaa	<input type="checkbox"/> Baadiyyaa	<input type="checkbox"/> Magaalaa	
4. Haala gaa'elaa	<input type="checkbox"/> Kan hinfudhin/hinherumin	<input type="checkbox"/> Kanfudhe/heerumtee	<input type="checkbox"/> Kan gargar bahan <input type="checkbox"/> Kan irra duee
5. Haala barnootaa	<input type="checkbox"/> Kan hin baratin <input type="checkbox"/> dubbisu fi barrreessuu kan dandeessu	<input type="checkbox"/> Sadarka 1faa	<input type="checkbox"/> Sadarkaa 2faa <input type="checkbox"/> Kollejjii fii isaanol
6. Haala hojii	<input type="checkbox"/> Kotee bulaa <input type="checkbox"/> Hojii motummaa <input type="checkbox"/> Hojii dhuunfaa	<input type="checkbox"/> daldalaa <input type="checkbox"/> dafqan bulaa <input type="checkbox"/> barataa	<input type="checkbox"/> Haadha manaa <input type="checkbox"/> kan biro _____
7. Galii baatii			
kutaa 2: haala dhukkubichaa			
8. Sababa dhukkubsichaatin rakkina dhufu beektuu?	<input type="checkbox"/> Eyyan	<input type="checkbox"/> lakki	
9. Yo deebiin gaaffii 8'eyyen' tahe rakkinota kana kessa kam bektuu? (tokko ol filachun ni dandehama)	<input type="checkbox"/> dhukkuba kalee <input type="checkbox"/> dhibee sammuu dhibbaa dhiigaatin kan dhufu <input type="checkbox"/> dhibee ijaan wal gabata	<input type="checkbox"/> Dhibee onnee fi dhibbaa dhiigaa <input type="checkbox"/> Hadoochuu qaamotaa (miillaa fi harkaa)	<input type="checkbox"/> Madauu millaa <input type="checkbox"/> Kan biroo_____
10. Hangi shukkara dhiiga kessanii hospitaala galuudhaaf sababa akka tahan beektuu?		<input type="checkbox"/> eyyen	<input type="checkbox"/> lakki

Haala fudhana qoricha: MMAPS

11. Qoricha dhibee sukkaara keessan fudhachuu irranfattanii beektuu?	<input type="checkbox"/> Eyyen	<input type="checkbox"/> Lakki
12. Torban laman darbanitti guyyaa itti qoricha kee fudhachuu dhiiste jiraa?	<input type="checkbox"/> Eyyen	<input type="checkbox"/> Lakki
13. Qoricha kee fudhachuu dhiistee beektaa yookaan hanga fudhachuu qabdu gadi fudhattee beektaa osoo ogeessi fayyaa yeroo jalqabaaf sitti hin himin, yeroo haalli fayyummaa keetii gad bu'aa deemu ?	<input type="checkbox"/> Eyyen	<input type="checkbox"/> Lakki
14. Yeroo karaa deemtu ykn manaa baaatu, Al tokko tokko qoricha kee fudhachuu ni dhiistaa?	<input type="checkbox"/> Eyyen	<input type="checkbox"/> Lakki
15. Kaleessa qoricha dhukkuba sukkaaraa fudhattee jirtaa?	<input type="checkbox"/> Eyyen	<input type="checkbox"/> Lakki
16. Yeroo dhukkubni sukkaara kee sitti foyya'u, al tokko tokko qoricha kee fudhachuu ni dhiistaa?	<input type="checkbox"/> Eyyen	<input type="checkbox"/> Lakki
17. Yeroo haala sirriin qoricha kee fudhattu, sitti toluu dhiisee beekaa?	<input type="checkbox"/> Eyyen	<input type="checkbox"/> Lakki
18. Qoricha kee fudhachuu yaadachuu irratti rakkinni yeroo akkamin si mudateee beeka? Hin beeku/ haalan hin beeku/ altokko tokko/ darbee darbee/ yeroo hundaa?	<input type="checkbox"/> Eyyen	<input type="checkbox"/> Lakki

V. Patient information sheet Afan Oromo version

Odeeffannoo hirmaataa

Maqaa qorattootaa: Adaana Tashooma, Tafahun Caanee fi Isaayaas kabada

Bakka qorannoo: Hospitaala Ispeshalayizdii yuniverssiti Jimmaa

Baasii qorannoo kan haguugu: Yuniversiitii Jimmaa

Kaayyoo qorannoo: haalota dhukkubsattoni dhibee sukkara hospitaala speshalizii yuniversittii jimmaa ittin galaniti buna' tajaijijja fayya issani qorachudha.

Fayyidaa qorannoo: Qorannoon kun haalota, baayyinaa fi murteessitoota rakkina itti fayyadamiinsa qoricha, dogoggora fayyadamiinsa qorichaa fi akkasumas ta'iiwwan qorichaa hin barbaadamneen wal qabatanii fi dhukkubsattoota ciisanii yaalaman irratti mul'atan qorachuun fulduratti faarmaasistoonni rakkinoota heeraman kunneen adda baasuun furmaata itti kennuuni fi ittisuun gahee tajaajila kilinikaal faarmaasii haara ta'e akka deeggaran gargaara.

Haala adeemsa qorannoo: Odeeffannoon tokkon tokkoon dhukkubsataaraa gaaffiilee qorannoo fi guccawwan qophaa'aniin saassabbameen booda fedhiin dhukkubsataan qorichaarra qabu akka eegame baruuf gargaara. Kana jechuunis qorichi hundi sirrin akka ajajame, qorichi hundarra hojjetuu fi ta'ii hin barbaadamne xiqqaa akkasumas dhukkubsatichi fudhachuu barbaaduu fi fudhachuu danda'u fa'a. rakkinni fi dogoggorri itti fayyadamiinsa qorichaa adda bahanis furmaanni itti kennama.

Rakkoo dhukkubsataarra gahu: Qorannicharratti rakkoon dhukkubsataa kamirrayyuu hin gahu.

Mirga hirmaataa: Mirgi hirmaachuu yookin dhiisuu fi yeroo barbaadan addaan kutuu hirmaatichaa eegamaadha.

Fayyidaa: Qorannichi fulduratti: Tajaajila qulqullina qabu dhukkubsataaf kennuuf gargaara.

Kanfaltii: Dhukkubsatichi galataan ala hirmaachuudhaaf kanfaltii addaa hin argatu

Icciitii: Maqaa fi teessoon dhukkubsatichaa hin caqafamu.

Waliigaltee: Dhukkubsatichi walii galtee guutuu godha jedhamee yaadama.

Gaaffii fi yaadaaf: Waan isinitti hin tolle yookin gaafattan kamiifuu namni dubbisuu qabdan:

Adaana Tashooma , Lakk. Mob: 0921465244 yookiin Imeelii adanet2011@gmail.com

VI. Informed consent Afan Oromo Version

Guca walii galtee himataa

Maqaan koo Adaanee Tashooma jedhama. Ani yeroo ammaa barumsa di grii lammaffaa gosa barnoota kiliinicaal faarmaasiitiin hospitaala spishaallii tiin yunveristii jimmaa kessatti barachaa kanan jiru yemmuun ta'uu barumsa koo kana xumuruudhaaf waraqaa qorannoo mata dure qorannoo haala dhukkubsatootni dhibee shukkaaraa hospitaala ittiin galanii fi bu'aa tajaajila fayyaa irraa agatan ilaalchisee qorannoo geggeessee jira.

Kaayyoon qorannoo kanaas sababoota beekamoo dhibee shukkaaraaf saaxilani fi dhukkubsatootni hospitaala ittiin galan akkasumas tajaajila fayyaa irraa bu'aa argamu fooyyessuuf yaadottan gargaaran sassaabuu fidha. Gama birootiin ammo fuulduratti tajaajila kennamu cimsuuf dabalataanis jirenya dhukkubsatootaa dhibee kanaa foyyessudhaan hospitaala ittiin galan hir'isuuf gargaara.

Kaayyoon qorannoo kanaas sababoota beekamoo dhibee sukkaaraaf saaxilaniifi dhukkubsatootni hospitaala ittiin galaan akkasumas tajaajila fayyaa irraa bu'aa arguu fooyyessuuf yaadoftan gargaaran sassaabuufidha

Kaayyoon qorannoo kanaa galmaan ga'uudhaaf deeggarsiifi hirmaannaan dhibamtoota murteesaa ta'uu isaa hubattanii yaada keessan soda tokko malee bilisaan akka ibsitan gafachaa soda tokko malee bilisaan akka ibsitan gaafachaa yaadni dhukkubsatootni kennan kam iyyule ieitii dhaan kan qabammu fi qorannoo kanaaf qofa kan oolu ta'uu isaa hubachiisaa dhukkubsatootni tajaajila hospitaala irraa argacha jiran kan hin hanbisne ta'u qorannoo nkana irratti hirmaachuufiis ta'ee dhiisuf mirga guutuu qabadan .

Qoranno kana irraatti hirmachuu akkan barbaadu mallatto kiyyan mirkaneesseera

Maqaa hirmataa _____ Mallattoo _____

VII. Patient information sheet Amharic version

ለተሳፊዎች መረጃ ቅፅ

ተመራማሪዎች: አዳነ ተሾመ ፣ ተስፋሁን ጫኔ ፣ ዶክተር ኢሳያስ ከበደ

የጥናቱ ቦታ: ጅማ ዩንቨርሲቲ ስፔሻላይድ ሆስፒታል

የጥናቱን ወጪ የሚሸፍነው ድርጅት: ጅማ ዩንቨርሲቲ

የጥናቱ አላማ: የስካር ህመማን ሆስፒታል የሚገቡበትን ምክንያት እና የህክምና ውጤታቸውን ለማጥናት

የጥናቱ ሂደት: ከታካሚዎች ሙሉ ፍቃደኝነት ከተገኘ በኋላ መረጃ ሰብሳቢው ተሳታፊዎችን ቃለ መጠይቅ ይደረግላቸዋል ። እንዲሁም ሌሎች ጠቃሚ መረጃዎች ከታካሚው መረጃ ቅን ሰበሰባል ።

የተሳታፊ መብት: ተሳታፊው በጥናቱ ያለመሳተፍ ና በፈለገው ሰዓት ከጥናቱ የመውጣት መብት የተጠበቀ ነው ።

ዓቅማ ዓቅም: ተሳታፊው በዚህ ጥናት በመሳተፉ የሚያገኘው ምንም ዓይነት ጥቅም ጥቅም አም

የጥናቱ ጥቅም: የዚህ ጥናት ውጤት በተመሳሳይ ሁኔታ ሆስፒታል ለሚገቡ ህመማን ጥራት ያለው የህክምና አገልግሎት ለመስጠት ይጠቅማል

ሚስጥራዊነት: እርሶዎን ማንነት የሚገልፅ ማንኛውም መረጃ የጥናቱ ውጤት ላይ አይካተትም ።

ስምምነት: በዚህ ጥናት ላይ የሚሳተፉት ታካሚዎች ሙሉ ፍቃደኛ መሆን አለባቸው

በጥናቱ ዙሪያ የበለጠ መረጃ ቢያስፈልገዎ: በጥናቱ ዙሪያ የበለጠ መረጃ ከፈለጉ የሚከተለውን ግለሰብ ማነጋገር ይችላሉ ።

አዳነ ተሾመ ስልክ :- 0921465244 ወይም የኢሜል አድራሻ adanet2011@gmail.com

VII. Patient informed consent Amharic version

የስምምነት ሰነድ

ወገን ማህተም መጠቀም ተሳታፊዎች፡-

ስሜ አዳነ ተሾመ ይበላል ። የሁለተኛ ድግሪ የመመረቂያ ጥናቱን በጅም ዩንቨርሲቲ ስክሻላማት ሆስፒታል የስካር ህሙማን ሆስፒታል የሚገቡበትን ምክንያት እና የሕክምና ወጪዎቻቸውን በማጥናት ላይ እጅግ ። የዚህ ጥናት ውጤት የሕክምና አገልግሎትን በማጠናከር የስካር ህሙማንን የኑሮ ሁኔታ በማሻሻል ሆስፒታል መግባትን ይቀንሳል ። በተጨማሪም የጥናቱ ውጤት ለእያንዳንዱ የስካር ህሙማን እና የጤና አገልግሎት ለሚሰጡ ተቋማት ሲወገዱ ስለሚችሉ ሆስፒታል የመግባት አጋላጭ ሁኔታዎች ላይ ጠቃሚ መረጃ ማስገኘት ።

በመሆኑም ከላይ የተጠቀሱትን አላማዎች ለማሳካት የእርስዎ ትብብር እና ተሳትፎ በጣም አስፈላጊ ነው። እርሶዎ የሚሠጡት መረጃ ከተቋሙ የሚያገኙት የህክምና አገልግሎት ላይ ተፅዕኖ አያሳድርም የሚሠጡት መረጃ ሚስጥራዊነትም የተጠበቀ ነው ። እንዲሁም የእርሶዎን ማንነት የሚገልፅ ማንኛውም መረጃ የጥናቱ ሒደት አካል አይደለም። ከዚህም ባሻገር ተሳታፊው በጥናቱ ያለመሳተፍ እና በፈለገው ሠዓት ከጥናቱ ራሳቸው የማግለል መብት የተጠበቀ ነው ።

ይህን የጥናት ዓላማ ተረድተው ተሳታፊ ለመሆን ፍቃደኛ ስለሆኑ በቅድሚያ ምስጋናየን እጅግ እናገለግላለን ።

በጥናቱ ላይ ለመሳተፍ መስማማቱን በፊርማዎ አረጋግጣለሁ ።

ስም_____ ገጽ_____

ስለትብብረዎ በድጋሚ አመሰግናለሁ

DECLARATION

This is to certify that the paper prepared by Adane Teshome, entitled: “Reasons for hospitalizations, treatment outcome and predictors in adult diabetic patients at Jimma University Specialized Hospital, Southwest Ethiopia” in partial fulfillment of the requirements for the degree of Master of Science in Clinical Pharmacy. I declare that this paper is original work and all sources of material used for this thesis and peoples involved are fully acknowledged.

Name: Adane Teshome

Signature _____ Date _____

Approved by:

1st advisor's Name: Tesfahun Chanie

Signature _____ Date _____

2nd advisor's Name: Dr. Esayas Kebede

Signature _____ Date _____