Diabetes & Metabolic Syndrome: Clinical Research & Reviews 13 (2019) 2025–2031

Contents lists available at ScienceDirect

Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: www.elsevier.com/locate/dsx

Original Article

# Affordability effect of diabetic medicine on Patient's treatment adherence case study: Itojo Hospital in Ntungamo District

Tumusiime Cathbert

ARTICLE INFO

*Article history:*
Received 1 April 2019
Accepted 21 April 2019
Dedication: I dedicate this research to my dear parents Mr & Mrs Muhanguzi E Moses for their endless care and tireless parental and financial support.May God bless them abundantly, my siblings Talbert and Patricia, my relatives for their dedicated support and to my dear friends who have been with me through this academic struggle.

ABSTRACT

The objective of this study was to assess the affordability effect of diabetic medicine on patient's treatment adherence among patients aged 18 and above who sought treatment at IH diabetic clinic.

The source of data was primary which was collected by the researcher from IH. The independent variable was considered as affordability of the diabetic medicine and adherence was the dependent variable in this study. Findings showed that Sex, marital status, education level, estimated monthly income were significantly associated with treatment adherence at the bivariate level.

The objectives of the study were looking at the affordability effect of diabetic medicine and awareness among the patients. It was found out that there is a statistically significant relationship between the two variables.

Basing on the findings of the study, it is recommended that more sensitization should be put in place to help patients be informed about their health, to be educated and also made aware of how to take good care of themselves especially on the side of females as well as be trained on how to have a strong financial base as this can help improve on affordability of medicine.



## 1. Introduction

### 1.1. Background

Treatment adherence is essential in the management of Diabetes. Adherence to diabetes treatment leads to improved glucose control and reduces the risk of disease complications. Affordability refers to a product's cost versus the ability and willingness of people (as well as health systems and third-party payers) to pay for it. Diabetes is defined as a defect in the body's ability to convert glucose (sugar) to energy.

Poor adherence to medication regimens is common, contributing to substantial worsening of disease, death and increased health-care costs. Hence, practitioners should always look for poor adherence and can enhance adherence by emphasizing the value of a patient's regimen, making the regimen simple and customizing the regimen to the patient's lifestyle [1]. The contribution of price determination factors to the overall affordability issue could not be determined precisely and is likely to vary across the many regions. However, it seems that they all add to the financial burden of diabetes on those affected. It should also be remembered that the prices represent only a portion of the actual costs of diabetes treatment, they do not include healthcare costs, costs due to complications or those associated with the behavioral changes that having diabetes entails.

In developed countries like the United States, more than 23 million people have diabetes mellitus, although about one third of these cases are undiagnosed [2]. Affordability issues were identified as a barrier to access to diabetes supplies in at least four countries:

Bulgaria, Lithuania Poland and Romania. This is according to the International Diabetes Federation publication, affordability seems to be a problem for many people with chronic conditions. Previous studies have found adherence to diabetes treatment generally to be sub-optimal ranging from 23% to 77%, In addition, these studies have generated varied results of the factors associated with non-adherence to diabetes treatment, it is further suggested that databases on how to evaluate the cost-effectiveness of programs [3]. Many individuals are influenced by traditional beliefs, myths and misconceptions regarding the causes, symptoms and care of diabetes and continue to seek alternative measures for curing their condition.

*Abbreviations:* ADA, American Diabetes Association; BSTA, Bachelors in statistics; DM, Diabetes Mellitus; IH, tojo Hospital; IDF, International Diabetes Federation; UDA, Uganda diabetes association; USA, United States of America; MOH, Ministry of Health; MS, Medical Superintendent; WHO, World Health Organisation.

*E-mail address:* tcathbert1@gmail.com.

https://doi.org/10.1016/j.dsx.2019.04.029
1871-4021/

However, the disease is not only a problem for the individual but is also a societal challenge because of its serious complications and cost of treatment. Meanwhile, public awareness and understanding of diabetes remains very low in certain areas [3]. The data indicated a high median, Cameroon and Kenya showed particularly high values, thus poor affordability. Furthermore adherence to diabetic treatment has been reported to range from 20 to 60% in Africa (Neiheisel et al., 2014).

Many diabetic patients are usually admitted with complications which would have been controlled with treatment if access to medicine was affordable as it would reduce the rate at which diabetes develops.

Patient interviews while straight forward and inexpensive are clearly limited by their subjective nature, this is according to a study conducted in Ethiopia in 2011 on medication adherence in diabetes and self-management practices.

Finally, according to the study that was done at Mulago in Uganda, it was found out that the rate of adherence to diabetic treatment was 28.9% which is below average of 50% and therefore this research was needed to provide an understanding of affordability of diabetic medicine on its treatment adherence.

### 1.2. Problem statement

Adherence is a key factor to healthcare outcome in all aspects of medical care including diabetic care. The rate of adherence to diabetic treatment according to studies in USA has indicated that less than 50% of patients adhere whereas in Africa it is about 41% and it stands at around 28.9% in Uganda.

Adherence to medications is not routinely measured in clinical practice as diabetes is a common problem in every health practice according to Ref. [4] and the review of studies shows that insufficient literature has been documented on the affordability of the medicine prescribed to the patients diagnosed with diabetes.

Presently, there is no single measure accepted as the gold standard to relate medication adherence with affordability, because all commonly employed methods have weaknesses. By using the patients part of income spent on medication, the researcher carried out a study on the affordability effect of prescribed medicine in relation to treatment adherence.

### 1.3. Main objective

The main objective of the study was to assess the affordability of medicine prescribed to diabetic patients and its effect on treatment adherence.

#### 1.3.1. Specific objectives

- ➢ To explore the relationship between affordability of diabetic medicine and patients treatment adherence.
- ➢ To provide improved awareness on affordability of medicine prescribed for diabetic patients and treatment adherence.

### 1.4. Hypotheses

- ➢ There is no relationship between affordability of diabetic medicine and patient's treatment adherence.
- ➢ There is awareness of diabetic patients about the affordability of prescribed medicine towards their treatment adherence.

### 1.5. Significance of the study

The study was intended to enable stakeholders understand the relationship between the affordability effect on treatment adherence so as to be guided by facts in implementing policies and to be able to come up with proper decision making,this will minimise complications amongst diabetic patients.

It is going to help health workers in creating awareness about the financial aspect in relation to adherence to diabetic treatment and how they can improve it to help diabetic patients through procuring enough medicine from the national medical stores to cater for the patients.

### 1.6. Scope of the study

The study was carried out at Itojo hospital located in Ntungamo District along Mbarara-Kabale high way 52 km from Mbarara town and it involved diabetic patients who attended the diabetic clinic at the hospital.

The research was done on the affordability of prescribed medicine in relation to patients' response to diabetic treatment for a period of four months (May–September 2016).

## 2. Literature review

### 2.1. Adherence to diabetic treatment

According to the World Health Organisation adherence is defined as "the extent to which the patient follows medical instructions." (WHO, 2003)

[5] Therapeutic adherence means that the patient observes the medical recommendations, taking the medication, and maintaining a lifestyle as recommended by clinicians.

In this study, focus was on diabetic adherence. Adherence to diabetic treatment was determined through self-reports of how patients had been taking medication one week prior to the interview. Patients were specifically asked to recall if they missed any doses of medication on a day by day basis over a period of seven days. The number of times doses were missed were calculated basing on the patients medication regimen which was obtained from their medical forms.

A patient's ability and willingness to follow a prescribed regimen directly influences the effectiveness of that therapy. One factor was the patient's ability to read and understand medication instructions. Patients with low literacy may have difficulty understanding instructions; this ultimately results in decreased adherence and poor medication management. Issues of low literacy must be recognized and strategies designed with this limitation in mind.

Adherence rates for patients with type 2 diabetes have ranged from 65% to 85% for oral agents and 60%–80% for insulin. Influences on adherence in this population are similar to those in patients with other chronic diseases: understanding of the treatment regimen, treatment regimen complexity, perception of the benefits of treatment, adverse effects, costs of medications, and emotional well-being.

[6] Medication adherence was measured by patients' overall exposure to medications used to treat a given condition. Adherence was defined as the percentage of days during the analysis period that patients had a supply of one or more maintenance medications for the condition as this was based on "days' supply" data in patients' prescription claim records. This measurement strategy was found to reduce the risk of overestimating adherence for example, cases in which patients have overlapping prescriptions as a result of a change in therapy. For prescriptions extending beyond the end of the analysis period, days' supply was truncated at the end of the period. Patients in each study sample were stratified into 5 categories based on their adherence score: 1–19%, 20–39%, 40–59%, 60–79%, or 80–100%.

[7] States that numerous studies have explored potential predictors of adherence to medicines across a variety of conditions. However, the majority of studies have explored largely unmodifiable variables due to the retrospective databases that are often used to measure adherence. Some of the frequently cited predictors include age, sex, ethnicity, income and education though their relationship to adherence has been inconsistent due to variations in study designs and sample populations. Adherence to medications was assessed based on patients' recall on the use of anti-diabetic drugs in the previous one week and three months. Good adherence was considered if the patient's calculated adherence was at least 80% of the expected days. Patients with less than 80% days of using their medications were judged as poor adherent. The cut-off point of 80% was considered acceptable as it was also used in other studies of chronic medications. For patients using more than one anti-diabetic drug, the worst computed adherence of the drugs was used to represent the patient's overall adherence [8].

[9] Says although adherence was the outcome of interest in this study, the technology also has the potential to improve other aspects of HIV care like clinic attendance. It can also be explored for improving adherence in communicable and chronic disease like tuberculosis and diabetes. Lack of adherence to diabetic self-management regimens is associated with a high risk of diabetes complications. The quality of affordability relationship is associated with adherence to diabetes treatment. This study attempts to improve awareness of both patient treatment adherence and affordability factors involved in lack of adherence to treatment among diabetic patients.

### 2.2. Affordability of diabetic medicine

According to the study in the US on economic costs of diabetes [10]. it follows the methodology used in the 2002 and 2007 costs of diabetes studies by the American Diabetes Association, it further states that health resource use and associated medical costs are analysed by age, sex, insurance coverage, medical condition, and health service category with modifications to refine the analyses where appropriate. A prevalence based approach was used to estimate the medical costs by demographic group, health service category, and medical condition.

Information on affordability of anti-diabetic drugs and glycemic control category based on latest monitoring tests were extracted from filled prescriptions and traced case-notes respectively, into respective questionnaires, coded by the hospital number of individual patient [11]. Any patient that was able to buy all available prescribed anti-diabetic drug (s) at the point of prescription by the pharmacist was assumed to afford the anti-diabetic drug (s) and categorized as to be affording all anti-diabetic drugs while any patient that could not afford at-least one of the prescribed available anti-diabetic drug(s) was categorized as can't afford all anti-diabetic drugs.

[12] In most countries the affordability of generic glibenclamide (it is a diabetic drug) and metformin is reasonable, being less than 1 days' wages except in countries where only the originator is available e.g. China, Cameroon and Chad. The affordability of the originator versions of glibenclamide was also found to be poor in Indonesia and Mali, and policies to promote the use of generic medicines should be encouraged. This includes requiring generic substitution in addition to other measures related to facilitating registration and ensuring availability. Diabetes is a disease that is likely to increase dramatically in prevalence in the near future. Although this disease may initially affect the affluent, many poor people will also be affected since they may not afford diabetic drugs. Governments need to ensure that these poor people have access to effective generic medications ideally through public facilities at low or no cost.

[13] Also reveals that the issue of affordability of health care services remains high on the health policy agenda because determining whether health care services are affordable is complex, however, as the concept 'affordability' is inherently normative. With a focus on measuring affordability in low and middle-income countries, we discuss different methods used to operationalize this concept. Patients diagnosed with DM showed that underlying living conditions such as affordability of drugs, food, equipment for self-monitoring of blood glucose, and different gender roles determined beliefs about health and illness and affected health-related behavior including healthcare-seeking behavior. Affordability is an important, yet a hard to define concept, it has much to do with the fact that by definition, affordability is a standardizing issue and it requires defining when we consider something to be too expensive for someone. The researcher stresses that a good is unaffordable when its price exceeds the total budget a person can attract. The researcher used the alternative of linking the amount spent on buying prescribed medicine to the income of the individual and require it not to exceed some percentage of total income as a measure of affordability.

## 3. Methodology

This chapter describes the research design and approach, study population, sample size determination, inclusion criteria and exclusion criteria, study instruments, data collection procedures, data analysis, ethical issues and finally plan of disseminating data.

### 3.1. Research design and approach

This was a descriptive survey, the study was cross-sectional because it was conducted across participants over a short period of time and it did not necessitate the researcher to make follow-ups of the participants. The study looked at only some representative sample elements of the population by a quantitative approach which allows a comprehensive presentation of data as was obtained from the study.

### 3.2. Study population

The study was conducted among diabetic patients both men and women who attend the diabetic clinic at Itojo hospital and have been diagnosed with diabetes for at least 3 month prior to this study. Data was collected from those patients who were able to consent to participate in the study.

### 3.3. Sample size determination

Sample size was estimated using a standard formula by Cochran (1963);

$$n = \frac{Z^2 pq}{d^2} \quad (1)$$

where $n$ is the sample size.

$Z$ is score at 95% of confidence interval which is 1.96
$p$ = Assumed a population prevalence, [14]
$p = 0.2$
$q = 1 - 0.2 = 0.8$
$d$ = Level of error expected which is 0.09 as estimated from a similar study on diabetic adherence. [15]

There fore. $n = \frac{1.96^2 * 0.2 * 0.8}{0.09^2} = 75.883$

But due to the cost and time limitations, a sample of 60 respondents was considered in carrying out this study.

### 3.4. Sampling procedures

The sampling frame was all diabetic patients aged 18 years and above who have sought treatment at the IH diabetic clinic for a period of three months and above. A simple random selection was used because it was convenient, time saving and did not create room for bias.

### 3.5. Research instruments

A questionnaire was designed in line with the set study objectives and the researcher took time to interview the participants one by one since the questionnaires were not self-administered and the research involved some respondents who were less or not educated and could not easily cope up with the questionnaire language. Therefore, this method became effective in terms of time saving as it was face-to-face with the respondents and the questionnaire was sectioned into three divisions of knowledge, attitude and practice so as to capture information based on diabetic medicine affordability and its effect on treatment adherence for patients. It was an easy way of reaching out to the respondents and obtaining desired information in the limited time that was available.

### 3.6. Inclusion criteria

The study included the diabetic patients who have spent 3 months or more on treatment and attend the diabetic clinic at Itojo hospital and were willing to participate in the study. Generally, it included both type I and type II diabetic patients.

### 3.7. Exclusion criteria

All diabetic patients who did not consent to take part in the study were not included while conducting the research.

### 3.8. Data collection procedure

After obtaining an approval letter from the School of statistics and planning Makerere University, the researcher presented it to the administration of Itojo hospital where the study was carried out. After authorization from the hospital administration, he and the hospital staff briefed the patients about the study, he then collected data from willing respondents who consented to the study and then questionnaires were filled through interviewing respondents. The average time it took the researcher to complete an interview with a respondent was about 10–15 min. And finally questionnaires were collected by the researcher and kept safely.

### 3.9. Data analysis

After data was collected, the researcher went on to carry out statistical analyses, where a template was designed using the Epi-Data software which was used for data entry and documentation. Data was defined for each variable, the data file created. The checks were conducted to ensure quick and clear use of the entry tool (Lauritsen JM, 2003), the qes, rec, chk files were saved and after entry, data was exported to STATA 12 for analysis, organisation and interpretation of the results obtained. For bivariate analysis of categorical data the cross tabulations were carried out to assess the affordability effect on diabetic treatment adherence.

The bivariate analysis formula used was chi-square;

$$x^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\left[\frac{(O_{ij}-E_{ij})^2}{(E_{ij})}\right] \quad (2)$$

$(r-1)(c-1)$ are the degrees of freedom.
$O_{ij}$ is the Observation in the ith row and jth column.
$E_{ij}$ is the expected value from the ith row and the jth column.
$r$ is the number of rows
$c$ is the number of columns

### 3.10. Ethical consideration

Approval to carry out the study was sought and obtained from the school of Statistics and planning Makerere University, the consent form was interpreted in the local language during the briefing for each participant to understand very well what they were to fill, after explaining the study purpose to the respondent, informed consent was obtained and confidentiality was ensured through using codes on data documents, securely store data documents within closed locations and limiting access to identifiable information. The study carried no potential risks to the participants and they were free to pull out from the study at any time of the study.

## 4. Findings of the study

### 4.1. Introduction

This chapter presents findings of the study based on primary data which was obtained from Diabetic patients who attended the diabetic clinic at Itojo Hospital. A total of 60 patients were interviewed and therefore the findings are based on the responses captured in the questionnaire that was used to collect the data. Relationship between affordability effects on treatment adherence was established using the Pearson's Chi-square test.

### 4.2. Demographic characteristics of the respondents

This section presents the characteristics of mothers based on age, sex, marital status, education level, estimated monthly income and the respondent's household size as shown in Table 1.

#### 4.2.1. Distribution of patients by age category

In terms of patients age distribution, the study found out that the highest percentage (28.33%) of respondents were in the category of 30–39 followed by those in the category of 40–49 (26.67%) and the least (10.00%) were in the category of 60 years and Above.

#### 4.2.2. Distribution of patients by sex

More than half of the respondents (56.67%) were females and only 26 males with 43.33% were found to have participated in the study thus majority of the patients who on average report to Itojo Hospital diabetic clinic are females.

#### 4.2.3. Distribution of patients by marital status

Results indicate that close to half of the total number of respondents 29(48.33%) were married followed by the widowed patients at 26.67% whereas the least were patients categorized as single at 8.33% of the total study participants.

**Table 1**
A table showing demographic characteristics of study participants (n = 60).

| Variables | Response (n) | Percentage of respondents |
|---|---|---|
| Age group (in years) | | |
| 18–29 | 9 | 15.00 |
| 30–39 | 17 | 28.33 |
| 40–49 | 16 | 26.67 |
| 50–59 | 12 | 20.00 |
| 60 and Above | 6 | 10.00 |
| Sex | | |
| Male | 26 | 43.33 |
| Female | 34 | 56.67 |
| Marital status | | |
| Single | 5 | 8.33 |
| Married | 29 | 48.33 |
| Divorced | 10 | 16.67 |
| Widowed | 16 | 26.67 |
| Education level | | |
| No formal education | 08 | 13.33 |
| Primary education | 17 | 28.33 |
| Secondary | 19 | 31.67 |
| Tertiary | 16 | 26.67 |
| Income level | | |
| ≤ to 100,000 | 22 | 36.67 |
| 110,000–250,000 | 14 | 23.33 |
| 260,000–500,000 | 15 | 25.00 |
| ˃ than 500,000 | 09 | 15.00 |
| Household Size | | |
| 2-4 Members | 15 | 25.00 |
| 5-7 Members | 22 | 36.67 |
| 8-10 Members | 17 | 28.33 |
| Above 10 Members | 06 | 10.0 |

**Table 2**
Relationship of patient adherence with other characteristics.

| Variables | Category | Patient adherence | | χ2 | P– value |
|---|---|---|---|---|---|
| | | Yes (%) | No (%) | | |
| Age of the patient | | | | | |
| | 18–29 years | 22.22 | 77.78 | | |
| | 30–39 years | 41.18 | 58.82 | | |
| | 40–49 years | 37.50 | 62.50 | 4.413 | 0.353 |
| | 50–59 years | 25.00 | 75.00 | | |
| | 60 & above years | 0.00 | 100.00 | | |
| Sex | | | | | |
| | Male | 50.00 | 50.00 | | |
| | Female | 14.71 | 85.29 | 8.740 | 0.003* |
| Marital Status | | | | | |
| | Single | 40.00 | 60.00 | | |
| | Married | 44.83 | 55.17 | | |
| | Divorced | 30.00 | 70.00 | 10.121 | 0.017* |
| | Widowed | 0.00 | 100.00 | | |
| Education level | | | | | |
| | No formal educ. | 0.00 | 100.00 | | |
| | Primary educ. | 23.53 | 76.47 | 17.051 | 0.001* |
| | Secondary educ. | 15.79 | 84.21 | | |
| | Tertiary | 68.75 | 31.25 | | |
| Estimated income | | | | | |
| | ≤100,000 | 13.64 | 86.36 | | |
| | 110,000–250,000 | 21.43 | 78.57 | | |
| | 260,000–500,000 | 33.33 | 66.67 | 13.157 | 0.004* |
| | ˃ 500,000 | 77.78 | 22.22 | | |
| Household size | | | | | |
| | 2-4 members | 20.00 | 80.00 | | |
| | 5-7 members | 40.91 | 59.09 | | |
| | 8-10 members | 29.41 | 70.59 | | |
| | Above 10 members | 16.67 | 83.33 | 2.472 | 0.480 |

#### 4.2.4. Distribution of patients by education level

The highest percentage of respondents (31.67%) had attained Secondary as there education level followed by primary education (28.33%) and the least (13.33%) were found not to have attained any formal education. The relatively high percentage in education level could be explained by the mass enrolment due to UPE and USE government programs.

#### 4.2.5. Distribution of patients by estimated monthly income level

The study results indicate that about 36.67% of the respondents were earning an amount less than or equal to 100,000 shillings, a quarter of the participants were ranging in the 260,000–500,000 shillings category at 25% and the least being 9(15%) who were earning above 500,000 shillings per month. This result means that most of the patients were unemployed while others were just casual labourers as well as stay home mothers especially for the case of women.

#### 4.2.6. Distribution of patients by household size

Most of the respondents reported that they came from a household of 5–7 members (36.67%), about 28.33% were from a household of 8–10 members, at least one out of every four respondents reported that they came from a household of 2–4 members and only 10% were found to be from households with members above 10.

### 4.3. Comparison of adherence and other patient characteristics

A number of characteristics of diabetic patients (who constitute the study sample) were tested for their association with medicine adherence using the Pearson's Chi-square as shown in Table 2 below.

#### 4.3.1. Relationship between adherence and patient's age

The results show that the proportion of patients who adhered to the prescribed medicine was highest (41.18%) in the age category of (30–39) years followed by 37.50% in the category of 40–49 years and that none of the patients aged 60 years and above ever took all the medicine as prescribed by the medical officer. In as much as there exists a certain percentage of adherence among some patients who seek treatment from IH diabetic clinic in respect to the different age brackets, it could be deduced that patients age was not significantly associated with adherence (P = 0.353).

#### 4.3.2. Relationship between adherence and patient's sex

According to the results, it was found out that for every ten males interviewed, 5 of them responded to have been fully adhering to the medicine with a 50% as seen in Table 2. On the other side, majority of female patients (85.29%) said they did not adhere to the medication as was prescribed by the health worker.

Generally the study shows that patient's sex was statistically significant with adherence to medication (P = 0.003).

#### 4.3.3. Relationship between adherence and marital status of the respondent

Marital status plays a very big role as far as diabetic treatment is concerned. Patients who were married registered the highest number at 44.83%, these were followed by those who were single at 40.0% then to those formerly married who included separated and divorced (30.0%) and none among the widowed was found to be adhering to the treatment fully as prescribed by the health worker.

According to the study, a change in marital status presented a significant effect on diabetic treatment adherence among patients (P = 0.017).

#### 4.3.4. Relationship between adherence and level of education attained

Adherence to diabetic treatment averagely increased with the increase in the level of education of the patient. Treatment adherence was lowest among patients with no education and this increased to 23.53% among patients with primary level of education. It is not clear why among patients with secondary education, adherence went low to about 15.79%. The more educated the patient is, the higher the ability and capacity he/she has to adhere and understand the importance and benefits that accrue to seeking medication against DM.

Therefore a patient's education attainment is significantly associated with their treatment adherence (P = 0.001). These results could be explaining that education increases the level of awareness of patients about the dangers of not seeking medication which may result into heavy health complications and possibly death.

#### 4.3.5. Relationship between adherence and estimated income

The study result clearly indicates that the level of adherence to treatment increases with the increase in the patient's level of income. Patients who earn a monthly income that is above 500,000 Uganda shillings showed the highest percentage (77.78) of patient adherence whereas the least percent (13.64) was from patients who earned the least amount of monthly income. Thus the level of income was statistically significant (P = 0.004).

This shows that as ones income increases, they are more able to afford buying the medicine from either the pharmacy or drug shop if the hospital cannot provide all the required medicine for their treatment.

#### 4.3.6. Relationship between adherence and household size

The results also reveal the nature of relationship between adherence and household size of the diabetic patient.

Among the patients who were interviewed, most of them (40.91%) were from households of 5–7 members followed by those from households with size 8–10 members (29.41%) while the least (16.67%) were from households with members above 10. This could possibly be so because families no longer produce many children and in other cases the household members work far and do not stay at home or others are married somewhere and are out of their homes.

However, the findings still show that there is no significant relationship between patient adherence and household size (P = 0.480)(see Table 3).

### 4.4. Relationship between affordability and diabetic treatment adherence

The study found out that patients who spent 60,000 and above were fully adhering to treatment and the least were patients who spent 50,000 or less than 20,000 shillings, who were found to be non-adherent to diabetic treatment.

**Table 3**
A table showing the relationship between affordability of medicine and treatment adherence.

| | Affordability | | |
|---|---|---|---|
| Adherence | Less than 20,000–50,000 | 60,000-Above 100,000 | Total |
| Yes | 6 | 12 | 18 |
| No | 35 | 03 | 38 |
| Total | 41 | 15 | 56 |

Pearson chi2(1) = 18.621 Pr = 0.000.
Fisher's exact = 0.000.

The two-tailed P value is less than 0.0001.

The association between adherence and affordability was considered to be extremely statistically significant.

Fisher's test was the best choice as it always gives the exact P value, while the chi-square test only calculates an approximate P value.

This was explained by some cases in which patients reported that medicine was expensive to buy on their side and it was not possible to get all the required medication from the government diabetic clinic.

It was further reported that of the patients who responded, only 32.14% said they were adhering to the medicine whereas the majority 67.86% were not taking all their prescribed medicine. There were cases where patients were not deliberately taking their medicine because they got fed-up with the lifelong medication.

## 5. Summary of the findings, conclusion and recommendations

### 5.1. Introduction

This chapter presents a summary of all the study findings at the different levels of analysis. It also presents conclusions drawn from the findings and the recommendations thereof.

### 5.2. Summary of findings

This study sought to provide a summary of the inferential test of hypotheses and it looks at a case where there is no significant relationship between affordability of diabetic medicine and patient's treatment adherence and patients' awareness about the effect of affordability on treatment.

It has been hypothesised that most diabetic patients cannot afford to take their medicine as advised by the health workers and that a patient's age and household size from which they come has no influence on their adherence level thus rejecting the null hypothesis of no relationship between affordability and treatment adherence.

Specifically, the researcher looked at demographic characteristics and the different levels of patients' income in relation to whether they were able to take all the medicine prescribed by the health workers.

Analysis was carried out at two levels (univariate and bivariate levels) using primary data obtained from IH diabetic clinic.

At outcome level of analysis; it was observed that the p-value of 0.000 indicates a significant relationship between affordability and treatment adherence. As far as affordability is concerned, most patients disclosed that they could only afford buying medicine that costs them about twenty thousand to fifty thousand Uganda shillings of which majority of these reported that they could not take all the medicine prescribed to them by the health workers. Of all the respondents, only three in ten were found to be fully responding to the treatment as prescribed by the medical workers while the majority seven in ten were partially adherent to diabetic treatment due to a number of reasons.

Over 30% of the interviewed patients said that they have no access to required medicine, a case in which one particular respondent informed the researcher that they only depend on medicine they get from the government hospital because she cannot afford buying from pharmacies which are even expensive. Others gave their reasons saying that they got fed-up with lifelong medication and about 3 respondents said that they forget to take their medicine due to other schedules like being in gardens past the time for taking medicine.

### 5.3. Conclusions

In this study, it has been shown that the objectives were achieved from the research conducted on both the dependent and independent variables on diabetic patients who cannot afford to take their medicine as advised by the health workers and that a patient's age and household size from which they come has no influence on their adherence level since they could not afford buying medicine.

However, more findings reveal that the marrieds are more likely to access medicine perhaps due to other financial support from their spouses, the educated are also cited as a group that is both able to adhere and afford medication through being aware of the dangers of not seeking medication and having some money to buy some of the prescribed medicine that would otherwise not be found at the hospital.

The study also revealed that more than half were subjected to the various methods of administering treatment and the biggest number were being given tablets followed by those on insulin injections, a case for the patients' whose condition had grown and then the least number of patients were also put to medication through supply of a syrup. At least every patient was given a minimum of two out of three treatment methods depending on the wisdom of the medical workers.

### 5.4. Recommendations

With respect to the research hypotheses, the following recommendations can be made.

Based on the alternative hypothesis that there is a relationship between affordability and treatment adherence among diabetic patients and more to that is that patients are not aware of the different prices of medicine prescribed to them. Therefore, more sensitization should be put in place to help patients be informed health wise, to be educated and also made aware of how to take good care of their health especially among females.

Secondly, it is recommended that there is still need to empower women by creating awareness especially among those in rural areas whereby most of them are stay home mothers and cannot afford to buy medicine due to lack of financial support since the study shows results of most of them earning less than or equal to one hundred thousand Uganda shillings monthly. One of the lady participants said that her husband sometimes takes away her money without her consent instead of using it to buy medicine that can't be accessed from the hospital but she has nothing to do about it other than to leave the whole situation.

### 5.5. Recommendations for further research

In order to strengthen this research, it is recommended that the limitations that have been faced under this study which were majorly limited time and financial constraints should be addressed made by other parties intending to conduct a relatively similar research by looking at a larger sample size in order to give a clear picture of the underlying attitudes and practices in affordability and medication adherence.

## Acknowledgements

I thank the administration of Makerere University, especially the school of statistics and planning (SSP) for their inputs which have positively shaped my skills and attitudes to face the challenges in the world. Appreciation also goes to the staff of Itojo Hospital especially the Medical Superintendent Dr. Nabaasa James and Nurse Catherine for the assistance and opportunity given to me to carry out my research at the hospital, spending their time and the efforts to supervise my work and ensure it is completed despite the little time that was available. Special thanks to my supervisor Dr. Omala Saint Kizito for his continuous guidance and corrections that helped me to carry out this research successfully.

I thank the participants who were involved in the study willingly for making an invaluable input to this dissertation. I also express gratitude to my fellow students and friends, and all BSTA III 2016 class who encouraged me throughout the course and during the research period. May God bless them abundantly.

Finally, I give thanks to the Almighty God for granting me the gift of life, knowledge, and strength to enable me complete this dissertation.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dsx.2019.04.029.

## References

[1] WHO. Medication adherence to antidiabetic therapy in patients with type 2 diabetes mellitus. In: Pierson C, editor. Journal of the American association of Nurse practitioners. vol. 18; 2014. p. 7. 40.
[2] Cramer JA. The significance of compliance and persistence in the treatment of diabetes, hypertension and dyslipidaemia: a review. Int J Clin Pract 2008, January;62(1):76–87. https://doi.org/10.1111/j.1742-1241.2007.01630.x.
[3] WHO. Guidelines for the prevention, management and care of diabetes mellitus. EMRO Technical Publications Series; 2008. Retrieved from, http://www.who.int/iris/handle/10665/119799.
[4] Pladevall MW. Clinical outcomes and adherence to medications measured by claims data in patients with diabetes. Diabetes Care 2004;27(12):2800–5.
[5] James B, Elizeus R, William B. Adherence to anti diabetic medication among patients with diabetes in eastern Uganda; a cross. BMC Health Serv Res 2015;15:2–7. https://doi.org/10.1186/s12913-015-0820-5.
[6] Michael CS, MS K, A M, Robert & R, V. Impact of medication adherence on hospitalization risk and healthcare cost. Med. Care 2005;43(6):521–30.
[7] Mann DM, Diego P. Predictors of adherence to diabetes medications. J Behav Med 2009;(32):278–84. https://doi.org/10.1007/s10865-009-9202-y.
[8] Mastewal A, Anteneh M, Mignote H, Fisseha Z. Adherence and associated factors towards antidiabetic. In: Mitchell AM, editor. Advances in nursing; 2015. p. 1–7. https://doi.org/10.1155/2016/8579157.
[9] Rodriguez M, Rosenzweig J, Vigersky R. Hypoglycemia and diabetes: a report of a Workgroup of the American diabetes association and the Endocrine society. In: Seaquist ER, editor. Journal of clinical Endocrinology & metabolism. vol. 7; 2013. https://doi.org/10.2337/dc12-2480. 8.
[10] ADA. Economic costs of diabetes in the U.S. In 2012vol. 34; 2012. p. 1033–46. https://doi.org/10.2337/dc12-2625. 6.
[11] Giwa A, B P, M P. Poverty, affordability of anti-diabetic drugs and glycemic control: an unholy alliance in a developing economy ? Int J Pharma Sci Res 2013;4(9):114–7.
[12] Susanne G ME. Price, availability and afordability. In: An international comparison of chronic; 2006. p. 10–26.
[13] Niëns L, W B. Measuring the affordability of medicines: importance and challenges. Health Policy 2013;112:45–52.
[14] Jamous R, WM S, AS A-T, AF S, SH Z, DE M. Adherence and satisfaction with oral hypoglycemic medications: a pilot study in Palestine. Int J Clin Pharm 2011;13(6):942–8. https://doi.org/10.1007/s11096-011-9561-7.
[15] Hernandez TM, Campbell JA, Walker RJ, Smalls BL, Egede LE. Diabetes empowerment, medication adherence and self-care behaviors in adults with type 2 diabetes. Diabetes Technol Ther 2012;14(7):630–4. http://doi.org/10.1089/dia.2011.0287.

I am **Tumusiime Cathbert**, a student from the School of Statistics and Planning (SSP) Makerere University pursuing a bachelor's degree of Statistics. I am conducting a study on **affordability effect of diabetic medicine on patient's treatment adherence** at the diabetic clinic of Itojo Hospital in Ntungamo District, western Uganda.Your participation in this study is voluntary and your free refuse or to withdraw at any time you wish, this will not have any effect on your medication process. You are free to ask for clarity in case something is not clear to you. Thank you.