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The Impact of Inadequate Glycemic Control in Type 2 Diabetes Mellitus Patients at the Diabetic Clinic of Hoima Regional Referral Hospital in Hoima City

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ABSTRACT

Per the 2016 World Health Organization (WHO) Global Report on Diabetes, the prevalence of diabetes and associated risk factors has been on a steady rise, currently standing at 2.7% for males and 3.0% for females. Overweight individuals make up about 18.6% of adults, while the obese account for 3.9%. This particular study conducted at Hoima Regional Referral Hospital focused on assessing the prevalence of inadequate glycemic control and the factors contributing to this issue among Type 2 Diabetes Mellitus patients. Employing a descriptive, cross-sectional design utilizing quantitative data collection and analysis methods, the study captured the opinions and perceptions of a considerable number of Type 2 diabetic patients attending the hospital's diabetic clinic at a specific moment, allowing for broader generalizations. The study uncovered that poor glycemic control among Type 2 diabetic patients led to various complications, notably cardiovascular issues (56%), diabetic neuropathy (50%), diabetic nephropathy (33%), diabetic retinopathy (25%), and infections (21%). Specifically, cardiovascular complications were more prevalent among patients with a family history of diabetes, hypertension, high BMI, and those categorized as overweight. Additionally, patients over the age of 60, highly educated individuals, married persons, and professionals exhibited higher instances of cardiovascular complications due to poor glycemic control. The study recommended hospital management to dedicate time for educating patients on managing their conditions beyond medication intake, addressing factors hindering good glycemic control. Furthermore, the study suggested strategies such as community outreach programs and routine screening for Diabetes Mellitus among hypertensive patients to facilitate early detection of non-communicable diseases.

Keywords: Diabetes Mellitus, Overweight, Obesity, Cardiovascular diseases, Glycemic control.

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder of blood sugar control that occurs when the pancreas does not produce enough insulin or when the body cells fail to respond to circulating insulin [1-4]. Type 2 diabetes is the most common type of DM in the world [5, 6]. According to the 2016 World Health Organization (WHO) Global Report on Diabetes, the prevalence of diabetes and risk factors has been increasing steadily with the numbers now at 2.7% and 3.0% for males and females, respectively. About 18.6% of adults are overweight and 3.9% are obese [7]. Global prevalence of diabetes has been on the rise, and statistics show a threshold increase in diabetes prevalence between the years 2000 and 2014. In 2017, approximately 421 million people around the world had diabetes, and this figure was expected to rise to 693 million people by the year 2045 [8, 9]. Suboptimal glycemic control is pervasive among patients with type-2 diabetes and poses a significant public

health challenge [10, 11]. While urgent interventions are required to optimize glycemic control in the sub-Saharan African region, these should consider sociodemographic, lifestyle, clinical, and treatment-related factors [12]. In 2017, around 15.5 million adults between the ages of 20 to 79 years in Africa had diabetes, representing a regional prevalence of 6%. By 2045, it is projected that about 40.7 million adults will have diabetes. Moreover, Africa has a high percentage of people with undiagnosed diabetes. Most people are unaware they have diabetes which raises the risk of chronic complications leading to increased morbidity and mortality are reported on the global estimates of diabetes prevalence [7, 13]. The high prevalence of diagnosed and undiagnosed DM in rural communities in Africa has compelled rural residents to resort to the unguided use of herbs in the maintenance of health. The traditional use of herbs in the management of various diseases is an age-long practice [14, 15]. Herbs contain ample concentrations of bioactive nutrients which possess pharmacological properties [16-18]. However, caution is advocated to avoid overdose and associated toxicities [19].

In Uganda, a study was done, a population–based national survey, on the prevalence and correlates of diabetes mellitus which showed that diabetes mellitus is low in Uganda providing an opportunity for the prevention of diabetes. The majority of persons were not aware of their hyperglycemic status, which implies a likelihood of presenting late with complications [20]. A study done in the Kanungu district showed a high prevalence of type 2 diabetes observed in this study compared to studies done in previous years which raised a public health concern. This study also found that females and patients aged 61-65 years were most affected by type 2 diabetes [21]. The presence of a family history of diabetes, being overweight, and being obese increases the chances of acquiring type 2 diabetes [22-24]. There is no published study from the Hoima district on contributing factors to poor glycemic control and its effects. Thus, this study aimed to determine the effects of poor glycemic control and the contributing factors among type 2 DM (T2DM) patients in the diabetic clinic at Hoima Regional Referral Hospital, Hoima City.

METHODOLOGY

Study design

The study was descriptive and cross-sectional in design using quantitative methods of data collection and analysis where opinions and perceptions of diabetic patients from a relatively large number of subjects were collected at a point in time to cater to the generalizations that will be made.

Area of Study

The study was done in Hoima Regional Referral Hospital, Hoima City. Hoima Hospital is a government hospital and operates on a 24-hour basis. The hospital is approximately 110 kilometers (68 mi), by road, north-west of Mubende Regional Referral Hospital and approximately 198 kilometers (123 mi), by road, north-west of Mulago National Referral Hospital, in Kampala, the capital city of Uganda. The coordinates of Hoima Regional Referral Hospital are 01°25'41.0"N, 31°21'16.0"E (Latitude: 1.428051; Longitude: 31.354451).

Study population

Type II diabetic patients enrolled in care in the Clinic at Hoima Hospital were the studypopulation and the assessment was done when they came for review on a clinic day.

Inclusion criteria

All type II diabetic patients attending the clinic for 2nd visit and above who consented toparticipate in the study.

Exclusion criteria

Type II diabetic patients too sick to answer the questions

Sample size determinations

Sample size is calculated using the Kish and Leslie formula as follows; n = Z2 p (1-p) E2 Where; n = estimated minimum sample size required, z = reliability coefficient at 95% confidence interval (standard value of 1.96) 19

p = the proportion of patients of 40 years who have been diagnosed is 7.1% (Mubende hospital annual report 2014) d = margin of error at 5% (standard value 0.05) therefore from the formula above q = 1-p (probability measure of the proportion)

n = (1.96x1.96) x0.071x0.929/ 0.05x0.05
n = 3.8x0.071x0.1929/ 0.0025
n = 100 respondents

Sampling procedures

In this study, a simple random sampling procedure was employed in which 200 pieces of paper were made and numbers from 1 to 200 were written on these pieces of paper. They were folded and put in a bucket. Patients were made to pick and whoever picked an evennumber was my respondent. The patients were then screened to assess if they met the inclusion criteria and were good enough, that they all met the criteria. So, they were interviewed to acquire further information.

Data collection methods and management

Data was collected using researcher-administered structured questionnaires with both open and closed-ended questions that were filled by the researcher and research assistants after asking the respondents and listening to their responses will help the respondents to interpret questionnaires. At the end of the session, the completed questionnaires are to be collected immediately and an appreciation note is given to the respondents.

Data analysis

The study findings and results were presented in a summary report providing a comprehensive overview of the patient's‟ perception about effects of poor glycemic control in type II Diabetes mellitus”. The main expected outcome measure is knowledge about the effects of poor glycemic control among type II Diabetes patients.

RESULTS

Social demographic factors

Table 1: shows the number of patients with diabetes in relation to the different socialdemographic factors.

Age range	Number of participants	Level of education	Number of participants according to level
18-24	16	Never studied	**41**
25-44	20	Primary	35
45-60	**45**	Secondary	18
61 and above	19	University	6
Occupation	**Number of participants**	**Marital status**	**Numbers of married and unmarried participants**
Ordinary job	**66**	Married	**53**
Professional workers	34	Non married (widowed)	47

The major social demographic factors that were interviewed included but were not limited to the age of the patient, level of education of the patient, marital status, and occupation, From the data collected most of the patients were aged between 45 and 60 (45% of the study group), patients who had no study history at all were the highest, 41% of the group, patients with professional

jobs were much of the victims, 34%, compared to the counterparts with ordinary life survival jobs, 66%, and the married people presented more than the unmarried, 53% and 47% respectively. Therefore, social demographics have a great impact on patients with Type 2 DM.

Clinic factors

Table 2: shows the number of participants in relation to the different clinical factors that lead to poor glycemic control.

Clinical factors	Number of participants with specific clinical factor.
Obesity and BMI	34
Family history	48
Hypertension	56
Obesity + hypertension	21
Family history + hypertension	12
Family history +obesity	9
Hypertension + obesity + family history	5

As seen from the study, most of the patients had a co-morbidity of hypertension with diabetes 56(56%), those with family history followed by 48(48%), and obesity and high BMI levels 34(34%). Other participants had two or more of the clinical features as seen above in the Table.

Effects of poor glycemic control

Table 3: shows the number of participants who presented with specific effects of poor glycemic control and those in relation to the specific clinical factors affecting glycemic control

Effect of poor glycemic control	The number of participants with particular effects	Clinical factors - number of participants with particular relations		
		Family history	hypertension	BMI and obesity
Cardiovascular disease	56	**30**	**55**	**49**
Diabetic neuropathy	50	**15**	**40**	**33**
Diabetic nephropathy	33	**5**	**35**	**41**
Retinopathy	25	**8**	**37**	**42**
Infections	21	**11**	**27**	**32**

From the table above, the majority of the participants, 56%, had cardiovascular disorders as the main effect assessed, then neuropathy 50%, nephropathy 33%, retinopathy 25% and infections 21% In relation to the clinical factors, cardiovascular effects presented in patients with a family history, hypertensive and those with high BMI and over-weight, 30%, 55%, and 49%

respectively.

Table 4: shows the relationship between the effects of poor glycemic control and the different social demographic factors of each participant in the study.

Effects	Age ranges				Level of education				Marital status		Occupation	
	18--24	25--44	45--60	>60	non	pri	sec	uni	married	unmarried	regular	professional
CVS disease	9	18	27	**46**	12	14	29	**35**	**57**	43	48	**52**
Neuropathy	7	14	27	**52**	**40**	23	11	26	40	**60**	**58**	42
Nephropathy	10	16	30	**34**	25	18	14	**43**	**61**	39	**56**	44
Retinopathy	13	25	25	**37**	**45**	20	20	15	42	**58**	**67**	33
Infections	15	23	**38**	24	**40**	23	19	18	**65**	35	**70**	30

The effects of poor glycemic control were assessed in relation to the different social demographic factors of each participant in the study. Cardiovascular disease is one of the major complications/ comorbidities that Type 2 DM patients present with, patients aged > 60 present with high levels of CVS disorders, 46%, highly educated patients, 35%, the married, 57% and professional workers, 52%. Neuropathy predisposes Type 2 DM patients to a number of complications, patients aged>60 years, uneducated, unmarried, and ordinary workers are much more affected, 52%, 40%, 60%, and 58% respectively. Nephropathy in patients with Type 2 DM is common at ages >60, 34%, highly educated, 43%, married, 61%, and regular workers, 56%. Retinopathy is also common in old age 37%, uneducated, 45%, unmarried, 58%, and regular workers, 67%. Infections are times driven by some of the complications like neuropathy and nephropathy and were common in ages 45-60 years, uneducated, married and regularly working patients of Type 2 DM, 38%, 40%, 65%, and 70% respectively.

DISCUSSION

Participants social demographic factors in the study

The results of the study reveal that the majority of the participants 64(64%) were 45 years and above, and only 36% were below 40 years. This agrees with the assertions of Patrick *et al.* [25] who reported that older patients aged above 65 years had good glycemic control compared to those aged between 18 and 24 years. Ndauti *et al.* [26] reported that patients above 56 years of age had good glycemic control compared to those aged between 41 and 55 years. This was all attributed to the fact that older patients had better experience of the disease condition and good managerial skills than the younger patients. In the study, the majority of the respondents 59(59%) were found to possess formal education and these included primary, secondary, and tertiary levels. In the study, only 41% of the respondents were illiterate. This is important and can positively impact on acquisition of knowledge on issues to do with their health and the attributes of good health hence an improved lifespan among type II diabetic patients. These findings concur with those of Houle *et al.* [27] who in the study revealed that the majority of patients who were educated

had good self-management practices which lowered the rates of complications. Also, a study by Al-Rasheedi [28] showed that knowledge and skills deficits significantly contributed to poor glycemic control, thus showing that education is a factor that has an impact on patients' glycemic control. The majority of the respondents 53(53%) were married and were staying with their partners and this is important because it can positively impact some of the lifestyle modification measures with respect to knowledge, and practice especially in the areas of adherence, physical exercises, and dietary modifications whereby the partner acts as a supporter of their spouse to keep remind them of the lifestyle modification measures and also provide socio-economic support to enable the patient to carry on with glycemic control in the prevention of outcomes of poor glycemic control. This is congruent with *Almigbal et al.* [29] study. Occupation has an impact on glycemic control and from this study majority of patients 66 (66%) were those with ordinary jobs compared to those with professional jobs 34 (34%), this is because of the knowledge that educated people have and so they are able to deal with the conditions that come in with diabetic control and also because of the income earnings that allow them to practice lifestyle modifications to help control their sugar levels. This is consistent with the study done by Nini Shuhaida *et al.* [30]. However, the study is incongruent with the study done by Lima *et al.* [31] which showed that those having professional jobs had limited time to take care of the sugar control measures and therefore presented with poor glycemic outcomes.

Participants' clinical factors affecting glycemic control

The results of the study showed how clinical factors play a role in affecting glycemic control in patients with type 2 DM. Hypertension is one of the major co-morbidities found in patients with type 2 diabetes [32, 33]. The majority of participants 56 (56%) had hypertension compared to the others who didn't 44%. This is consistent with the study done by Feduka *et al.* [34] which showed that hypertension affects 20-60% of diabetes patients depending on obesity, ethnicity, and age. As was seen in this study, there were some groups of patients 21(21%) who had both hypertension and obesity. Patients with this co-morbidity have an increased risk of macrovascular and microvascular complications of diabetes as seen in the study by Chen *et al.* [35] which showed that poor glycemic control exerts an adverse effect on the endothelial function, and aggravates coronary atherosclerosis in type 2 DM. Obesity and BMI in relation to hyperlipidemia are also associated with poor glycemic control in some patients as seen in this study, 34% of the participants presented with such conditions. Also, a study by Bae *et al.,* [36] showed that diabetic patients with high BMI have an increased occurrence of poor glycemic control which is attributed to increased insulin resistance due to high body fat. A family history of type 2 diabetes is associated with early manifestation of high glucose levels in the blood thus leading to early manifestation of features of poor glycemic control, 48% of participants had a family history of diabetes showing the relationship between poor glycemic control and family history. This agrees with the assertations of Kayar *et al.* [37] and De *et al.* [38] which reported that patients with a family history have an earlier onset of diabetes and poor glycemic control compared to those without a history in the family.

Effects of poor glycemic control that the participants had

The effects of poor glycemic control were assessed based on their relationship with the social demographic factors and clinical factors contributing to poor glycemic control. The majority of patients had cardiovascular conditions, mainly hypertension 55%, and the relationship of cardiovascular conditions with social demographic factors, age mostly in those aged > 60 years 46% and in married 56% and professional working participants 52%. This is consistent with the study by

Chen *et al.* [35] who showed that poor glycemic control exerts an adverse effect on endothelial function and aggravates coronary atherosclerosis in type 2 DM. Patients who are married tend sometimes have partner criticism, hostility, and overprotection, thus end up presenting with high levels of cardiovascular conditions as seen in this study by Houston-Barret and Wilson [39] which showed that such conditions were found to have a negative form of social support which was associated with poor glycemic control, and thus the effects. The majority of patients were of professional working jobs with cardiovascular conditions due to the fact that they spend much of the time in the office working and therefore don't have time to take care of themselves causing poor glycemic control and thus cardiovascular conditions. This agrees with the study by Lima *et al.* [40]. Half of the participants presented with neuropathy 50%, which showed a great impact of poor glycemic control on patients. This was consistent with the study by Jasmine *et al.* [41] which showed that 44.9% of older patients with type 2 diabetes had neuropathy.

Diabetic nephropathy is one of the complications that come in due to poor glycemic control measures [42]. 33% of the participants had already developed nephropathy. This is congruent with a study done in Ethiopia by Ahmed *et al.* [43] which assessed the incidence of chronic kidney disease in type II diabetes mellitus patients, they found that one in every ten diabetic patients experienced chronic kidney disease (CKD) cumulative incidence rate of 10.8%, and the median time to develop CKD was five years. Hypercholesterolemia and cardiovascular diseases escalate the risk of developing CKD [44-46]. Thus encouraging health promotion and education of diabetes patients to optimize cholesterol levels and prevent cardiovascular disease can limit life-threatening diseases.

CONCLUSION

According to the main objectives and findings of this study, the following conclusions were arrived at. Of the effects of poor glycemic control analyzed, cardiovascular, neuropathy, and nephropathy were much more related to the clinical and social demographic factors associated with poor glycemic control, thus showing that the effects of poor glycemic control are influenced by a number of factors that lead to the poor outcome of patient quality of life. Infections and retinopathy are not so manifest in many participants showing that besides the patients not controlling their sugars well, at least they have tried to do their best in other ways involving medication and regular clinical visits.

Recommendations

The hospital management system should create some opportunities and time for the patients to be taught how they can manage their conditions not only by taking their medications but also by working on some of the factors that would hinder them from properly having good glycemic control. Encouragement of early diagnosis of non-communicable diseases through ways like community out-reaches, screening of every hypertensive patient for DM, and others. From the analysis of the study, such studies have not been done largely in many health centers around the nation, it would be of great impact to encourage research on the effects of poor glycemic control and the factors influencing poor glycemic control in every major health center because this is a major concern to the lifestyle of patients with DM in general.

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