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Healthcare services utilization among patients with Diabetes Mellitus at Kirehe District, Rwanda

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ABSTRACT

Background/Objectives: Non-communicable diseases including Diabetes Mellitus are increasingly becoming a major public health concern globally and particularly in low- and middle-income countries. Although healthcare services utilization is not a major concern in developed countries, it is associated with worse health outcomes, leading to the increasing burden of diabetes in many developing countries including Rwanda. This study aimed to assess healthcare service utilization and associated factors among patients with Diabetes Mellitus attending Kirehe District hospital (KDH)'s 17 catchment health centers in Rwanda. ***Design/Methods:*** The study employed retrospective health records review and key informant interview. The researchers conducted a review of patients' health records and key informants interview. The sample size for the study was 272 patients' health records drawn from the target population of 781 records, covering a period of one year. For the key informants interview, one health worker each was selected from the 17 health centers. Quantitative data were analyzed using descriptive statistics and Chi-square computation using IBM.SPSS.v21, while qualitative data was analyzed thematically. ***Results:*** The study found that more than half (54%) of the participants had missed more than three DM clinic appointments with 84.9% missing at least an appointment. Only 15.1% adhered to all appointments. Demographic factors such as education level, social status and marital status, were significantly associated with health service utilization at $p < 0.005$. Some participant-related characteristics such as current medication and time of diagnosis were also significantly associated with health service utilization at $p < 0.005$. ***Conclusion:*** The overall level of healthcare services utilization was low and there are some modifiable participant-related and health service-related factors influencing the utilization of healthcare services among DM patients in Rwanda. The study recommends that KDH and its partners put in place strategies to ensure an improvement of clinic appointment adherence by patients and improving system-related factors such as training and retention of staff, laboratory strengthening and medication availability as well as accessibility.

Keywords: Diabetes Mellitus; Non-Communicable Diseases; Rwandan Diabetes Association; Service Utilization; Kirehe District

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INTRODUCTION

Non-communicable diseases (NCDs) have fast become quite a significant public health matter. This is especially in the low and middle-income nations previously concerned mostly with communicable diseases[1]. Globally, Diabetes Mellitus (DM), cardiovascular diseases (CVDs), Chronic Obstructive Pulmonary Disease (COPD) and cancers present the biggest burden of disease, causing 7.9 million deaths annually with DM and CVD accounting for almost 80% of those deaths[2]. Diabetes Mellitus is a disease that results when a human body cannot properly utilize glucose. Glucose uptake in the blood is controlled by a hormone called insulin which is synthesized by the pancreas. This hormone helps glucose to enter the cells and therefore regulates blood glucose levels. In diabetes, the pancreas is unable to synthesize enough insulin (Diabetes Type 1) or the body is unable to respond normally to the synthesized

insulin (Diabetes type 2). Both of these scenarios cause a rise in blood glucose levels and consequently give rise to symptoms such as frequent micturition, exhaustion, excessive thirst, and feelings of hunger[3].

In terms of morbidity, approximately 463 million persons were living with DM in 2019 and expected to rise to 578 million by the year 2030[4]. The prevalence is higher in urban compared to rural areas at 10.8% and 7.2% respectively, and in high-income countries compared to low-income countries at 10.4% and 4.0% respectively[4]. Half of the individuals living with diabetes do not know their status[4]. World Health Organization (WHO) estimates that DM affected over 7% of the world population in 2017. This converts to nearly 500 million individuals[1]. Type 2 DM was the predominant form of DM in the Sub-Saharan Africa region, accounting for more than 90% of cases. In the Middle East and Northern Africa region, DM is an emerging concern problem with notable consequences on mortality, morbidity as well as on healthcare resources. It is estimated that the current prevalence of DM in the African region is 9.7%[1].

In Rwanda, according to the Rwandan Diabetes Association (RDA), the prevalence of DM is about 3.2% of the population. Since 2015, the Rwanda Ministry of Health developed guidelines and protocols for NCDs to allow clinicians at primary levels to treat NCDs including DM. Controlled patients are followed at the health center level and those, who are not controlled or with other chronic or severe comorbidity (s) are followed at district or tertiary level hospitals. Among the interventions in the NCD policy include prevention measures, improvement of the supply chain, and management of cases including complications, all targeted at improving the quality of life of patients as well as reducing mortality[3]. Just like other neighboring countries and in the region, DM is an important public health problem in Rwanda with reports showing it to be one of the leading five causes of morbidity in CHUB[5]. A study conducted at KUTH in Kigali discovered considerable morbidity as well as related complications among hospitalized DM patients as well as those in outpatient care[5].

Testing for Glycated hemoglobin A1c (HbA1c) is crucial in the management and monitoring of DM with the values representing the average glycemic control over a period of 2-3 months and accounting for both pre and post-prandial levels of blood glucose. This glycemic control is fundamental for preventing and alleviating DM complications. Due to the significance of proper glycemic control in overall health outcomes, routine HbA1c testing is a recommendation for all patients with DM. Guidelines recommend monitoring of glycated hemoglobin (HbA1c) at least two to four times each year[6]. Adequate healthcare services utilization has shown to be beneficial to overall health outcomes in patients with DM[3]. Similarly, Tapela studied loss to follow-up and associated factors among DM patients in Rwanda and found that factors such as access to diabetes services, insurance coverage, weak patient monitoring systems, limited equipment for glucose and HbA1c testing, and limited facilities within reach to rural-based patients are some of the contributing factors. This current study sought to evaluate healthcare service utilization among patients with DM enrolled in Kirehe district hospital and HC diabetes clinics and explore factors that influenced the uptake of healthcare services for DM patients during the past year.

METHODS

Retrospective review of health records and key informant interview were used to assess the level of health service utilization and associated factors among DM patients attending KDH catchment area for the past one year. In the quantitative aspect, patients' health records were reviewed to gather data on socio-demographic and other patient-related factors associated with service utilization. In the key informant interview, selected core healthcare workers were interviewed to gather data on healthcare service factors related to service utilization. The study reviewed records of DM patients attending KDH's 17 HCs in its catchment area from January 2021 to January 2022. According to the hospital records, the total number of those patients was 831,which constituted the target population. The study also targeted key healthcare workers in the DM clinics in the 17 health centers.

Sample size

In this study, since it dealt with finite and known population (831), which is relatively low (less than 1000), the sample size was determined by using Slovins formula.

The formula is as follows:

$$n = \frac{N}{1+N(e)^2}$$

Where: n = sample size; N = total population and e = error margin / margin of error

Since the target population was 831, then the sample size n was given by: $n = \frac{N}{1+N(e)^2}$

Then: $n = \frac{831}{1+831(0.05)^2}$

$n = 270$

In addition, key informant interview was conducted among 17 health workers selected from health centers to assess health system related factors.

Sampling Techniques

The study adopted simple random sampling to select 16 patients' health records each from the 17 HCs (total of 272 files) by generating random numbers from a list of all the files constituting the target population. This method gave equal chance to each patient's records to be part of the study. The 17 key informants - health workers were NCD nurse managers representing each of the DM clinics at the health centers. Being managers, these participants possess the necessary information on the heath service-related factors as regards the clinics they manage, based on their knowledge and continuous interaction with DM patients. The lead investigator interviewed one health worker at each HC, who was the head of the DM clinic at each of the health centre as at the time of the study.

Data collection tools

The study used two data collection instruments; a data capturing sheet to gather sociodemographic data and other patient-related characteristics from the patients' health records and an interview guide to gather healthcare service-related data from the selected key healthcare workers.

Data analysis and management

Quantitative data were analyzed using descriptive statistics and Chi-square computation using IBM.SPSS.v21, while qualitative data was analyzed thematically.

Ethical considerations

Upon ethical approval and necessary waivers from the Health Research Ethics Committee in Rwanda. The researchers duly obtained informed consent from all participants. Participants were assured of utmost confidentiality and as well, personal identifiable information were de-identified from the data.

RESULTS

Socio-demographic characteristics of participants

The highest portion (37.5%) of the participants were 60 years or older, which is followed by those aged 50-59 years (27.3%) and 40-49 years (23.2%). There were more male participants (59.9%) compared to females (40.1%). Most of the patients (97.1%) had primary or secondary education and only 2.9% did not have any education at all. Most (67.6%) of the participants were Christians, most of whom (90.8%) were married. More than half (52.9%) were from high social economic class (category 3) and the vast majority (97.8%) were using the community health insurance (Mituelle) with all (100%) utilizing some form of insurance.

Characteristics associated with uptake of healthcare services utilization

To establish the factors associated with healthcare service utilization among patients with DM attending Kirehe District Hospital and catchment health centers between 2021 and 2022, patient-related factors are presented in Table 1. As indicated in Table 1, the vast majority (94.5%) of the participants had Type 2 DM with over a half (50.4%) having been diagnosed over three years ago and only11.4% being diagnosed within the past year. In the participants' last visit, only a small minority (29%) had normal glucose levels with 69.9% testing low glucose levels and 1.1% testing high glucose levels. The majority (63.2%) were on a combination of medications while 16.2% were on insulin. Most of patients (64.7%) had no co-morbidities.

Relationship between selected participants' characteristics and healthcare service utilization

As shown on Table 2, the current DM medication and time of diagnosis were strongly associated with appointment adherence at $p < 0.001$. The factors significantly associated with DM clinic attendance were level of education, marital status, religion, current DM medication, type of DM diagnosis, sugar levels at the last clinic visit (all at $p < 0.001$) and social status (p

<0.030). In all, age, marital status, current DM medication, type of DM diagnosis, time of diagnosis and sugar levels at the last clinic visit (all at p <0.001) were all significantly associated with DM related hospitalization in the past year.

Table 1: Participants' characteristics associated with uptake of healthcare services utilization

Variables	Freq.	%
DM type		
Type 1	15	5.5
Type 2	257	94.5
Time of diagnosis		
Past one year	31	11.4
Two years	53	19.5
Three years	51	18.8
>Three years	137	50.4
Glucose level last visit		
Normal	79	29.0
Low	190	69.9
High	3	1.1
Current DM medication		
None	5	1.8
Insulin	44	16.2
Metform	30	11.0
Gilbenclamide (Daonil)	21	7.7
Combination	172	63.2
Comorbidity		
None	176	64.7
CVD	84	30.9
Respiratory	1	0.4
Other	11	4.0

Qualitative data

Data concerning service related were collected through interviews with the heads of the 17 NCD clinics at the health centers. The data were analyzed thematically as follows:

Number of DM patients

The 17 health centers in the Kirehe district hospital catchment area attend to approximately 1,020 DM patients per month. This converts to an average of 60 patients per clinic with a range of 37 – 76.

Health Specialists

All 17 clinics had one nurse each trained by RBC on NCD patients management and PIH on NCDs including diabetes management. For any advanced management, patients had to be referred to Kirehe district Hospital.

Patient cost

The estimated cost to the patient for attending the clinic was 2500 – 5000 Rwf, which includes meals, transport and medication, all paid by the patient. Insurance took care of medications with a 10% co-pay paid by the patient.

Laboratory services

All the 17 clinics had a laboratory for testing Glycemie, HB1C, Creatinine, Protenerie and Glucosis. Seven of the 17 clinic managers felt that the laboratory services were effective and sufficient while ten of the clinic managers felt that the services were not effective because, there was repeated stock out of some laboratory reagents.

Pharmaceutical services

The pharmaceutical supplies for the clinics included Daonil, Metformine, Nethyldepa, and Insulin. There were several challenges cited by the clinic managers in relation to the supply and distribution of medication. These challenges revolved round stock out, transport difficulties for elderly patients, non-adherence to clinic visits, long distances for some patients and financial challenges to some patients.

Patient support

In 16 of the 17 clinics, no additional patient support was provided to patients apart from the service package that is prescribed for HC level. The exception was Kirehe Health center and District Hospital, where PIH provides support for transport fees to all NCD patients.

Challenges

Several challenges were faced at the clinics in the course of managing DM patients. Many of the challenges centered on under-staffing/overworking, lack of budget for home visits/follow-up, patients lost to follow-up, stock out of laboratory reagents and pharmaceutical supplies, insufficient staff training in DM management and insufficient equipment.

DISCUSSION

Findings from this study show that the current DM medication and time of diagnosis were

strongly associated with appointment adherence at p <0.001. The findings also establish that the factors significantly associated with DM clinic attendance were level of education, marital status, religion, current DM medication, type of DM diagnosis, sugar levels at the last clinic visit (all at p <0.001) and social status (p <0.030). It is also evident from our findings that age, marital status, current DM medication, type of DM diagnosis, time of diagnosis and sugar levels at the last clinic visit (all at p <0.001) were all significantly associated with DM related hospitalization in the past one year. These findings are in congruent with a study by Negera and Epiphanio in Ethiopia which reported that a key predictor of non-compliance was lack of education[7]. In a related study, Jackson *et al.* found low level of education as one of the factors independently connected to compliance[8]. Another study by Afriyie in Ghana also revealed that level of education, was associated with adherence to treatment[9]. Studies from India showed that being literate and low level of education were significantly associated with adherence and non-compliance to treatment process[10,11].

Similar to the findings of the current study, a prospective analysis of various factors involved in the adherence rate in type 2 diabetes medication in Malaysia, adherence was associated with duration of diabetes; patients having a longer duration of diabetes demonstrated a higher rate of adherence to medication compared to those with a shorter duration[12]. It is perhaps expected that the longer a patient lives with a chronic illness, the more aware they become about diabetes management and may also get concerned that poor adherence may worsen their conditions thus positively influencing adherence. According to the Health Belief Model, as cited by Glanz *et al.* adherence to therapeutic and preventive therapies is largely influenced by the individuals' perceived susceptibility, severity, benefits, and barriers[13]. Thus, improving literacy through formal education may increase an individual's knowledge about their susceptibility, severity, benefits of adhering to the recommended regimen.

Findings from interviews with DM clinic managers indicated that nurses managed all the clinics, and there were challenges with the stocking and distribution of laboratory reagents and pharmaceutical supplies. There was very limited patient support and insufficient budget for home visits and follow up as well as under-staffing and insufficient training of staff operating the clinics. This finding is similar to a 2018 Kenya-based study on health system-related factors influencing the uptake of healthcare services[14]. The study revealed inadequate and poorly implemented health policies, inadequate health facilities, and inadequate health workers, shortage of essential drugs, low-level funding and poorly managed health insurance[14].

Limitations to the study

This study was limited to Kirehe District due limited resources and conducted among only 17 health workers though, it reviewed many patients' health records. It would have gained the impetus for generalization if it had been extended to other districts in Rwanda.

CONCLUSION

The overall level of healthcare services utilization was low in Kirehe District, Rwanda having found greater portion of patients missing more than three DM clinic appointments and only one quarter of them adhering to all scheduled appointments. This low level of adherence portends a potential setback in the management of diabetes mellitus type 2 management in the district.

Human factors such as level of education, marital status, religion, social status, current DM medication and time of diagnosis were significantly associated with appointment adherence, DM clinic attendance, and DM-related hospitalization. Many of these factors are modifiable and present opportunities to positively influence patient outcomes.

Recommendations

1. Improvement of clinic appointment adherence by providing patient support such as lowering costs.
2. Patient support budget to provide home visits and patient education.
3. Training of healthcare workers in management of DM.
4. Improving laboratory services and pharmaceutical supply chain.

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Authors Contribution:

NS conceived of the study, initiated the design, participated in literature search, data abstraction and collection, analysis and coordination. AIT, MAA and Muazu SD participated in the design, literature search, technical process, data analysis and coordination and reviewed the final manuscript.

Table 2:Participants' characteristics and healthcare service utilization

Variables	Missed appointment		p value	Clinic visit in past year		p value	Hospitalization in past year		p value
	No, n(%)	Yes, n(%)		No, n(%)	Yes, n(%)		No, n(%)	Yes, n(%)	
<30	3(27.3)	9(72.7)	0.500	2(18.2)	9(81.8)	0.056	3(27.3)	8(72.7)	**0.001**
30 to 49	13(15.3)	72(84.7)		34(40.0)	51(60.0)		63(74.1)	22(25.9)	
≥50 years	25(8.6)	151(85.8)		88(50.0)	88(50.0)		139(79.0)	37(21.0)	
Gender									
Male	14(12.8)	95(87.2)	0.401	43(39.4)	66(60.6)	0.096	79(72.5)	30(27.5)	0.366
Female	27(16.6)	136(83.4)		81(47.7)	82(50.3)		126(77.3)	37(22.7)	
Health Insurance									
Mituelle	40(15.0)	226(85.0)	0.912	123(46.2)	143(53.8)	0.150	200(75.2)	66(24.8)	0.647
Other	1(16.7)	5(83.3)		1(16.7)	5(83.3)		5(83.3)	1(16.7)	
Education									
None	1(12.5)	7(87.5)	0.152	0(0.0)	8(100)	**0.001**	5(62.5)	3(37.5)	0.571
Primary	34(13.9)	210(86.1)		120(49.2)	124(50.8)		186(76.2)	58(23.8)	
Secondary	6(30.0)	14(70.0)		4(20.0)	16(80.0)		14(70.0)	6(30.0)	
Religion									
Christian	25(13.6)	159(88.4)	0.322	99(53.8)	85(46.2)	**0.001**	145(78.8)	39(21.2)	0.057
Non-Christian	16(18.2)	72(81.8)		25(28.4)	63(71.6)		60(68.2)	28(31.8)	
Marital status									
Married	37(15.0)	210(85.0)	0.892	123(49.8)	124(50.2)	**0.001**	197(79.8)	50(20.2)	**0.001**
Unmarried	4(16.0)	21(84.0)		1(4.0)	24(96.0)		8(32.0)	17(68.0)	
Social category									
Category 1	1(10.0)	9(90.0)	0.527	5(50.0)	5(50.0)	**0.030**	6(60.0)	4(40.0)	0.299
Category 2	21(17.8)	97(82.2)		40(33.9)	78(66.1)		86(72.9)	32(27.1)	
Category 3	19(13.2)	125(86.8)		79(54.9)	65(45.1)		113(78.5)	31(21.5)	
Current Medication									
Combination	17(9.9)	155(90.1)	**0.001**	89(51.7)	83(48.3)	**0.001**	145(84.3)	27(15.7)	**0.001**
Gilbenclamide	5(23.8(	16(76.2)		14(66.7)	7(33.3)		18(85.7)	3(14.3)	
Insulin	6(13.6)	38(86.4)		1(2.3)	43(97.7)		9(20.5)	35(79.5)	
Metform	11(36.7)	19(63.3)		19(63.3)	11(36.7)		29(96.7)	1(3.3)	
None	2(40.0)	3(60.0)		1(20.0)	4(80.0)		4(80.0)	1(20.0)	
DM Diagnosis									
Type 1	4(26.7)	11(73.3)	0.197	0(0.0)	15(100.0)	**0.001**	0(0.0)	15(100.0)	**0.001**
Type 2	37(14.4)	220(85.6)		124(48.2)	133(51.8)		205(79.8)	52(20.2)	
Sugar Levels									
Normal	14(17.7)	65(82.3)	0.435	3(3.8)	76(96.2)	**0.001**	26(32.9)	53(67.1)	**0.001**
Abnormal	27(14.0)	166(86.0)		121(62.7)	72(37.3)		179(92.7)	14(7.3)	
Time of Diagnosis									
<3 years	36(26.7)	99(73.3)	**0.001**	77(57.0)	58(43.0)	**0.001**	116(85.9)	19(14.1)	**0.001**
≥3 years	5(3.6)	132(96.4)		47(34.3)	90(65.7)		89(65.0)	48(35.0)	
Co-morbidities									
No	29(16.2)	150(83.8)	0.471	78(43.6)	101(56.4)	0.355	133(74.3)	46(25.7)	0.571
Yes	12(12.9)	81(87.1)		46(49.5)	47(50.5)		72(77.4)	21(22.6)	

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