

Factors Associated with Adherence to Oral Antidiabetic Drugs among Patients with type 2 Diabetes Mellitus attending Diabetic Clinic at Jinja Regional Referral Hospital Jinja District

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ABSTRACT

Diabetes Mellitus (DM) is a metabolic illness that causes excessive blood sugar levels as a result of either impaired pancreatic insulin production, insulin resistance, or both. People with diabetes mellitus die prematurely, and DM is a global burden. Adherence to drug regimens is essential in the management of diabetes mellitus, in addition to lifestyle changes. However, patients with diabetes are more likely not to take their medications as prescribed, and poor medication compliance jeopardizes patient safety and treatment efficacy, increasing mortality and morbidity. This study aimed to determine oral diabetes medication adherence and its associated factors among type two diabetes patients (T2DM) at Jinja Regional Referral Hospital. An institutional-based cross-sectional study of 136 T2DM patients was undertaken at Jinja Regional Referral Hospital in Jinja district. A convenience sampling technique was used to recruit participants, and the research was carried out from April 2022 to October 2022. The Morisky Medication Adherence Scale was used to assess medication adherence. STATA version 15.1 was used to analyze the data. To discover independent determinants of T2DM adherence, logistic regressions were used. To declare statistical significance, a P-value of less than 0.05 was employed. This study enrolled 136 type 2 diabetes patients, with a response rate of 100%. Overall, 58.33% of T2DM patients showed good medication adherence. T2DM patients who took both oral and injectable anti-diabetic medications (AOR = 1.98, 95% CI: 1.16-3.39), received the prescribed anti-diabetic medication from the hospital (AOR = 0.51, 95% CI: 0.32-0.80), had their own glucometer at home (AOR = 0.30, 95% CI: 0.16-0.54), and had good diabetes-related knowledge were found to be more adherent to oral anti-diabetic medication. At Jinja Regional Referral Hospital, there is a low prevalence of oral anti-diabetic drug adherence among patients with T2DM. Significant independent predictors of anti-diabetic treatment adherence included the type of medication that T2DM patients were taking, the ability of patients to receive their prescriptions from the hospital, having a glucometer at home for glucose monitoring, and having sound knowledge of diabetes. Patients should therefore receive more education on the importance of medication adherence, and as well be encouraged to purchase personal glucometers.

Keywords: Diabetes Mellitus, Blood sugar levels, Insulin, Medication adherence, Oral anti-diabetic.

INTRODUCTION

Diabetes Mellitus (DM) is a metabolic illness that causes excessive blood sugar levels as a result of either impaired pancreatic insulin

production, insulin resistance, or both. DM is more prevalent in low-income and middle-income countries [1, 2]. Common risk

factors to DM include obesity and overweight, poor nutrition, lack of exercise, and a sedentary lifestyle [3].

DM can be basically divided into three: Types 1, 2, and gestational. Type 1 (Insulin Dependent Diabetes Mellitus (IDDM) or juvenile-onset diabetes), accounts for 5-10% of DM. It affects people of all ages but is most common in children or young adults. It is hereditary in nature. Type 2 (Noninsulin Dependent Diabetes Mellitus) makes up for 90-95% of all DM. Gestational Diabetes Mellitus (GDM) is commonly diagnosed during pregnancy. GDM is a risk factor for type 2 diabetes in women [4]. 387 million people worldwide, including over 22 million in Africa, have diabetes, according to the International Diabetes Federation (IDF). This number will nearly double by 2035 [4]. Metabolic syndromes like obesity, insulin resistance, and dyslipidemia contribute to type 2 diabetes [5, 6]. There have been several drugs used in the management of DM such as Exenatide, sulfonylureas, Liraglutide; insulin injections; dipeptidyl peptidase-4 (DPP-4) inhibitors like sitagliptin, metformin [7-9]. Despite these numerous drugs, the incidence of DM is still high as patients sometimes do not adhere to taking these drugs citing adverse effects and economic burden as reasons. Some patients even resort to the use of alternative treatments mainly herbs and plant products [10]. The use of herbal medications in the management of diseases is an age-long globally acceptable practice and its use is approved by the World Health Organization [11, 12]. The phytoconstituents of these herbs and plants are responsible for their various therapeutic effects and also serve as precursors of conventional drugs [13, 14]. Notably, some herbs and plant products have been scientifically proven to possess anti-diabetic properties like *Allium sativum* [15], *Pterocarpus santalinoides* [16], *Moringa oleifera* [17], *Ageratum conyzoides* [18], *Bucholzia coriacea* [19], *Sphenocentrum jollyanum* [20], and *Datura stramonium* [21].

Adherence to drug regimens is essential in the management of diabetes mellitus, in addition to lifestyle changes. However,

patients with diabetes are more likely not to take their medications as prescribed, and poor medication compliance jeopardizes patient safety and treatment efficacy, increasing mortality and morbidity. In the end, the healthcare system will incur high direct and indirect expenditures [22]. Additionally, it is asserted that increasing adherence to current treatments would have a greater global health impact than developing new medical interventions due to the severity and scope of non-adherence [23]. Lower morbidity, mortality, and healthcare use are all connected with effective diabetes management, which lowers the expense and burden on the government and the community. According to a study conducted in the USA, persons with diabetes who did not follow their prescribed therapy had noticeably worse clinical results than those who did [24]. Despite the focus placed on the necessity of proper pharmaceutical use, many patients have poor adherence to medications, especially those for chronic conditions like diabetes. As a result, they are unable to achieve their desired levels of health. Non-adherence is associated with factors that are patient-centered, therapy-related, or healthcare system-related [25]. The patient-centered factors can be demographic (age, gender, educational level, and marital status) and psychological (patients' beliefs and motivation towards the therapy, negative attitude, patient-prescriber relationship, understanding of health issues, and patients' knowledge) [26]. Therapy-related characteristics include medication route, duration of treatment, treatment complexity, medication kind, and medication adverse effects. The availability and accessibility of health care, as well as health provider-patient relationships, are issues related to the healthcare system [27]. Non-adherence is sometimes associated with medication-related adverse effects [10, 11]. The number of diabetic patients in rural areas is growing. According to a Ministry of Health (MoH) report, diabetes is on the rise in Uganda [28]. According to the IDF, diabetes affects 1.6% of adults in Uganda [4]. Similarly, in Uganda, a population-based

nationwide assessment of diabetes and its associated indicated a prevalence of 1.4% among adults [29]. However, there has been little published work in the research area on the prevalence of and factors related to adherence to Oral Antidiabetic Drugs (OADs) therapy so far. As a result, there is a need to investigate factors associated with drug adherence. Furthermore, the majority of research has been conducted in

industrialized nations, leaving a gap in understanding the prevalence and factors that may be linked with diabetic treatment adherence in settings such as Jinja. Thus, this study sought to determine factors associated with adherence to oral antidiabetic drugs among patients with Type 2 diabetes attending the diabetic clinic in Jinja Regional Referral Hospital (JRRH), Jinja District.

METHODOLOGY

Study design

This was a descriptive cross-sectional design with quantitative methodologies to determine the percentages of persons who were adherent and influential. Cross-sectional studies based on questionnaire surveys are often quick, easy, and inexpensive to conduct, and there was no loss to follow-up because participants were only interviewed once. As a result, cross-sectional studies provide a "snapshot" of the outcome and the factors associated with it at a particular point in time.

Area of Study

The study was done in Jinja Regional Referral Hospital, also commonly known as Jinja Hospital. The hospital is located in the center of Jinja, not far from the Source of the Nile. It is the Regional Referral Hospital for the districts of Bugiri, Iganga, Jinja, Kaliro, Kamuli, Luuka, Mayuge, Namayingo, Kayunga, and parts of Buikwe. The hospital is located approximately 84 kilometers (52 mi) east of Mulago National Referral Hospital. The coordinates of Jinja Regional Referral Hospital are: 00°25'52.0"N, 33°12'18.0"E (Latitude: 0.431111; Longitude: 33.205000).

Jinja Hospital is one of the thirteen (13) Regional Referral Hospitals in Uganda. It is also one of the fifteen (15) hospitals designated as Internship Hospitals, where graduates of Ugandan medical schools may undergo a year of internship under the supervision of consultants and specialists in the designated medical and surgical disciplines. The diabetes clinic offers various services to various categories of patients and the services include physician consultations, health education, eye and foot screening, laboratory investigations,

and the issuing of medicine.

Study population

The study population consisted of patients with a diagnosis of Type 2 diabetes attending a diabetic clinic at the Hospital.

Inclusion criteria

- Patients 18 years and above diagnosed with T2DM.
- Patients who had clinical records in the hospital.
- Patients on oral antidiabetic medications (OADs).
- Patients who have been attending the diabetic clinic for at least 6 months.
- Patients who consented to be part of the study.

Exclusion criteria

- i. Patients with Type 2 diabetes but on insulin only.
- ii. Pregnant and lactating women.
- iii. Critically sick patients with T2DM
- iv. Patients who have been attending the diabetic clinic for less than 6 months.

Sample size determination

This was determined by using Kish's formula [30] which states that,

$$N = \frac{p(1-p)}{\epsilon^2}$$

Where;

N = the required sample size

p = 90% - Proportion of adherent patients to oral antidiabetic drugs, according to a systematic review by Krass and colleagues [31]. ϵ = margin of error on p (set at 5%)

z = standard normal deviate corresponding to 95% confidence level (=1.96)

$$N = 1.9 \{0.9(1-0.9)\} = 1380.0$$

Sampling procedure and rationale

A convenience sampling technique was used to recruit participants. Convenience sampling is a nonprobability sampling

technique where participants are selected because of their convenient accessibility. All potential, available, and accessible participants were approached for interviews on the two clinic days of Tuesdays and Thursdays per week for three weeks, including any other patient in the medical ward who was diabetic but fulfilled the inclusion criteria. The diabetic clinic was attended by an average of fifty to seventy diabetic patients per clinic day, but up to a hundred patients were given appointments per clinic day. Eleven participants that met the inclusion criteria were targeted for interviews per day, making 22 participants per week and 44 in two weeks, respectively. This method was adopted because this technique is fast, inexpensive, and easy and the participants were readily available.

Study variables

Dependent variables

Adherence to oral antidiabetic drugs (OADs).

Independent variables

Patient characteristics: Age, gender, family social support marital status, literacy level, and patient income/occupation; therapy regimen-related characteristics such as duration of treatment, drug side effects, complexity of medication regimen/or form of medicine used for the treatment of diabetes and frequency of medicine, direct expenditure for buying medication. In addition, health facility-related characteristics like availability and/or accessibility of the drugs/or facility, short consultation time, patient-provider relationship, and weak capacity of the system to educate the patient and provide follow-up.

Research Instrument

An interview guide (questionnaire) was used as a data collection instrument in this study for identifying the factors associated with drug adherence. To achieve the reliability of the tool, the instrument was designed with great care matching questions with objectives for the study then pretested among 5 patients prior to actual data collection the responses from the pretest revealed inconsistencies in the question, and they were used to modify the instrument in terms of clarifying the

questions.

Data Collection Procedures

A face-to-face interview with Type 2 diabetes patients during clinic days was conducted with the help of research assistants, while those who were uncomfortable and could fill for themselves, were allowed to do so. Adherence measurement in this study was based on patient recall of their compliance with prescribed doses in the dispensation prior to the interview. Self-reported adherence to antidiabetic medication was determined during the interview using the Morisky 8-item medication adherence questionnaire. Overall adherence to medication was categorized based on patients' responses, according to the following scores: 0 = poor adherence (non-adherence); 1 or 2 = medium and high adherence respectively.

Data management

All collected questionnaires were checked for completeness and consistency of responses manually prior to analysis.

Data analysis

The collected data was first rechecked manually for completeness and consistency. The data were then entered into EpiData version 3.3.0.0-RC1. The entered data were exported and analyzed with STATA version 17.0 software. Descriptive statistics was employed for the sociodemographic characteristics of the respondents. Bivariable logistic regression analysis was done to identify independent factors and a p-value < 0.25 was considered to select candidate variables for the multivariable logistic regression model. Multivariable logistic regression was conducted to identify independent factors of non-adherence to anti-diabetic medication. Hosmer and Lemeshow's goodness-of-fit test the model adequacy. Crude Odds Ratio (COR), and Adjusted Odds Ratio (AOR) with their 95%CI were computed to determine the associated factor of T2DM patients' medication adherence, and P- a value less than 0.05 was considered statistically significant.

Ethical considerations

The study was approved by the research committee of KIU. The researcher then

obtained permission from JRRH before interviewing participants. The interviewer explained the purpose of the study and procedures in order to gain written informed consent from the study

participants before the actual interview. The participants were assured of uttermost confidentiality and anonymity through the use of strict coding measures.

RESULTS

Socio-demographic characteristics of the respondents

136 respondents constituted the sample size due to 2 inconsistent responses discovered during data clean-up and analysis. This study included 136 T2DM patients in total, with a response rate of 98.6%. 72 (52.7%) of the total responders

were men, and 60 (44.4%) of them had no ability to read or write. The respondents' mean age (SD) was 52.68 12.29 years (range from 29 minimum age to maximum age 88 years). The majority of research participants (71.8%) had no family history of T2DM, and the majority of them (59.1%) lived in cities (Table 1).

Table 1: Socio-demographic characteristics of patients with T2DM attending diabetic clinic at Jinja Regional Referral Hospital (JRRH), Jinja District. (n = 136).

Variables		Frequency	Percent (%)
Sex	Male	72	52.7
	Female	64	47.3
Marital Status	Single	14	10.8
	Married	93	68.4
	Divorced	25	18.1
	Separated	4	2.7
Religion	Orthodox	122	89.7
	Protestant	2	1.7
	Muslim	12	8.6
Residence	Urban	81	59.1
	Rural	55	40.9
Educational Status	Unable to read and write	60	44.4
	Able to read and write	26	18.9
	Primary education	10	7.6
	Secondary education	16	11.3
	Higher education and above	24	17.9
Occupational Status	Student	1	.7
	Government employee	30	21.8
	Merchant	26	19.1
	Farmer	48	35.0
	NGO	11	8.3
	Housewife	20	15.0
The family history of DM	No	98	71.8
	Yes	38	28.2
Distance from the Hospital	30 minutes	49	36.3
	>30 minutes	87	63.7
Smoking	Yes	6	3.9
	No	130	96.1

Prevalence of adherence to oral antidiabetic drugs among patients with Type 2 diabetes attending the diabetic clinic in JRRH.

The overall rate of medication adherence was 58.3%. The question "When you travel or leave home, do you sometimes forget to bring along your diabetes medication" had the greatest non-adherence rate (19.9%), and 34.8% of the study participants indicated

that it was difficult to remember to take their prescriptions. Minimum adherence (65.2%) was discovered on the item "How often do you have difficulty remembering to take all your diabetes medications" while maximum adherence (97.1%) was found on the item "When you feel like your diabetes is under control, do you sometimes stop taking your medicine" (Table 2).

Table 2: Responses of study participants based on individual items of Morisky Medication Adherence Scale (MMAS-8).

S.no	Questions	No (%)	Yes (%)
1	Do you sometimes forget to take your diabetes pills/injections?	87	13
2	People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past 2 weeks, were there any days when you did not take your diabetes medicine?	87.5	12.5
3	Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?	93.6	6.4
4	When you travel or leave home, do you sometimes forget to bring along your diabetes medication?	80.1	19.9
5	Did you take your diabetes medicine yesterday?	4.9	95.1
6	When you feel like your diabetes is under control, do you sometimes stop taking your medicine?	97.1	2.9
7	Taking medication every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your diabetes treatment plan?	84.6	15.4
8	How often do you have difficulty remembering to take all your diabetes medications?	Never/rarely = 65.2% Once in a while = 15.9% Sometimes = 14.2% Usually, = 4.4% All the time = 0.2%	

Note: = Reversely coded = response 1-4 coded as 1 for analysis

Regarding how many years ago since patients were diagnosed with T2DM, the average was 5.33 ± 3.83 years (minimum 1 to maximum 25 years). Fasting Blood Sugar (FBS) was 175.35 ± 69.13 mg/dl on average (SD included). Most study participants (70.6%) reported taking two or more drugs every day with a high

frequency of daily dosage (76%). Most responders (77.9%) did not have glucometers at home, and 86.5% of study participants had never received diabetic education during follow-up for diabetes. 70% of the individuals in the research obtained their medication from the hospital. 78.9% of survey

participants had inadequate knowledge of diabetes (Table 3).

Table 3: Clinical and medication characteristics of the patients with T2DM attending the diabetic clinic at Jinja Regional Referral Hospital (JRRH), Jinja District. (n = 136).

Variables	Years	Frequency(n)	Percent (%)
Duration of DM Diagnosis	1-5 years	82	60.5
	6-10 years	59	28.4
	> 10 years	16	11.0
Duration of DM Treatment	1-5 years	84	62.0
	6-10 years	39	28.7
	> 10 years	13	9.3
Number of medications taken per day	One	40	29.4
	Two or more	96	70.6
Having a glucometer at home	No	106	77.9
	Yes	30	22.1
Having chronic illness	No	82	60.5
	Yes	54	39.5
Ever had diabetic education	No	18	13.5
	Yes	118	86.5
	Never	2	1.5
Got all the prescribed drugs from the hospital	Sometimes	38	28.4
	Always	95	70.1
	Poor Knowledge	36	78.9
Diabetic Related Knowledge status	Good Knowledge	28	21.1

Patient-related factors associated with adherence to oral antidiabetic drugs among patients with Type 2 diabetes attending the diabetic clinic in JRRH.

The location of patients' homes (the distance from home to the hospital), their educational level, occupation, whether or not they had a glucometer, and their understanding of diabetes were all strongly linked to how

adherent T2DM patients were to their medications. Patients with T2DM who used a glucometer for blood glucose monitoring had a 70% lower risk of failing to take their anti-diabetic medication than those who did not. Patients with T2DM who had high knowledge of diabetes were 50% more likely than those with poor knowledge to adhere to their anti-diabetic medications as prescribed.

Table 4: Bivariable and multivariable logistic regression analysis of patient factors associated with adherence to oral antidiabetic drugs among patients with Type 2 diabetes attending the diabetic clinic in JRRH. (n = 136).

Variables		DM drug adherence status		COR (95% CI)	AOR (95% CI)
		Yes	No		
Residence	Urban	53	27	1	
	Rural	27	29	2.07 (1.30, 3.10)	
Educational status	Unable to read and write	31	30	1	
	Able to read and write	14	11	0.82 (0.48, 1.40)	
	Primary education	3	3	0.42 (0.19, 0.97)	
	Secondary education	9	6	0.80 (0.41, 1.53)	
	Higher education and above	18	6	0.34 (0.18, 0.62)	
Occupation	Government employ	24	7	1	
	Merchant	14	12	3.09 (1.59, 6.01)	
	Farmer	21	26	4.57 (2.52, 8.29)	
	Non-governmental organization	7	2	2.23 (0.95, 5.22)	
	House wife	13	7	1.89 (0.92, 3.90)	
Have own glucometer	No	55	50	1	1
	Yes	23	6	0.30 (0.17, 0.51)	0.30 (0.16, 0.54)***
Diabetic related knowledge	Poor knowledge	57	50	1	1
	Good knowledge	22	6	0.32 (0.18, 0.56)	0.50 (0.27, 0.90)**
Distance from home to hospital	30 minutes	36	13	1	
	>30 minutes	43	43	2.84 (1.83, 4.40)	

NB:

*** = significant at P-value 0.001 **

= significant at P-value 0.01

* = significant at P-value 0.05, AOR = Adjusted Odds Ratio, COR = Crude Odds Ratio.

Healthcare-related factors associated with adherence to oral antidiabetic drugs among patients with Type 2 diabetes attending the diabetic clinic in JRRH.

Adherence to diabetic medicine among T2DM patients was substantially correlated with the type of medication that patients

were taking, receiving the recommended anti-diabetic therapy, and the length of Diabetes mellitus treatment.

Compared to T2DM patients who were unable to obtain the prescribed anti-diabetic medicine from the hospital, non-adherence to anti-diabetic medication was 49% less probable. Patients with T2DM who took both

oral and injectable anti-diabetic medicine had a 98% higher risk of non-adherence than those who took only oral anti-diabetic medication. (Table 4).

Table 5: Bivariable and multivariable logistic regression analysis of healthcare factors associated with adherence to oral antidiabetic drugs among patients with Type 2 diabetes attending the diabetic clinic in JRRH. (n = 136).

Variables		DM drug adherence status		COR (95% CI)	AOR (95% CI)
		Yes	No		
Type of drug	Oral only	23	43	1	1
	Oral and injectable	11	14	2.11 (1.27, 3.52)	1.98 (1.16, 3.39)*
Have got prescribed drug from the hospital	Sometimes	19	21	1	1
	Always	60	36	0.56 (0.37, 0.86)	0.51 (0.32, 0.80)**
Duration of DM treatment	1-5 years	53	31	1	
	6-10 years	21	17	1.33 (0.55, 2.08)	
	>6 years	5	7	1.27 (1.27, 5.15)	

NB:

*** = significant at P-value 0.001 **

= significant at P-value 0.01

* = significant at P-value 0.05, AOR = Adjusted Odds Ratio, COR = Crude Odds Ratio.

DISCUSSION

Prevalence of adherence to oral antidiabetic drugs among patients with Type 2 diabetes attending the diabetic clinic in JRRH.

Our study revealed that the prevalence of adherence to oral antidiabetic medication was 58.3%. This study's findings were consistent with those of studies conducted in Addis Ababa, Ethiopia (54.8%) and Botswana (58.2%) [32, 33]. Contrary to our study's findings, other studies have found lower

adherence rates, including 62% in Pakistan [34], 54.66% in India [35], and 45.5% in Kenya [36].

Given that the bulk of the respondents in our study come from urban areas, the disparity in the results may be attributable to the respondents' varied sociodemographic backgrounds.[37][38] [39][40], non-adherence to anti-diabetic medication may be linked to poor diabetic outcomes, and can also be responsible for the significant worsening of

diabetes, increased hospitalization rates, increased overall healthcare costs in diabetic patients, and increased risks of mortality and all-cause hospitalization. One of the most important issues that contribute to diabetic-related mortality and morbidity in people with type 2 diabetes is non-adherence to anti-diabetic medication [38] [41] [42] [43] [44] [45]. **Patient-related factors associated with adherence to oral antidiabetic drugs among patients with Type 2 diabetes attending the diabetic clinic in JRRH**

Similar to a study conducted in the Oromia area of Ethiopia, this study found that T2DM patients who had a glucometer at home for blood glucose monitoring were 70% more likely to be adherent to their oral anti-diabetic medicine than those who did not [39]. This could be because drugs are generally more accessible to people with glucometers because they may be in a better financial state. The other reason might be that people who use glucometers are more likely to be aware of DM complications. Furthermore, this study showed that diabetic patients who had good diabetic-related knowledge were 50% less likely to be non-adherent to oral anti-diabetic medication than those who had poor diabetes-related knowledge. This is similar to a study done in Pakistan [34] and Southwest Ethiopia [39]. This might be because an increased level of awareness about diabetes and its complication eventually increases the attitude and practice of taking one's medication for the prevention of diabetes-

related complications and mortality. Previous studies support this finding [39],[44],[45].

Healthcare-related factors associated with adherence to oral antidiabetic drugs among patients with Type 2 diabetes attending the diabetic clinic in JRRH

There was a significant association between the type of anti-diabetic medication and the level of adherence. We attempted to assess whether taking oral medication alone increases adherence. The researcher discovered that patients with T2DM who used both oral and injectable hypoglycemic drugs were 98% more likely to be non-adherent than those who used only oral antihyperglycemic drugs. This can be explained by the fact that patients may experience discomfort and exhaustion from taking both oral and injectable drugs. Drug non-adherence as a result of polypharmacy is the cause of this [34]. According to the study's findings, T2DM patients who consistently obtained hospital-prescribed anti-diabetic drugs were 49% less likely to be non-adherent as compared to those who were unable to do so. This result was in line with research carried out in Addis Ababa, Ethiopia [32] and Uganda [40]. Patients who were unable to obtain their prescriptions from the government hospital were forced to purchase them from private pharmacies. So, T2DM patients who could not afford to purchase their prescription outside of the hospital are more likely to be non-adherent to their medication due to the costs.

CONCLUSION

At Jinja Regional Referral Hospital, there is a low prevalence of oral anti-diabetic drug adherence among patients with diabetes mellitus type II. Significant independent predictors of anti-diabetic treatment adherence included the type of medication that T2DM patients were taking, the ability of patients to receive their prescriptions from the hospital, having a glucometer at home for glucose, monitoring, and having sound knowledge of diabetes.

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