Student's Journal of Health Research Africa
Vol. 4 No. 9 (2023): September 2023 Issue
https://doi.org/10.51168/sjhrafrica.v4i9.534
Original article

FACTORS CONTRIBUTING TO SHORTAGE OF DIABETES MEDICINES IN KAKINDO HEALTH CENTRE IV, KAKUMIRO DISTRICT. A CROSS-SECTIONAL STUDY.

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Abstract

Background.

The purpose of the study was to determine the factors contributing to a shortage of diabetes medicines in Kakindo health center iv, Kakumiro district. The specific objectives of the study were to assess the knowledge of health workers about the procurement of diabetes medicines, to find out the storage facilities of diabetes medicines, and to determine the prevalence of diabetes in the Kakumiro district.

Methodology.

The study employed a cross-sectional study design to gather data on the specific objectives using a simple random sampling technique to select the sample size of 50 respondents. Data was collected using questionnaires written in English with semi-structured and open-ended questions designed based on the specific objectives, systematically analyzed data manually, computed into frequency and percentages using Microsoft Excel with illustrated figures like tables and pie charts.

Results.

The study established that most of the health workers knew what procurement of medicines was (64.29%), 28.57% tried to explain procurement of medicines but lacked some ideas and only 7.14% had no idea. The study showed that all the health workers knew the correct temperature for storing insulin, the number of diabetes patients increased from 100 to 150 respectively and knowledge of health workers about procurement of medicines was fair as 85.7% knew the proper quantification process.

Conclusion.

Storage of diabetes drugs during transit at the facility was well done as indicated by 100% knowledge about storage temperature. The number of diabetes patients is increasing in the district.

Recommendation.

The researcher recommended that there should be organized seminars to educate the health workers about proper procurement procedures. There is a need to educate communities about diabetes and its causes to curb the raising numbers. The government should provide more

Keywords: Diabetes, medicine, factors, shortage, Submitted: 2023-07-06 Accepted: 2023-08-20

1. Background.

Diabetes mellitus is an increasing global health problem. According to International Diabetes Federation (IDF) 387 million people are living with diabetes in the world and more than 22 mil-

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lion in the African region. By 2035 this number will almost double (IDF, 2O15).

According to (Mobula et al, 2018), there is evidence to suggest that the prevalence of non-communicable diseases (NCDs), in particular cardiovascular diseases and diabetes, are being recognized as forming a substantial proportion of the burden of disease among populations in Low- and Middle-Income Countries (Mobula et al., 2018)

Diabetes mellitus represents a set of autoimmune, metabolic, and genetic disorders that share one major characteristic-hyperglycemia (Aoife, 2019). Diabetic medicines are used to lower blood glucose levels when lifestyle changes such as diet and exercise have not been successful. (Thompson, 2023)

The number of people with diabetes rose from 108 million in 1980 to 422 million in 2014(Canning, 2020). Prevalence has been rising more rapidly in low- and middle-income countries than in high-income countries (WHO, 2023).

The shortage of diabetes medicines remained a problem in history up to the present date(Shukar et al., 2021). The first-time drug shortage on record could be traced back to the insulin shortage in the early 1920s (Shukar et al., 2021). Since then drug shortage is more common worldwide (Unguru, 2019).

1.1. General Objective.

A study to determine factors contributing to a shortage of diabetic medicines in Kakindo Health Centre IV, Kakumiro district.

1.2. Specific Objectives.

To assess the knowledge of health workers about procurement of diabetes medicines in Kakindo Health Centre iv, Kakumiro district.

To find out the storage facilities of diabetes medicines in Kakindo Health Centre IV, Kakumiro District.

To determine the prevalence of diabetes in Kakindo Health Centre IV, Kakumiro district.

2. METHODOLOGY.

2.1. Study area

The study was carried out in Kakindo Health Centre IV, Kakumiro Town Council, Bugangaizi, Kakumiro, Western Region, Uganda.

2.2. Study design.

A cross-sectional study was used in the research. The main reason as to why cross-sectional study design was used is because the design is relatively inexpensive and takes up little time to conduct, can estimate the prevalence of the outcome of interest because the sample is usually taken from the whole population, many outcomes and risk factors can be assessed, useful for the public health planning, and there is no loss to follow up.

2.3. Study population.

Health workers, patient registers, order forms, and delivery notes were used.

2.4. Study variables.

These included both dependent and independent variables.

2.4.1. Dependent variable.

The availability of diabetes medicines at Kakindo Health Center IV

2.4.2. Independent variable.

Knowledge of health workers about procurement of diabetes medicines

Storage facilities used to store the diabetes medicines

The prevalence of diabetes patients in Kakumiro district.

2.5. Sample size determination.

Kish and Leslie's method (Kish, 1965) was used to determine the sample size

Kish and Leslie's formula, n= (Z^2pq)/ d^2

Where n is the required sample size

p is the estimated prevalence

z is the standard deviation at 95% confidence interval d is the allowed error

z= 1.96. p = 18.5%. = 0.185. d =0.5 q = 1 –p. , q=1-0.185 = 0.815

n= (1.96 x 1.96 x0.185 x 0.185)/ 0.5 x 0.5. = 232

Using modified Kish and Leslie's formula, N = n/ (1+n/popn)

Where N is reduced sample size, n = 232, Popn= target population is 70 N = 232/ (1+232/70) = 54

Therefore, my sample size will be 50 respondents

2.6. Sampling technique.

Simple random sampling was used during the study. The available staff concerned about the procurement of diabetes medicines was randomly selected and given questionnaires.

Randomly selected patients from the registers were selected to determine the prevalence of the disease, and order forms and delivery notes that were used in December 2022 were randomly selected. Simple random sampling was used because of the short period of the study.

2.7. Sampling procedure.

Only those health workers who were concerned about diabetes drugs were given questionnaires for assessment. Patient registers for December were checked for determining the number of patients that visited the facility. Randomly selected order forms and delivery notes for December 2022 were used to determine the number of medicines that were received by the facility.

2.8. Data collection method.

The questionnaire method was used to collect the data

2.9. Data collection tool(s).

Questionnaires, patient registers, order forms, and delivery notes were used to collect data. Pens, calculators, and papers were used for data storage.

2.10. Data collection procedure.

A copy of the questionnaires was given to a smaller group of correspondents before doing the actual research. Brief the correspondents about the research and inform them about their privacy and being in a position to leave the research at any time they don't want to continue. A questionnaire was given to them to fill in.

2.11. Quality control.

To ensure the quality of the research, I took ample time to collect data; only people concerned about diabetes drugs were assessed, (including the staff at the facility and diabetes patients).

2.12. Data analysis and presentation.

The data was presented in the form of pie charts and tables.

2.13. Ethical consideration.

Before the study, a letter containing the reason for the study was given to the DHO of the district who permitted the start of the research. A copy of the same letter was given to the in-charge of the facility.

All the people who were to participate in the research were briefed about the procedure to be taken and forced about the fact that they were to have maximum confidentiality of whatever information they disclosed to me.

3. RESULTS.

3.1. DEMOGRAPHIC DATA.

The research classified the respondents according to demographic factors like sex, age, place of residence, profession, and experience in pharmacy service. It was important for the researchers to know the sex (gender) of the respondents to know whether there was a relationship between gender and practices carried out by pharmacy practitioners. It was important for the researchers to know the age of respondents to whether respondents were old enough to participate in the study. It was important for the researcher to know the place of residence of respondents as this would give an insight into the accessibility of the workers. Knowing the profession and experience of the respondents would give an insight into whether the pharmaceuticals are handled by skilled personnel.

In table 1, the study showed that 64.29% of the participants were females and 35.71% were

Table 1: Showing demographic data of the respondents. (n=14)

Variable studied	Frequency	Percentage (%)
Age	5	35.71
20-25	3	21.43
26-30	4	28.57
30-35	2	14.29
35 and above		
Total	14	100
Gender	5	35.71
Male Female	9	64.29
Total	14	100
Place of residence	14	100
Within Kakumiro district Outside Kakumiro district	0	0
Total	14	100
Profession Dispenser Nurse	1	7.14
Others (midwives, doctors etc)	10	71.43
	3	21.43
Total	14	100
Experience	4	28.57
<2 years	8	57.14
>2years but <5years	2	14.29
>5 years and above		
Total	14	100

males. 35.71% were aged between 20-25years, 21.43% were aged between 26-30 years, 28.57% were aged between 30-35 years and 14.29% were aged between 35 years and above. All the participants lived within Kakumiro district as they found easier to access their places of work. Furthermore, the district had one dispenser (7.14%), most of the professionals who handled pharmaceuticals were nurses (71.43%) and a few midwives (21.43%). This is probably because Kakumiro district is a yet a new district and the government has not yet recruited professionals there.57.14% of the professionals had an experience of more than 2years but less than 5years, 28.57% had an experience of less than 2 years and 14.29% had an experience of 5years and above.

3.2. Knowledge of health workers about procurement of drugs.

3.2.1. Assessing if health workers know the definition of procurement.

In table 2, the majority of the respondents 64.29%, knew what the meaning of procurement was, a few of the respondents tried to define 28.57% though they lacked some aspects. Very few respondents had no idea about procurement 7.14%.

3.3. Source of medicines.

In table 3, the study showed that most of the respondents 71.43% received medicines from NMS. A few of the medicines were received from donations and non from the JMS.

The study showed that most of the respondents 12 (86%), knew the proper quantification process while few 2(14%), followed a wrong procedure.

Table 2: showing knowledge of health workersabout procurement of drugs based on the ability to define.(n=14)

Variable		Fre-quency	Percentage (%)
Deftnition of procurement	Perfectly defined Tried but lacked some aspect Had no idea a	9 4 1	64.29 28.57 7.14
Total		**14**	**100**

Table 3: Showing source of themedicines (n=14)

Variable		Frequency	Percentage(%)
Source of medicine	NMS JMS Donations	10 0 4	71.43 0 28.57
Total		**14**	**100**

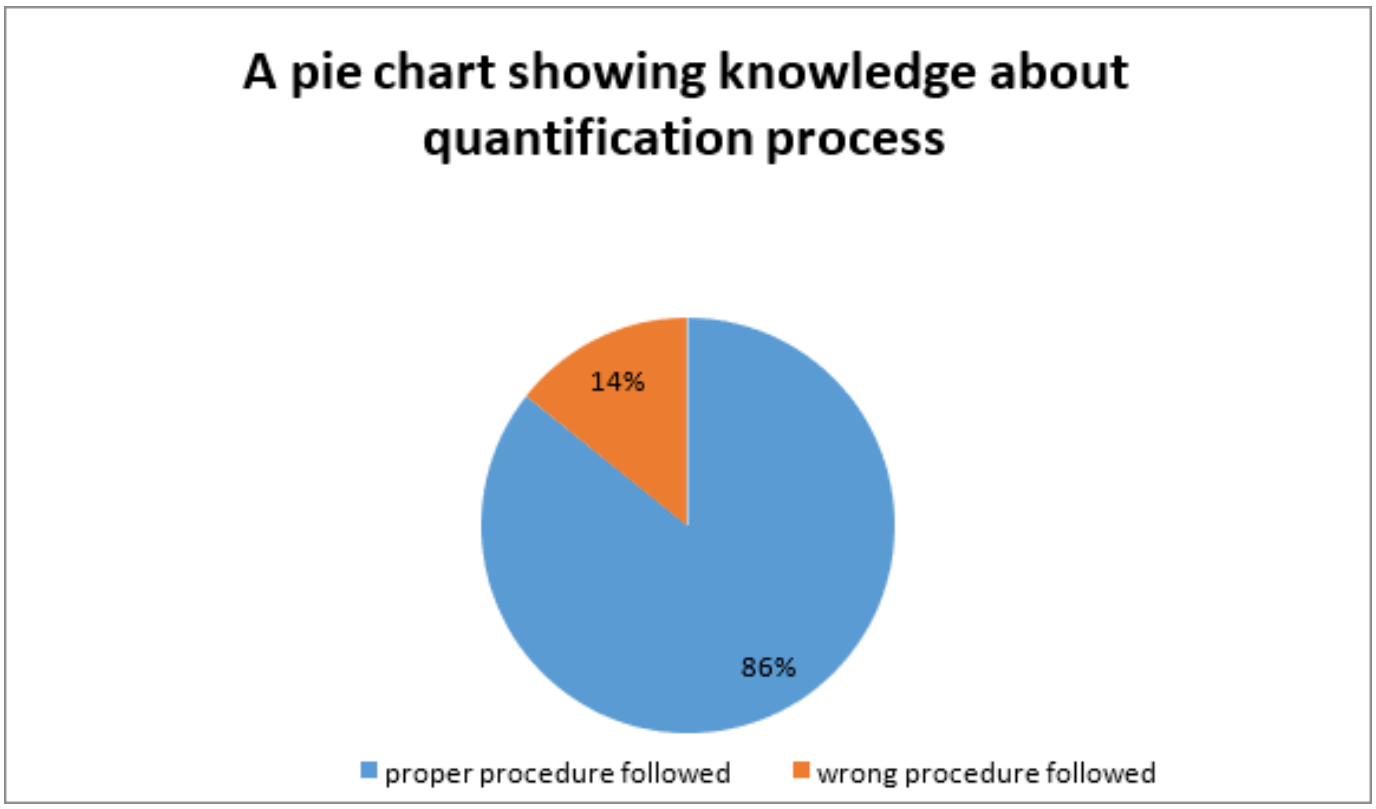

Figure 1: Showing the quantification processes.

3.4. Checklist for medicines procured between June to December 2022.

To fill this checklist, order forms and delivery notes were checked from June to December 2022. The average of the medicines was calculated.

On average, by the time insulin mixtard was ordered, stock at hand was only 2 bottles. A total of 30 bottles were ordered and approved. When it came to oral hypoglycemic, 0pkts of metformin were in stock and only 10 pkts of 100tabs were ordered and approved. Glibenclamide was also at 0 pkts by the time it was re ordered. 10pkts of 100 tabs were ordered. All quantities were delivered as ordered.

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Table 4: **Showing Medicines procured between June to December 2022**

Name of Medicine	Average stock at hand	Average quantity ordered	Average quantity Approved	Average quantity Delivered
Insulin mixtard	2 bottles	30 bottles	30 bottles	30 bottles
Metformin tabs	0	10 pkts of 100 tabs	10 pkts of 100 Tabs	10pkts of 100 Tabs
Glibenclamide Tabs	0	10pkts of 100 tabs	10pkts of 100tabs	10 pkts of 100tabs
Total	**2**	**50**	**50**	**50**

3.5. Storage facilities used to store cold chain diabetes medicines.

3.5.1. Knowledge of health workers about proper storage temperature used to store insulin.

The study showed that 100% (14) of the health workers knew the correct storage temperature to store insulin.

3.5.2. Apparatus used in temperature monitoring.

The study showed that the facility had a functioning refrigerator and a thermometer to monitor the temperature in the refrigerator.

3.5.3. Availability of published SOPs about cold chain storage of insulin.

The facility had SOPs about storage of cold chain medicines. These were found in the store room where a refrigerator was found.

3.6. Patients diagnosed with diabetes.

3.6.1. Number of diabetes patients that were received at the facility between June to December 2022.

The study showed that there was a total of 150 diabetes patients in the whole district. These increased from 100 patients in June to reach the whole sum of 150 patients by December. This implies 50 patients were newly diagnosed within the time frame.

According to Figure 2, the highest percentage of diabetes patients (50%) lived a sedentary lifestyle and mainly not working. 27% of the patients were office workers and a small percentage 23% were farmers.

3.6.2. Level of care at which diabetic care starts.

The study showed that anti-diabetes care was initiated at health centers iv. However, diabetes medicines were easily accessed at a health center iii.

3.6.3. Availability of guidelines about diabetes care.

The facility had written guidelines about diabetes care and only one physician was easily accessed but only on Thursdays. Guidelines were in the form of UCGs.

4. DISCUSSION.

4.1. Demographic data

Most, 35.71%of the respondents were aged between 20 to 25 years. This is probably because most of the young patients are charismatic. Most, 64.29% of the respondents were females, this is probably because females were easily approached and willing to participate. By profession, 71.43% of the respondents were nurses. This is because nurses have a larger population countrywide compared to any other professionals. Most of the respondents 57.47% had an experience of greater than 2 years but less than 5 years. This is because most of the respondents were young adults.

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Vol. 4 No. 9 (2023): September 2023 Issue
https://doi.org/10.51168/sjhrafrica.v4i9.534
Original article

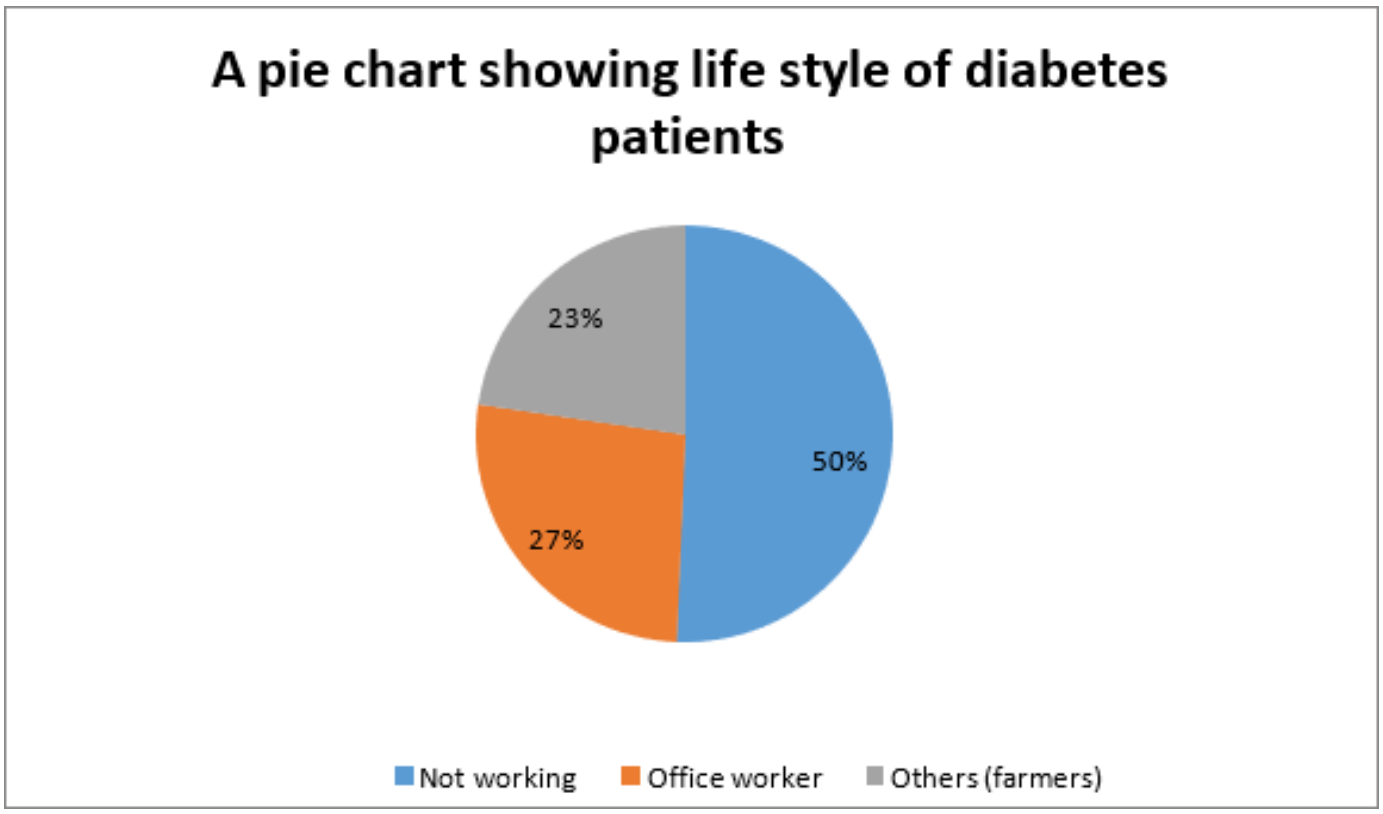

Figure 2: Showing life style of diabetes patients.

5. Discussion

5.1. Knowledge of health workers about procurement of medicines.

The majority of the respondents knew the meaning of procurement. This is by (UNICEF, 2010) where procurement was defined as the process of acquiring supplies after a properly selected list of products at the best possible total cost, in the right place and from the right source for the direct benefit or use of corporations, individuals or even governments(UNICEF, 2010.).

The majority, 71.43% of the respondents received medicines from the NMS. This agreed with research (Cook, 2010) where drugs were centrally received. In Kenya, before the devolution, procurement of drugs was handled at a national level where the drugs were procured nationally as all hospitals would send their requisitions to the Ministry of Health and they would then be distributed to the various hospitals nationwide, and the settlement of funds to the supplier was done by the national government(Wahome, 2019.). After devolution, this is the sole responsibility of the country governments where the money is distributed to the countries which are responsible for the running of all services in that country such as health.

The majority of the respondents followed the correct procurement procedure. This is not in agreement with a study carried out(Joy, 2017). In a study carried out in Kenya, it was found that there were problems in the quantification of drugs to procure. The hospital had its quantification based on its daily use and monthly reports made. This helped to know the number of patients treated in a given month and the number of drugs dispensed to that population. Poor quantification led to an overestimation or underestimation of the drugs needed thus resulting in over-ordering or under-ordering of drugs. In the case of over-ordering, it brought about the challenge of drugs expiring before they had been prescribed and this resulted in wastage of drugs and funds as expired drugs became poisonous and thus useless. In the case of under-estimation, it resulted in drugs ending before the population

served was reached thus resulting in a shortage of drugs and patients being forced to buy medication(Joy, 2017).

5.2. *Storage facilities used to store diabetes medicines.*

The study showed that all of the health workers stored insulin at the correct temperature. This is by (Bahendeka, 2019). In principle, insulin vials should remain in a certain temperature range all the time from the moment the insulin vials are filled until the patient is using the insulin. After manufacturers' and the Food and Drug Administration's (FDA) recommendations, insulin should ideally be stored in the refrigerator within a range of +2C/36F and +8C/46F for long-term storage until the expiration date (Bahendeka, 2019).

The study showed that 100% of the respondents agreed they had well-written SOPs about the storage of cold chain diabetes medicines at the facility. This disagrees with the study by (Adrienne A, 2010). According to the Journal of Community Medicine and Health Education, there is no systemic evaluation that was ever performed (and made publically available) about how well the transport of insulin from the manufacturer to the pharmacies (and the storage steps in between) works, at least not in the US. No information about the details of the cold chain is available. We are not aware of any coordinated examination of insulin vials (and insulin pens) or biological samples drawn from the supply pipeline post-manufacture release using publically defined methods (Adrienne A, 2010).

The study showed that the respondents had a functioning automated refrigerator at the facility which shut down when there were any deviation from 2C to 8C. This was in line with research by (Lioyd, 2015). In the cold supply chain, temperature fluctuation is managed by using qualified refrigerators and temperature monitoring systems. Temperature monitoring is a requirement for all steps in the distribution chain up to the point that medications are dispensed to the patient and could prove effective in reducing storage time outside the recommended temperature range for patients as well (Lioyd, 2015).

5.3. *The prevalence of diabetes.*

The research showed that diabetes care was initiated at the health center iv. However, diabetes medicines were available at lower health centers. This is not in agreement with the research done (Ludwig-2017, 2017) about diabetes care in SSA. The health service delivery structure for Tanzania and Uganda is pyramidal with primary health care services at its base. Despite policy stating that primary care facilities should provide services for diabetes, studies have demonstrated that most dispensaries and health centers do not provide such services (Ludwig- 2017, 2017).

The majority of the diabetes patients lived a sedentary lifestyle. This is in line with the research done by (Manouk, 2013) about the causes of diabetes. Rapid urbanization, increasingly sedentary lifestyles, and unhealthy eating habits have contributed largely to the increased prevalence of diabetes, estimated to be 5.7% and expected to rise to 6% by 2035. The prevalence of pre-diabetes, a transition stage with blood glucose levels higher than normal but not high enough to be diagnosed diabetes is currently at 8.3% and expected to rise to 9.3%by 2035. Therefore, interventions to control the epidemic of diabetes and hyperglycemia-related vascular complications should start at this early stage of its development (Manouk, 2013)

6. Conclusion.

According to the study, the knowledge of health workers about procurement of medicines was fair as 85.7% knew the proper quantification process. Storage of diabetes drugs during transit and at the facility was well done as indicated by 100% knowledge about storage temperatures required to store the medicines. Furthermore, the facility had a well-functioning refrigerator. The number of

diabetes patients are raising in the district. This is indicated by the fact that over 50 patients were diagnosed with diabetes between June to December 2022.

6.1. Recommendation.

- There should be organized seminars to educate the health workers about proper procurement procedures.
- There is a need to educate communities about diabetes and its causes to curb the raising numbers.
- There is a need to increase the tools used in the diagnosis of diabetes so that health centers iii also start initiating diabetes care.
- Government should provide more facilities for cold chain storage. Like automated refrigerators.

7. Acknowledgment.

I give thanks and honor to the almighty God for giving me life and supporting me in tough situations I underwent through the course of my academic journey.

I extend my sincere appreciation to my supervisor Dr. Niwagiira Mulodokayi for his valuable time, guidance, support, and encouragement in the preparation of my research.

I acknowledge the role played by the staff and administration of Kampala School of Health Sciences in guiding and developing me morally, especially the principal Mr. Mubangizi Prosper. My heartfelt gratitude goes to my beloved dad Isingoma Matthias Amooti, my mother Alinaitwe Sarah Atwooki, and my brother Amara Ernest Amooti who supported me financially.

8. LIST OF ABBREVIATIONS AND ACRONYMS.

DHO : District Health Officer
EMHSLU : Essential Medicine Health System of Uganda IDF : International Diabetes Federation
JMS : Joint Medical Stores
LMIC : Low and Middle Income Countries
NCD : Non Communicable Diseases
NMS : National Medical Stores
SSA : Sub Saharan Africa
T2D : Type 2 diabetes
UAHEB : Uganda Allied Health Examination Board
UNICEF : United Nations Children's Fund
WHO : World Healthy Organizations

9. Publisher details:

Publisher: Student's Journal of Health Research (SJHR)
(ISSN 2709-9997) Online
Category: Non-Governmental & Non-profit Organization
Email: studentsjournal2020@gmail.com
WhatsApp: +256775434261
Location: Wisdom Centre, P.O.BOX. 148, Uganda, East Africa.

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