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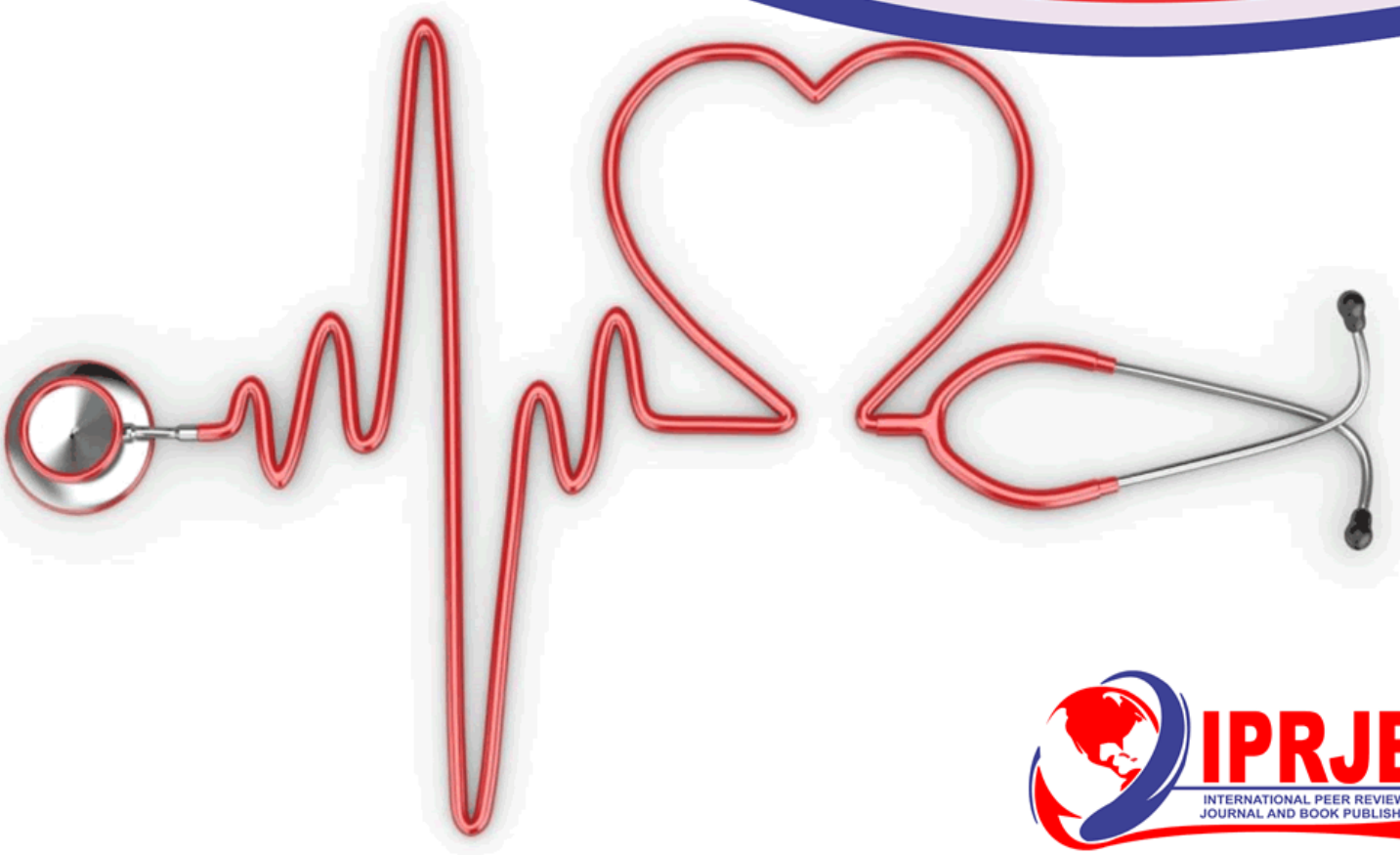

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DIABETES MANAGEMENT AMONG DIABETIC PATIENTS ATTENDING LONGISA LEVEL FOUR HOSPITAL, KENYA

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Abstract

Purpose: Diabetes is the commonest endocrine-metabolic disorder characterized by chronic hyperglycaemia giving rise to the risk of microvascular and macrovascular damage, with associated reduced life expectancy and diminished quality of life. The main objective of study was to establish diabetes management practices among diabetic patients attending Longisa level four hospitals.

Materials and methods: The study adopted a cross sectional study design. It utilized quantitative data collection methods where 87diabetic patients attending the health facility will be randomly selected into the study after giving their informed consents. The data was analysed using descriptive statistics while graphs, tables and figures were utilized to present the results. Regression analysis was employed to determine associations and trends between the dependent and independent variables. The proposal for this study was presented to Kenyatta National Hospital/University of Nairobi ethical Review Committee for ethical approval. Participants were requested to give their consent prior to their participation in the study and assured of confidentiality of their responses throughout the study duration.

Results: The study found out that Diabetes management continue to be a huge public health concern as issues of accessing diabetes services and equipment hinder uptake of the same by patients. A bleak future in diabetic management will be a reality based on the knowledge gained from information imparted to diabetic patients from health facilities they visit and behavioural practices. Costs associated with some important essentials such as a blood sugar machine especially with patients with no stable source of income poses a big challenge to diabetic management. Continuous health education and promotion should be offered and strengthened at the grassroot levels as a key strategy of empowering diabetic patients with friendly, practical and health ways of living.

Unique contribution to theory, practice and policy: The study recommends that to be able to reduce and subsequently address the issue of accessibility of services and safe time, the Ministry of Health in partnership with friendly stakeholders should devolve essential services and equipment to the lowest level to enable diabetic patients to fully utilize them. In this effort, the lives of diabetic patients will be saved and improved greatly.

Keywords: *Diabetes Management Practices, Diabetic Patients, Longisa Level Four Hospital*

1.0 INTRODUCTION

Diabetes mellitus is the commonest endocrine-metabolic disorder characterized by chronic hyperglycemia giving rise to the risk of microvascular (retinopathy, nephropathy, and neuropathy) and macrovascular (ischemic heart disease, stroke and peripheral vascular disease) damage, with associated reduced life expectancy and diminished quality of life. Recent estimates indicate there were 171 million people in the world with diabetes in the year 2000 and this is projected to increase to 366 million by 2030. This increase in prevalence is expected to be more in the Middle Eastern crescent, Sub-Saharan Africa and India (Chinenye & Young, 2013).

The all age worldwide prevalence of diabetes mellitus in 2000 was estimated at 2.8% and is projected to rise to 4.4% by 2030 (Wild *et al*., 2004). In sub-Saharan Africa type 2 diabetes mellitus is the most frequent type and although data is scarce, prevalence has been shown to be rising over the last two decades with highest frequencies in urban areas. No comparative slum/urban poor data is available from Kenya. However, utilizing the 1998 WHO criteria, survey of adults over the age of 50 years in an urban and rural parts of a cosmopolitan district in Kenya report a non-age adjusted prevalence of 6.6% (Mathenge *et al*., 2010) . The only other contemporary data from Kenya is that of a mixed location opportunity sample in person over 18 years, using OGTT that reported an age standardized rate of 4.2% (Christensen *et al*., 2009). A study report similar urban age adjusted rates of between 5.9-6.4% (Mbanya *et al*., 2010). The economic and social consequences of diabetes are expected to be greatest among the poor; reportedly utilizing up to 25% of their income on care and predominantly affecting the breadwinners of these communities (Sobhana *et al*., 2000).

Sub-Saharan Africa, like the rest of the world, is experiencing an increasing prevalence of diabetes alongside other non-communicable diseases (WHO, 2004). In 2010, 12.1 million people were estimated to be living with diabetes in Africa, and this is projected to increase to 23.9 million by 2030. In Sub-Saharan Africa, this trend is emerging in a region grappling with high rates of communicable diseases - including the highest global prevalence of HIV(UNAIDS, 2010), Tuberculosis and Malaria (WHO, 2010). Diabetes is a component cause of several other important and often lethal diseases, both non-communicable diseases such as cardiovascular disease (Saydah *et al*., 2002) and renal disease and communicable diseases such as pneumonia (Kornum *et al*., 2008), bacteraemia and tuberculosis (Thomsen *et al*., 2005) which have considerable impacts on morbidity and mortality in the region (Victoria *et al*., 2011). The estimated prevalence of diabetes in Africa is 1–3% in rural areas and 5-6% in urban Sub Saharan Africa. However, country reports have varied widely (Mbanya *et al*., 2010). The International Diabetes Federation Atlas estimated that in 2006, 10.8 million people had diabetes in Sub Saharan Africa and that this would increase to 18.7 million by 2025, an increase of 80% exceeding the predicted worldwide increase of 55% (Levitt, 2008).

The world prevalence of diabetes among adults was projected at 6.4% in 2010, affecting 285 million adults, and by 2030, it is estimated to be 7.7% with 439 million adults affected (Shaw *et al*., 2010). Much of this burden will be in developing countries with an increase of 69% in the number of adults with diabetes.

In Kenya, while 22.3% of the population is urban, the urban population growth rate is 4.2% almost double the national population growth rate of 2.4% (KNBS, 2009). In Nairobi a majority

(60%) of the population live in slums with much of the migrant population settling in slums. Further, 75% of the urban population growth is absorbed by informal settlements. It is estimated that the number of urban population living in slums will double in the next 10 years (UN-HABITAT, 2006), yet three quarters of the urban slum dwellers are deprived poor, living under impoverished conditions.

The first Kenyan urban-poor population survey to determine the prevalence of diabetes and associated behavioral and metabolic risk factors in the largest growing segment of our urban population, a population hitherto deemed to be burdened with infectious diseases and under nutrition, showed that the prevalence of diabetes increased with age and with no sex differential. This was occurring in an unplanned high-density urban settlement community; of relative young age structure, with high levels of self-reported daily life related physical activity. However, these slum residents were exposed to high level of behavioral risk factors such as cigarette smoking and harmful alcohol consumption. Close to half were either obese or overweight; a fifth had an elevated waistline and high body mass indices both of which were more frequent in females.

A higher prevalence of type 2 diabetes mellitus in deprived communities has been documented and is most striking in the 40–49 years age group (Connolly *et al*., 2000; Misra *et al*., 2001), which mirrors the highest age category specific prevalence. The occurrence of diabetes mellitus in persons of low socio-economic status has been attributed to dietary patterns, low physical activity, cigarette smoking and low birth weight (Ezeamama *et al*., 2006).

Screen detection rate of diabetes mellitus in communities has been shown to be a marker of availability of health care facilities (IDF, 2006) and is suggested that only 10% of diabetic patients in urban slums in Kenya have ever had a blood sugar measured. High screen detection rates of 70-100% have been reported in SSA and 50% from urban South Africa (Mbanya *et al*.,2010; Hall *et al*., 2011). The studies done in Kenya have reported the similar findings of high rate, with 50% of samples being undetected, in a population of relatively high literacy compared to the national adult literacy of 61.5% (Kilele, 2006) implying that contributing factors are probably low access to primary health care facilities and low public awareness of diabetes mellitus. This raises the need for evaluation of these factors alongside preventive strategies of screening high-risk groups. The study also point to the high-risk groups of hypertension that was significantly associated with the presence of diabetes mellitus, and general and central obesity. Family history and impaired glucose tolerance are other high-risk markers.

Behavioural risk factors among the diabetic subjects were found to be similar to that of the entire sample. However persons with diabetes were three fold more likely to have generalized obesity and hypertension. Central obesity as measured by waist circumference was not predictive of diabetes on adjusting for covariates of physical activity. The data suggested that the study population's transition to higher cardio-metabolic risk is presently being driven predominantly by dietary factors and less so by physical inactivity and other behavioral determinants. Despite the absence of longitudinal data on the prevalence of diabetes in Kenya, it was evident that high diabetes mellitus disease burden rate in slum dwellers is suggestive of a rapidly occurring reversal of the social class gradient of cardio vascular disease risk factors in urban Kenya (Ezeamama *et al*., 2006).

The urban poor are the population segment most likely to be affected. Low socio-economic status including low education levels has been associated with development of diabetes mellitus. An association between increasing poverty levels and increasing prevalence of diabetes has been shown among women but is not as strong for men (Robbins *et al.,* 2000). A study in India among a poor urban slum population generally believed to have low risk for lifestyle diseases found a high prevalence of risk factors for NCD's (Anand *et al*., 2007).

Urbanization has been identified as the key driver of the evolving NCD epidemic in developing countries (Yusuf *et al*., 2001). Identified lifestyle changes include reduced decreased physical activity; increase in smoking; increased alcohol intake. These are the behavioural risk factors for diabetes, which can lead to development of metabolic risk factors such as obesity. Since 2008, and for the first time in human history, the majority of the world's population has lived in urban areas (UNFPA, 2007).

Statement of the problem

Diabetes is increasingly becoming a common occurrence and a public health concern worldwide including Kenya that affect a big segment of the population with serious consequences not only to the affected patients but also their dependants, society and the country. The International Diabetes Federation estimated the prevalence of diabetes in Kenya to be about 3.3% in 2007 (Mwangi *et al*., 2011). However, local studies in Kenya have shown a prevalence of diabetes at 4.2% in the general population with a prevalence rate of 2.2% in the rural areas and as high as 12.2% in urban areas.

The majority of the people with diabetes in developing countries are within the productive age range of 45–64 years. These are the same individuals who are expected to drive the economic engines of their countries in order to achieve the agreed international development goals. The number of diabetes patients is estimated to rise dramatically in the near future in most developing and intermediate societies. Type 2 Diabetes Mellitus (T2DM) is the more prevalent, and Kenyans are developing it younger than those in developed countries. The age of onset of T2DM in Kenya has been shown in various studies to be between 45 and 55 compared with 64 years in developed countries. Kenyans are also at higher risk for crippling or life-threatening complications, because they report to health centers when the disease is at advanced stages (Mwangi *et al*., 2011).

Treatment of diabetes in Kenya, as in other parts of sub-Saharan Africa, is fraught with problems. Besides challenges related to diagnosis, care, and treatment, there is a lack of understanding and knowledge about the disease among healthcare professionals and the general population (McFerran, 2008). Because it is a chronic disease that lasts for many years, people diagnosed with diabetes need continuing access to proper medical care. That includes medication (insulin and other medicines), equipment (such as glucose measuring strips), and, most importantly, healthcare professionals who have had adequate training in the diagnosis and treatment of diabetes and its complications.

Research Objective

Broad Objective

To determine diabetes management practices among diabetic patients attending Longisa level four hospital.

Specific Objectives

i. To establish knowledge of diabetic patients attending Longisa level four hospital on diabetic management.
ii. To establish practices of diabetic patients attending Longisa level four hospital on diabetic management.
iii. To determine diabetic management outcome among diabetic patients at Longisa level four hospital.

2.0 MATERIALS AND METHODS

Study Site

This study will be conducted in Longisa level four hospital at the diabetic clinic. Longisa level four hospital, is located in Longisa in Bomet County and is run by the Ministry of Health. It is one referral government facility. It runs several clinics to include in and outpatient services, special clinics to include diabetic clinic, antenatal, immunization, HIV and counselling and testing services among others. Bomet County neighbours other counties such as Narok, Kisii and Kericho counties. The main economic activities in Longisa include small scale agriculture, and dairy farming. The areas surrounding the county are known for its vast agricultural enterprises and tourism. The main cash crops grown in Longisa include wheat, maize and beans.

Study Design

This was a cross sectional study design that was carried out in Longisa level four hospital, Bomet County. Independent variables included information on: levels of accessibility to diabetes management services, knowledge (on diabetes management), and practices of diabetes patients.

Study population

The study population comprised diabetic patients who were ordinarily taking services at Longisa level four hospital

Inclusion and Exclusion Criteria

Inclusion criteria

The diabetic patients attending Longisa level four Hospital who:

Consented to take part in the study

Were strong enough to respond to questions in the questionnaire

Exclusion Criteria

Diabetic patients attending Longisa level four Hospital who:

Did not consent to participating in the study

Were unable to participate due to their illness.

Sample Size Determination and Sampling procedure

A sample size of 82 patients was used. Patients were recruited after being attended to by the healthcare professional. Systematic sampling will be used to obtain the sample. The first patient to be recruited was chosen randomly by picking either the first or the second patient through tossing a coin. Thereafter, every 2nd patient who qualified to be included and consented to take part was recruited until the required sample size was reached.

Data Collection, Data Management and analysis

A structured questionnaire was used to capture issues that included diabetes management services available to diabetic patients, diabetic risky behaviours and practices of diabetic patients and factors associated with poor diabetic management. One research assistant was trained on data collection and therefore administered the questionnaire to respondents. The questionnaires were kept in a safe, locked and the keys kept by the principal investigator. The collected data from questionnaires was entered and stored in a password-protected MS Access database. The entered data was cleaned, coded and analysed using STATA version 15.0. Univariate analysis was done to explore the data. For categorical data such as gender, marital status, smoking status, bar/pie charts was plotted to show the distribution, frequencies and proportions will be reported in tables. For continuous/discrete data such as age, height, time taken to go to hospital, histograms was be plotted to show their distribution. Bivariate analysis was done to determine associations. Chi square (χ^2) test of association was used to assess the association of two categorical variables. To evaluate association of patients' adherence to diabetes management recommendations and their characteristics/profile, prevalence ratios was determined using log binomial regression model. This model was used to determine the prevalence ratio of adherence (adhering/not adhering) across different characteristics of patients. The model links a binary outcome to a set of predictors using a log function. Simple log-binomial model was used to obtain crude relative risk and adjusted relative risk was obtained using multiple log-binomial model.

3.0 RESULTS

3.1 Demographic Characteristics

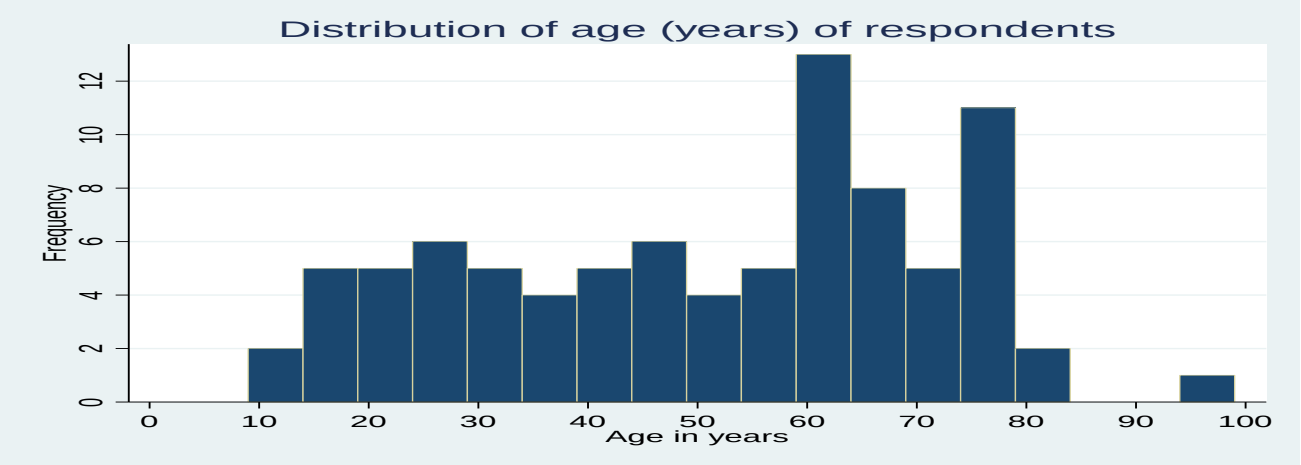
The Table below shows that more than two-thirds of the respondents were married (69.4%) while a few (4.71%) were either divorced or seperated. A majority (44.7%) of respondents had primary education and more than three-quarters (78.2%) were unemployed.

Table 1: Socio-demographic characteristics of participants

Variable	Category	Frequency	Proportion (%)
Marital status	Single	13	15.3
	Married	59	69.4
	Divorced/separated	4	4.71
	Widowed	9	10.6
Education	None	6	7.1
	Primary	38	44.7
	Secondary	20	23.5
	Post-secondary	21	24.7
Employment	No	68	78.2
	Yes	19	21.8

3.1.1 Distribution of participants by age

Participants' age distribution was skewed to the left, an indication that majority were elderly. The median (IQR) age was 55(33-68) years, with the youngest participant being 9 years and the eldest 95 years



1: Age distribution of respondents

3.1.2 Time taken to access Hospital

Respondents were asked to give time they take from their household to the hospital for checkup/treatment. The results, illustrated in Figure 2 indicate that more than a third (37.3%) of patients take 30 minutes to 1 hour on average. Slightly over a quarter (26.5%) take less than 30 minutes while the rest (36.2%) take more than an hour.

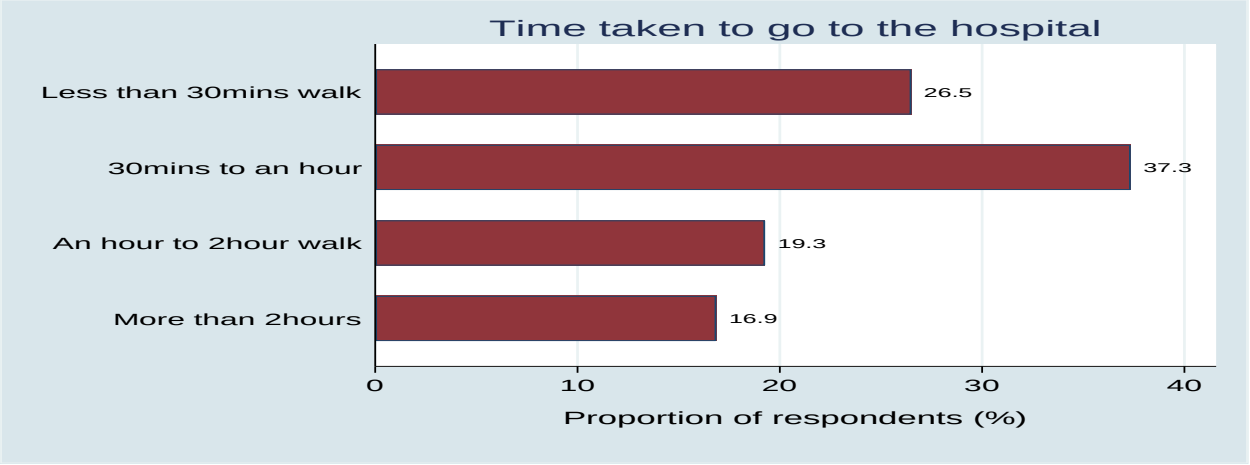


Figure 2: Time taken by respondents to go to hospital

3.1.3 Round trip cost of transport to the hospital

To understand part of the economic burden of patients, information regarding transport cost to the health facility was sought. On average, patients spend Ksh.100 (IQR: 50 - 200) on a round trip while seeking treatment or going for check-ups. Categories of fare were made according to

the nature of the distribution of transport cost, giving rise to the four shown in Figure 3. About a third (32.2%) of the respondents spent between Ksh.51 – 100 in transport cost, a quarter (25.3%) spent less than Ksh.50 while the remaining 42.5% spent more than Ksh.100.

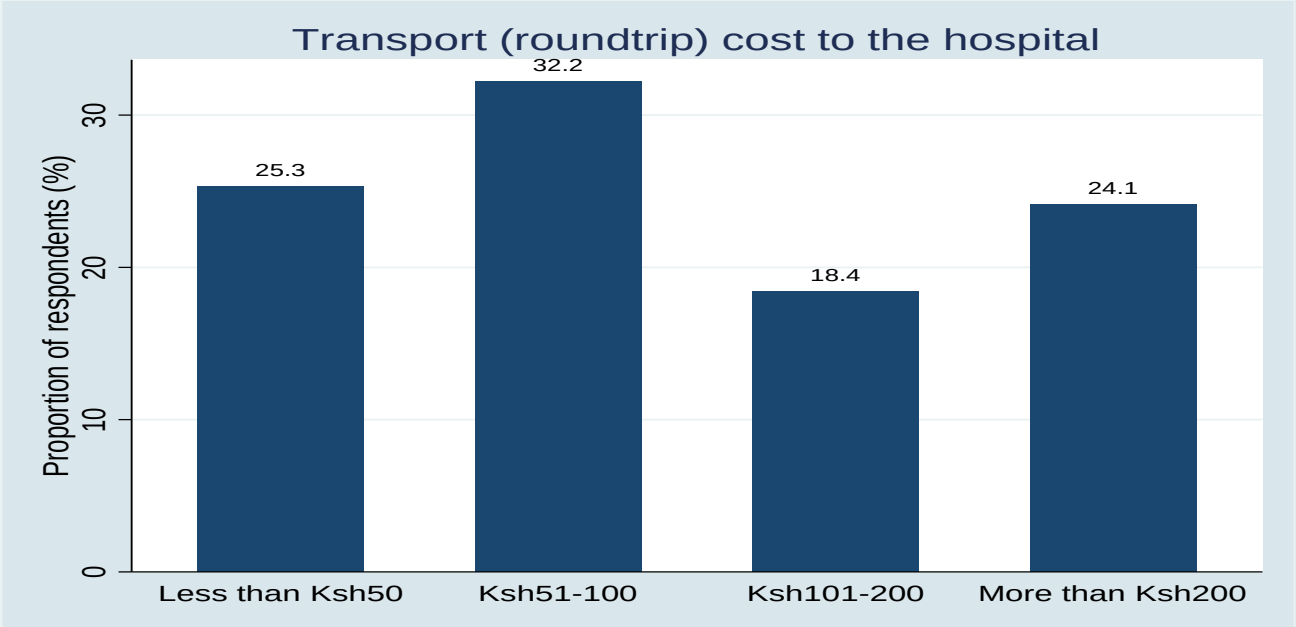


Figure 3: Round trip cost of transport to the hospital

3.1.4 Availability and Accessibility of healthcare services to diabetes patients

Almost all (95.4%) respondents found a health worker in the facility who attended to them. Regarding ownership and operation of a blood sugar machine, just about a third (32.2%) own one and approximately a quarter (26.4%) know how to operate it. More than half (53.3%) of the participants test their blood-sugar once a week and 28.9% do so twice a week. In addition, 6.7% do not test their blood sugar at all. Most respondents (81.9%) obtain their diabetes drugs from the hospital at subsidized fee and tablets are more commonly used (64.0%) than injection insulin (36.0%).

Table 2: Availability and accessibility of healthcare services to diabetes patients

Variable	Category	Frequency	Proportion
Availability of health worker in the facility	No	4	4.6
	Yes	83	95.4
Do you have blood sugar machine?	No	59	67.8
	Yes	28	32.2
Do you know how to operate blood sugar machine?	No	64	73.6
	Yes	23	26.4
Frequency of testing blood sugar in a week	None	3	6.7
	After two weeks	1	2.2
	Once	24	53.3
	Twice	13	28.9
	Thrice	3	6.7
	Daily	1	2.2
Drug type used	Injection insulin	31	36.0
	Tablets	55	64.0
Where do you get your drugs?	Buy from chemist/pharmacy	15	18.1
	Get from hospital at subsidized fee	68	81.9

3.1.5 Monthly cost of diabetic drugs

Information on the average amount spent in purchasing diabetes drugs in a month. Almost all respondents (95.2%) spend between Ksh.100 and Ksh.1000 in a month on drugs, while the rest (4.8%) spend over Ksh.1000.

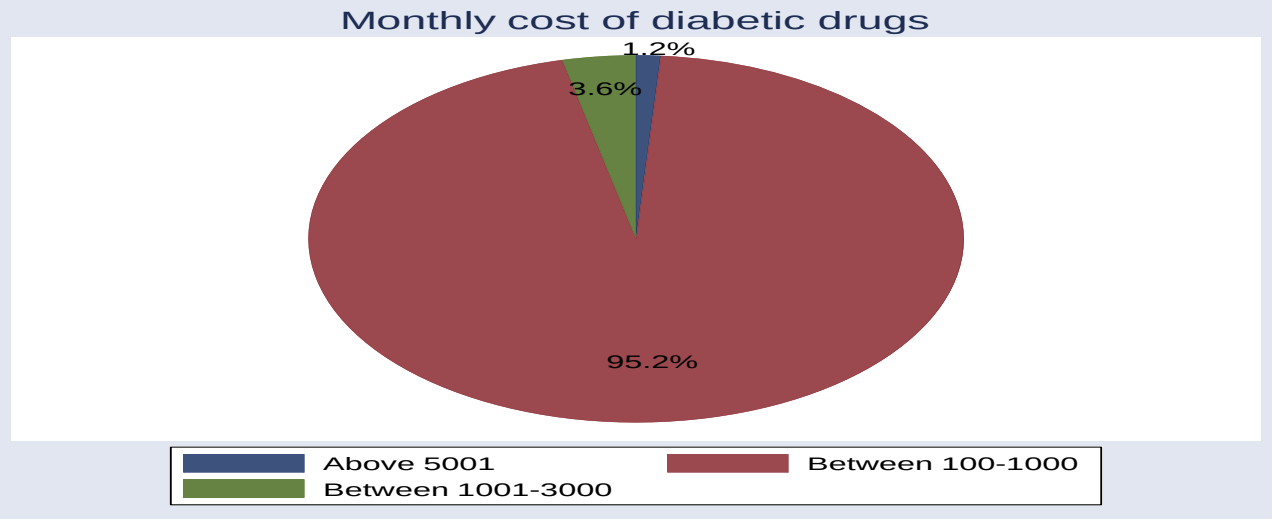


Figure 4: Monthly (aggregated) cost of diabetic drugs (Kenyan Shillings)

3.2 Knowledge of diabetic patients

An overwhelming majority of patients (92%, n=87) had received teachings, mostly in the hospital facility (97.5%, n=81), about recommended diet for diabetic people. More than three-quarters (77%) of patients consistently follow the diet recommendations. Over half (56.3%) of the respondents know the signs of low blood sugar (hypoglycemia). Those who knew the signs of low blood sugar (n = 49) were asked to name them and the results are illustrated in the table below. This was a multiple response question, so a patient could name more than one sign.

Table 3: Knowledge on diabetes among respondents

Variable	Category	Frequency	Proportion (%)
Have you ever been taught about diabetic diet?	No	6	8.0
	Yes	81	92.0
Where were you taught?	CHW	1	1.2
	Hospital facility	79	97.5
	Internet	1	1.2
Do you consistently follow the diabetic diet?	No	20	23.0
	Yes	67	77.0
Do you know the signs of hypoglycemia?	No	38	43.7
	Yes	49	56.3

3.2.1 Participants' knowledge on the signs of hypoglycemia

Majority of the patients (55.1%) who knew the signs of hypoglycemia named hunger and nausea followed by sweating (36.7%). over a third (34.7%) named weakness/fatigue and an almost similar proportion (32.6%) named shakiness/nervousness. The least named signs were chills, seizures/unconsciousness, and tingling /numbness in lips/tongue, mentioned by one patient each (2%).

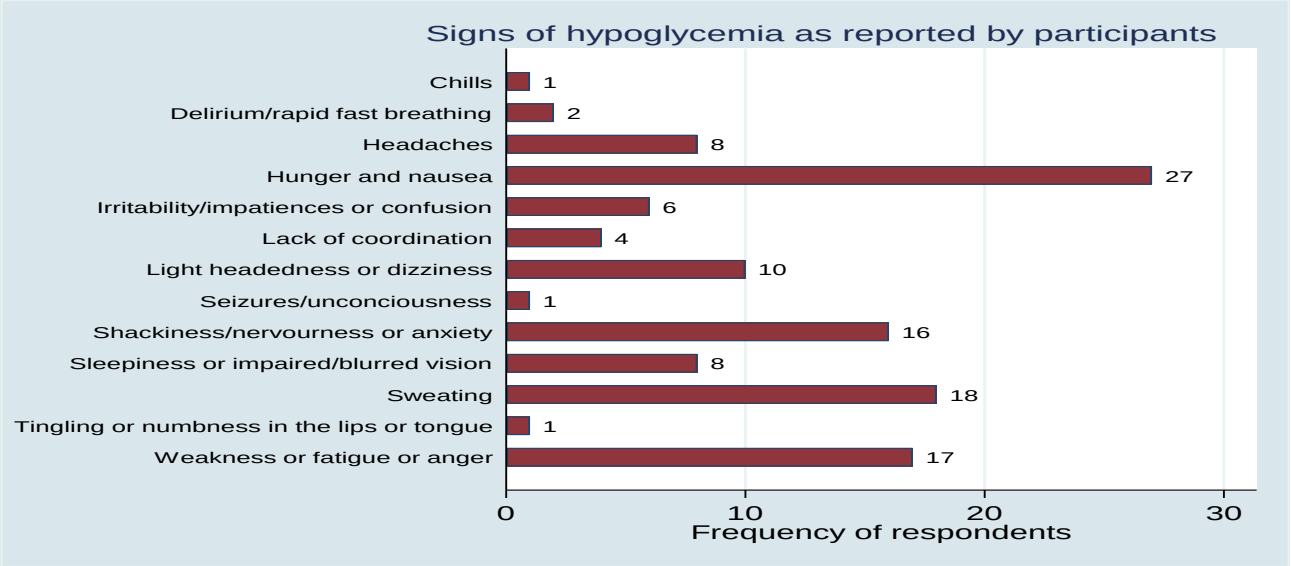


Figure 5: Participants' knowledge on the signs of hypoglycemia (low blood sugar) (n=49)

3.3 Practices of diabetic patients on diabetes management

A small proportion (5.7%) do smoke tobacco products among the study participants. Those who smoke consume between 1 and 2 cigarette sticks per day on average, with one smoker failing to respond to this question. A quarter of respondents (25.3%) have ever consumed alcoholic drinks, a few (8.1%) of whom drank the previous month.

Table 4: Individual risky behaviors among respondents

Variable	Category	Frequency	Proportion
Do you currently smoke any tobacco products?	No	82	94.3
	Yes	5	5.7
How many cigarette sticks do you smoke in a day on average?	One	1	25.0
	Two	3	75.0
Have you ever consumed any alcoholic drinks?	No	65	74.7
	Yes	22	25.3
Have you consumed alcoholic drinks in the last 1 month?	No	80	91.9
	Yes	7	8.1

3.3.1 Frequency with which respondents took alcohol

Of those who drink, most (42.9%) do once a month followed by those who do occasionally (35.7%) and weekly (21.4%) respectively.

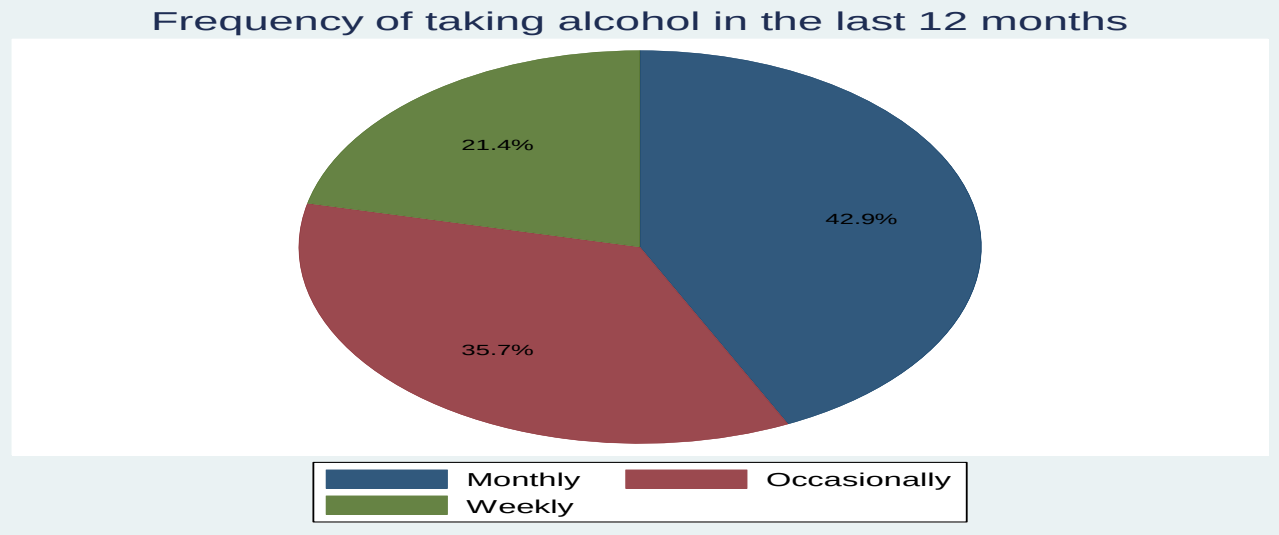


Figure 6: Frequency with which respondents took alcohol in the last 1 year (n=14)

3.3.2 Individual healthy practices

Approximately one third (35.6%) of patients do work involving vigorous activity that cause increased heart rate for at least 10 minutes, most of whom (47.2%) do 1-2 days a week. About half (52.9%) walk or use bicycle at least 10 minutes continuously and 30% do vigorous intensity sport/fitness activities that increase heart rate for at least 10 minutes.

Table 5: Individual healthy practices among respondents

Variable	Category	Frequency	Proportion
Does your work involve vigorous activity causing increased heart rate for at least 10 mins?	No	56	64.4
	Yes	31	35.6
How many days in a week do you do vigorous intensive activity as part of your work?	1-2 days	17	47.2
	3-4 days	11	30.6
	5-6 days	8	22.2
Do you walk or use bicycle at least 10 mins continuously to and from places?	No	41	47.1
	Yes	46	52.9
Do you do any vigorous intensity sport/fitness activities that causes increased heart rate for at least 10 mins continuously?	No	61	70.1
	Yes	26	29.9

3.3.3 Distribution of time (hours) spent sitting

Most patients generally spend less than 4 hours sitting/reclining on a typical day. The median (IQR) time was 3 hours (2-6) hours.

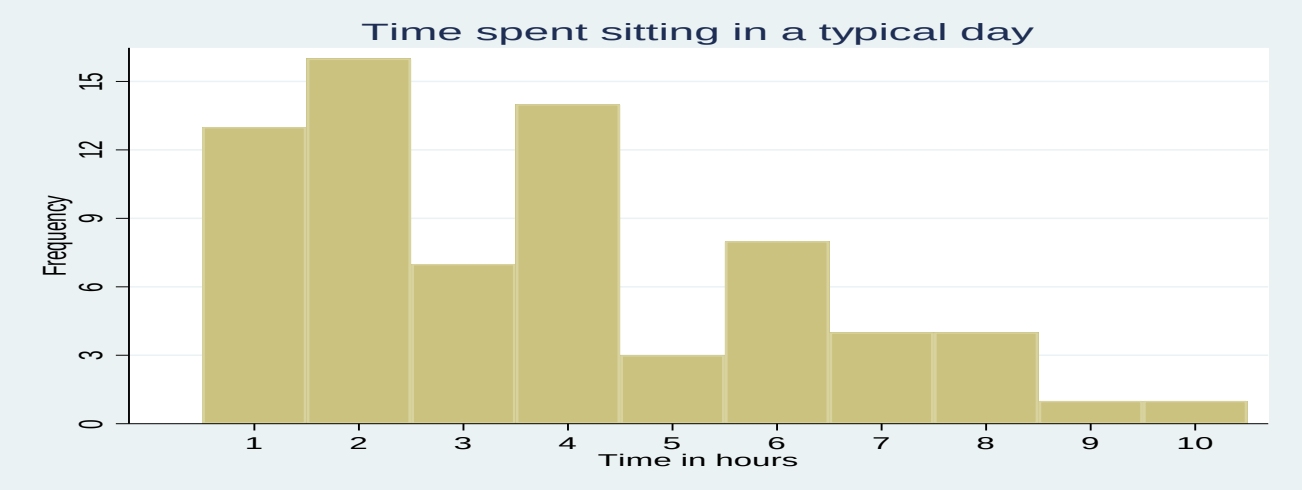


Figure 7: Distribution of time (hours) spent sitting or reclining in a typical day (n=71)

3.3.4 Co-morbidities of diabetes (multiple response)

The figure below shaows that 47.1% had co-morbidities. The most common co-morbidity was hypertension (78.0%) followed by HIV (12.2%) and the least common was heart disease (4.9%).

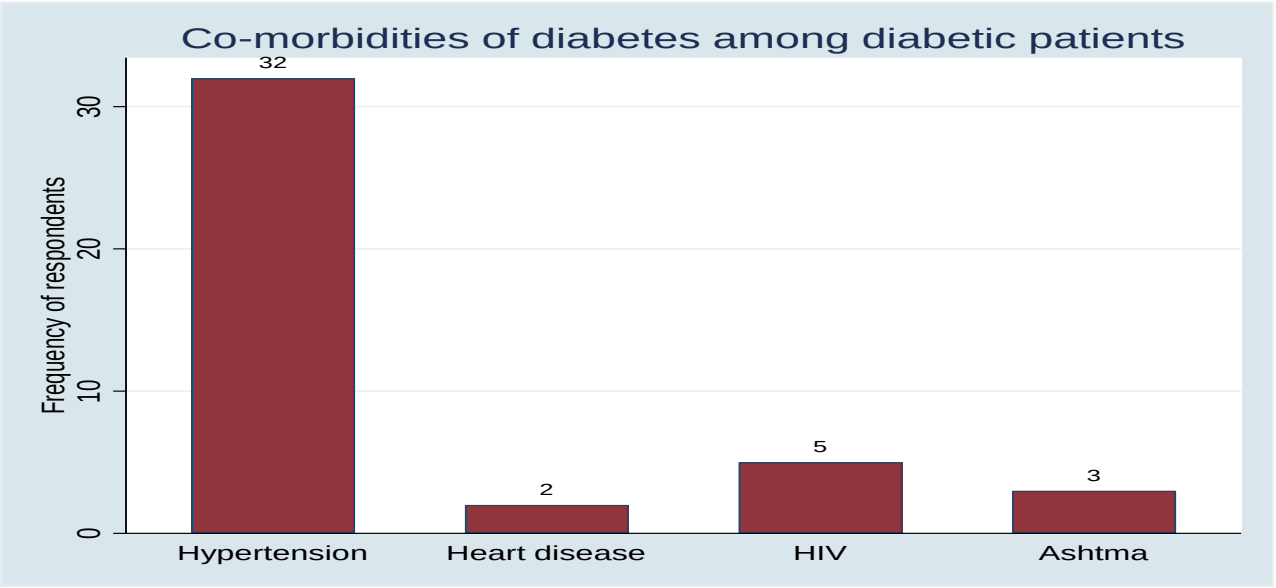


Figure 8: Co-morbidities of diabetes among respondents (n=41)

3.4 Associations of adherence to diabetes management recommendations

Table below shows results of multivariable (adjusted) analysis of the association of adherence to diabetes management recommendations and profile of patients. Three variables showed significant associations (P<0.05) with adherence: age (≥65 vs 9-29; P=0.023), household size (>5 vs ≤5; P=0.009) and current dose (adjusted upwards vs adjusted downwards; P=0.048).

Adjusting for household size, current dosage, knowledge of signs of hypoglycemia and presence of comorbidities, the proportion of adherence in the ≥65 years age group is 90% less than that of the 9-29 years age group. This implies that the elderly (≥65 year olds) have significantly low levels adherence to management recommendations of diabetes than the young (9-29 year olds) population. Adjusting for age, current dosage, knowledge of signs of hypoglycemia and presence of comorbidities, the proportion of adhering patients coming from households with >5 occupants is 4.3 times that of patients from households with ≤5 occupants. This means that patients coming from large households (>5) are more likely to adhere to recommendations of diabetes management than those coming from relatively small households.

The proportion of adhering patients whose dosage had been adjusted upwards is 68% less than that of those whose dosage had been adjusted downwards, having adjusted for age, household size, knowledge of signs of hypoglycemia and presence of comorbidities. In other words, patients whose dosage had been adjusted upwards have significantly lower levels of adherence to diabetes management recommendations compared to those whose dosage had been adjusted downwards.

Table 6: Adjusted associations of adherence to diabetes management recommendations and profile of patients

Adherence (Ref: Not adhering)	Prevalence Ratio (PR)	Std. Err.	z	P>z	[95% Conf.	Interval]
Age (Ref: 9-29 years)						
30-49 years	1.950488	1.297675	1	0.315	0.529459	7.185452
50-64 years	0.490879	0.209744	-1.67	0.096	0.212457	1.134169
≥65 years	0.100208	0.101108	-2.28	0.023	0.013869	0.724013
Household size (Ref: ≤5)						
More than 5	4.306684	2.39913	2.62	0.009	1.445317	12.83285
Current dose (Ref: Adjusted downwards)						
Adjusted upwards	0.320258	0.184723	-1.97	0.048	0.103402	0.991901
Same dosage	0.478518	0.219474	-1.61	0.108	0.194756	1.175724
Know signs of hypoglycemia (Ref: No)						
Yes	1.000429	0.485678	0	0.999	0.386326	2.590709
Presence of comorbidity (Ref: None)						
Present	0.470264	0.215689	-1.64	0.100	0.191397	1.155444

4.0 DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

4.1 Discussions

Level of accessibility of diabetes management services and equipment

This study established that about two-thirds (63.8%) of diabetic patients take up to one hour for a round-trip distance to hospital for check-up/treatment and on average, they spend Ksh. 100. This finding agreed with that of another study conducted in Kiambu which found that about 62.5% of patients travelled up to 19 kilometres to the health facility (Mwaura *et al.*, 2017). The study also

revealed a relationship between distance to a health facility and frequency of making hospital visits – the longer the distance, the fewer the number of visits to a health facility. More visits implies a closer attention to patients and overall better quality of life. The distance and transport cost could a barrier to health seeking behaviour among our study participants.

Most patients spend between Ksh.100 and Ksh.1000 a month on diabetes drugs. The cost of drugs together with indirect costs such as transport costs are key barriers to prevention and control of diabetes, which is one of the non-communicable diseases whose control and prevention are prioritized in the Kenyan Government National Medium Term Plan (2014-2018) (WHO, 2014).

There was an impressive response on the availability of healthcare workers in the health facility. Virtually all patients found a healthcare worker on arrival to the facility. This is an indication of the commitment of health workers in the provision of services to diabetic patients. In addition, it reduces the barriers to prevention and control of the condition.

On a negative note however, less than a third (32.2%) of diabetes patients have a blood sugar machine. This points to a serious challenge when it comes to determining when to see a doctor, as one may not know when their sugar levels are either too high or too low to warrant medical attention. A probable reason for the low uptake of the blood sugar machine is high cost of the gadget. More than three-quarters of patients get subsidized drugs from the hospital. Although subsidized, the price is still high for a majority who have no stable source of income.

Knowledge of diabetic patients on diabetes management

This study established that most patients (92%) had some knowledge, mostly from the hospital facility, on recommended diet for diabetic people. It further found out that about a quarter of them do not follow the diet recommendations consistently. This may be as a result of non-acceptance of the disease by patients. Poor adherence to recommended diet may reduce the efficacy of diabetes drugs, resulting in poor treatment outcomes such as worsening of the condition of the patient. To support this hypothesis, a study aiming to establish the factors affecting adherence to dietary recommendations in diabetes mellitus patients found out that poor adherence to the recommendations was associated with low level of disease acceptance (Jaworski *et al*., 2018). To improve adherence, there should be effective dietary education which includes promoting more positive attitudes, among those with negative attitudes, towards the disease through individual counselling, insistence on regular blood glucose testing, and respecting the patients' needs.

Slightly over half (56.3%) of patients knew the signs of hypoglycaemia, a suggestion that a remarkable proportion of patients have not been educated on signs to watch out for. Our finding did not mirror that of a study done in South Africa, which established a proportion of 66% of patients with knowledge of signs of hypoglycemia (Ejegi *et al*., 2018). The disparity could be attributed to differences in the levels of education in the two settings, which could impact on the knowledge of the signs of low blood sugar. Hypoglycemia affects patient management and as such, it should be considered by healthcare professionals at the onset of diabetes care. Since prevention rather than treatment is preferable, identifying high risk patients is critical in the prevention of the condition. Specifically, the most mentioned signs of hypoglycemia by patients were: hunger and nausea (55.1%), sweating (36.7%), weakness/fatigue/anger (34.7%), and

anxiety/nervousness (32.6%). This finding tend to disagree with another done in India which revealed the most common signs as: dizziness (81.4%), weakness (73.8%) and drowsiness (72.1%) (Shriraam *et al*., 2018). This is attributable to difference in the population structure and literacy levels.

Practices of diabetic patients on diabetes management

Our findings on smoking and drinking habits of patients revealed that only 5% currently smoke and about a quarter have ever drank alcohol, with 8% having drank in the last 1 month. The sharp decline in the proportion of drinking patients suggests commendable adherence to recommendation by healthcare professionals, of avoiding alcohol consumption. Since smoking and drinking have been linked to development of diabetes, the low prevalence of the same in our study population is a positive contribution towards reducing the impact of the disease.

Another point to note is the physical activity among our study participants – just over half of them engage in physical activities that increases their heart rate for at least 10 minutes. This result is important given that physical inactivity is associated with risk of diabetes. A systematic review of 10 prospective cohort studies established that those who participated in regular physical activities were 31% (CI: 17% - 42%) less likely to have diabetes compared to those who led sedentary lifestyles (Jeon *et al*., 2008). Another study in South Africa found out that more than three-quarters (79.6%) of those who were physically inactive had poor glycemic control (Umeh & Nkombua, 2018). This underlines the need for more awareness on the importance of physical activity (in addition to healthy eating) among the diabetes patients, since almost half of the patients in our study were inactive.

Adherence to diabetes management recommendations and characteristics of diabetic patients

The elderly population (≥65 years old) in this study showed significantly low levels of adherence to diabetes management recommendations as compared to the young population (9-29 years old). This may be attributed to higher physical activity among the young patients than the old. It may also point out to well informed youth who have access to the internet resources hence can learn more about the disease and its risk factors than the old who are technologically disadvantaged. Another notable finding was that patients from large households (>5) were more likely to adhere to recommendations of diabetes management compared to those who come from small families. A review showed that social support from family provides patients with practical help (like in taking drugs) and in coping with stress of living with the disease (Trcica and Robin, 2018). This supports our finding and indicates the need to pay closer attention to patients coming from small households when it comes to adherence. Finally, patients whose dosage had been adjusted upwards had poor adherence compared to those whose dosage had been adjusted downwards. This could be attributed to the negative side effects of the drugs or non-response to treatment of patients whose drugs had been adjusted upwards.

Conclusions

Diabetes management continue to be a huge public health concern as issues of accessing diabetes services and equipment hinder uptake of the same by patients. This study has demonstrated that diabetic patients often travel long distances to hospital for check-ups/ treatment, incurring

additional indirect costs in the form of fare. Despite subsidies by the Ministry of Health on drugs, this study noted that patients still spend considerable amount of money in purchasing them away from the facilities they travel to. An attempt to improve self-monitoring of one's condition through ownership of blood sugar machine was noted to be very low, further exacerbating the situation among patients and the overall management of diabetes.

Based on the knowledge gained from information imparted to diabetic patients from health facilities they visit and their actual practices (in terms of behaviour) depict a bleak future in as far as diabetic management at the individual level is concerned. Though a remarkable proportion of patients had been taught on the recommended diet, a relatively low proportion of them consistently followed the recommendations. Further, the low knowledge of patients was noted amongst some patients who were still indulging in drinking alcohol and cigarette smoking, a situation that compromises their overall health. This ignorance can lead to poor adherence to treatment and management of diabetes and may eventually lead to early death.

Recommendations

This study therefore makes the following recommendations;

To be able to reduce and subsequently address the issue of accessibility of services and safe time, the Ministry of Health in partnership with friendly stakeholders should devolve essential services and equipment to the lowest level to enable diabetic patients to fully utilize them. In this effort, the lives of diabetic patients will be saved and improved greatly.

Continuous health education and promotion should be offered and strengthened at the grass root levels as a key strategy of empowering diabetic patients with friendly, practical and health ways of living. This will also go a long way in checking behavioural aspects that may endanger lives of diabetic patients.

The community needs to be enlightened and be involved in determining practical ways and means of addressing not only the health needs of diabetic patients but also in eradicating behaviours and other practices that may compromise the health and subsequent lives of diabetic patients

There is need to create economic empowerment opportunities to diabetic patients that will not only engage those participating in harmful practices to a meaningful activities but also to give resources for reaching out to better quality care and management.

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