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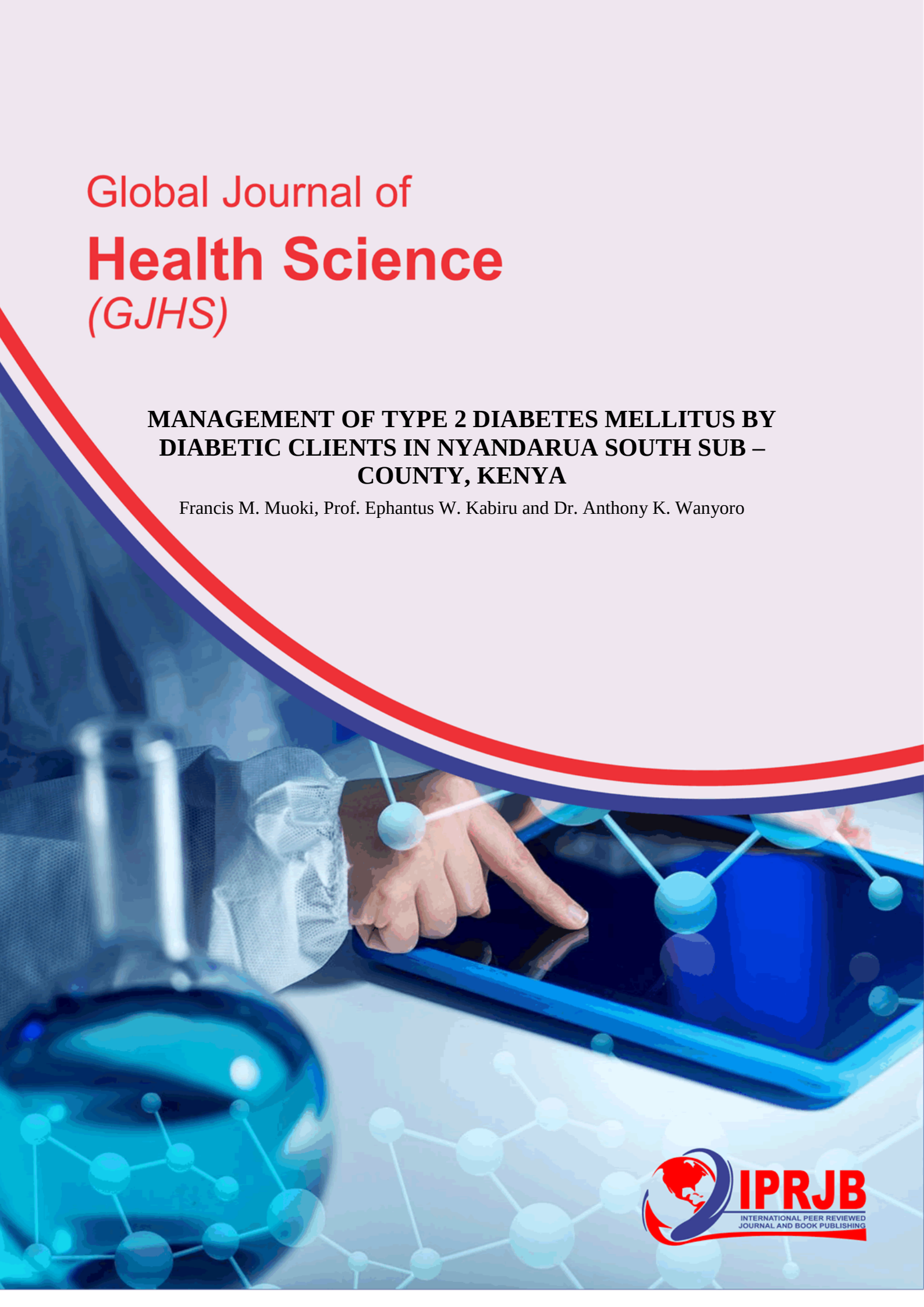

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MANAGEMENT OF TYPE 2 DIABETES MELLITUS BY DIABETIC CLIENTS IN NYANDARUA SOUTH SUB – COUNTY, KENYA

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Abstract

Purpose: Type 2 diabetes mellitus, (T2DM) is the most common form of diabetes, characterized by disorders of insulin resistance, insulin secretion, obesity, lipid abnormalities, hypertension, and cardiovascular diseases. The marked increase of type 2 diabetes mellitus (T2DM) necessitates active development and implementation of efficient prevention programs as the condition is a major public health concern in the world. This study sought to determine management of T2DM by diabetic clients in Nyandarua South sub-County, Kenya.

Methods: A descriptive cross-sectional facility based design was used. The study population comprised 294 T2DM clients. Relationship between levels of knowledge on the recommended management interventions, socio-demographic factors and management practices were examined using chi-square and bivariate analyses. A $P \leq 0.05$ was considered significant.

Results: Majority of participants (83.3%) had never been screened for DM except at the point of diagnosis. A small proportion of the participants (28%) had good knowledge on T2DM management interventions. Practices applied by the clients in managing T2DM included diet, exercise, taking diabetic medications and monthly weight monitoring. Conclusions made from the study are that there was low level of knowledge on T2DM management interventions, practices for management of T2DM that participants applied included diabetic diet, exercise, drug therapy and weight monitoring though fairly undertaken. Level of education and income significantly influenced clients' management of T2DM.

Recommendations: The national and Nyandarua County government's Department of Health to improve on creation of awareness on T2DM management interventions and diversify the media so as to reach most people. This should be standardized across the health facilities in order to improve the level of knowledge on management interventions for T2DM among diabetic clients.

Keywords: *Management, type 2 diabetes mellitus, diabetic clients*

1.0 INTRODUCTION

1.1 Background to the Study

Diabetes is one of the commonest non-communicable diseases of the 21st century (International Diabetes Federation, 2013). In 2013, 382 million people had diabetes globally with 90% of the cases being type 2 Diabetes Mellitus (WHO, 2013). In 2015, the global burden of diabetes was estimated to be 415 million people with a global prevalence of 8.3%, and the IDF estimated that this figure was likely to rise to 642 million by the year 2040 (International Diabetes Federation, 2015). This rise in Type 2 Diabetes Mellitus (T2DM) is associated with demographic and social changes such as globalization, urbanization, aging population and adoption of unhealthy lifestyles such as consumption of unhealthy diets and physical inactivity (International Diabetes Federation, 2015). Type 2 Diabetes Mellitus and its associated complications have been reported to increase dramatically and this resulted in 1.5 million deaths worldwide in 2012 (WHO, 2013). Globally, in every six (6) seconds, a person dies from diabetes which has resulted into 5.0 million deaths by 2015 (International Diabetes Federation, 2015).

Africa has the fastest growth rates of overweight and childhood obesity which are risk factors for T2DM later in life (Rossouw et al., 2012). The youth of sub-Saharan Africa are particularly vulnerable to T2DM due to a lifetime accumulation of risk factors such as early weight gain (0-5years), childhood obesity, malnutrition and sedentary lifestyle (Azevedo, 2008). While childhood diabetes mellitus cases were typically type 1, there has been a rapid increase in the development of obesity-associated T2DM among children (Tuei et al., 2010, Lee et al., 1995). Overall diabetes-induced deaths in sub-Saharan Africa significantly increased from 2.2% in 2000 to 6% in 2010 (International Diabetes Federation, 2012). These rates were highest amongst persons between 20 and 39 years, the most economically productive members of peri-urban populations (International Diabetes Federation, 2009). In 2010, 43 million children (<5 years) were overweight globally, with 35 million of these children living in developing countries (Rossouw et al., 2012).

Type 2 Diabetes Mellitus is rapidly emerging as a major health problem in Kenya making up over 90% of all reported cases of diabetes which is mainly caused by sedentary lifestyles (Christensen et al., 2006).

Many children and adolescents remain undiagnosed due to a lack of health education and services; as well as poor consensus of the diagnostic criteria of metabolic syndrome in children (Mayosi et al., 2009). This delays initiation of treatment with the clients developing severe complications (Mayosi et al., 2009). Management of T2DM entails intensive lifestyle modification for those at risk of diabetes and aggressive treatment for those with the disease. Ineffective management of the condition increases the occurrence rate of chronic complications of diabetes that the country's health care system is ill-prepared for, both in recurrent expenditure and facilities (KNDS, 2010)

1.2 Statement of the Problem

A high proportion of undiagnosed cases of diabetes mellitus end up with irreversible complications imposing a huge economic burden to the individual, family, community and the health care system (International Diabetes Federation, 2009). In 2012, diabetes resulted in 1.5 million deaths worldwide making it the 8th leading cause of death The global burden of diabetes was estimated to be 415 million people with a global prevalence of 8.3% and the

IDF estimated that this figure was likely to rise to 642 million by the year 2040 (IDF, 2015). The prevalence of diabetes in Kenya was 4.7% (IDF, 2013). The prevalence of T2DM in Nyandarua South sub-County was 10.8% which was higher compared to the country's prevalence (MOH, 2013). This raises a concern on the management of T2DM by diabetic clients in Nyandarua South sub-County.

1.3 Specific Objectives

i. To establish the level of knowledge on recommended management interventions for type 2 diabetes mellitus among T2DM clients in Nyandarua South sub-County.

ii. To establish practices applied by T2DM clients in self-management of type 2 diabetes mellitus in Nyandarua South sub-County.

iii. To determine the influence of socio-demographic factors on management of type 2 diabetes mellitus among T2DM clients in Nyandarua South sub-County.

2.0 METHODS

2.1 Study Design

A descriptive cross-sectional facility based design was used. This design enabled description of management of T2DM by the respondents at one point in time during the study without influencing their behaviour in any way. The design was appropriate to the study because screening, enrolment, management and follow up care for diabetic clients take place within health facilities.

2.2 Study Variables

2.2.1 Dependent Variables

The dependent variable for the study was management of type 2 diabetes mellitus by T2DM clients in Nyandarua South sub-County, Kenya

2.2.2 Independent Variables

The independent variables for the study included:-

i. Level of knowledge on management interventions for T2DM (causes and signs of poor blood sugar, diabetic diet, foods that elevate blood sugar level, body weight management, complications and their prevention)

ii. Practices for management of T2DM (blood glucose control, use anti-diabetic drugs, self blood glucose monitoring, regular meal composition, exercise and body weight monitoring).

iii. Socio-demographic and economic characteristics of the respondents (age, gender, marital status, level of education, employment status and income level)

2.3 Location of Study

The study was carried out in Nyandarua South sub-County, Nyandarua County. Nyandarua County is located in the central part of Kenya with a total surface area of 3,245.2km² and a total population of 596,000 (KNBS, 2013) The sub-County has two (2) main health facilities; North Kinangop Catholic hospital and Engineer sub-County hospital. The facilities serve as the main centres for provision of care and follow up services to diabetic clients including monthly clinical review, health education, weight and blood sugar monitoring and nutritional counseling.

2.4 Study Population

The study population included T2DM clients attending diabetic clinic for their monthly check up. The clients were limited to the sampled health facilities; North Kinangop Catholic hospital and Engineer sub-County hospital in the sub-County.

2.5 Sampling Procedures

The study was conducted in two (2) health facilities within Nyandarua South sub-County. Purposive sampling method was used in the selection of Nyandarua South sub-County. This was due to the observed increase in the number of T2DM clients admitted with diabetes related complications. Probability proportionate to size (PPS) strategy was used to obtain the number of respondents from each facility. Systematic random sampling method was used to select consenting respondents as they met the inclusion criteria until the required sample size for the study was obtained. A sample size of 294 respondents was used.

2.6 Data Collection

The data collection tool for the study was a semi-structured questionnaire which sought information on the participants' socio-demographic characteristics, level of knowledge on recommended management interventions for T2DM, and management practices for T2DM. The interviewer would introduce him/herself to the participant, and having obtained an informed consent, he/she would read out the questions to the participant as they were on the questionnaire and allow the participant to respond appropriately without any influence.

2.7 Data Management and Analysis

After the data was collected, it was cleaned for identification of incomplete or inaccurate responses. The data was then coded and entered in the excel software, Microsoft office Excel 2010, and exported into the Statistical Package for Social Sciences, IBM® SPSS, version 20.0 (SPSS Inc, USA) for analysis. Descriptive statistics were computed to generate frequencies, mean, median and standard deviation. Proportions for categorical data were computed while mean and standard deviation were reported for age. Chi-square test was used to examine differences in proportions between socio-demographic variables and the dependent variable. A P-value of less than 0.05 ($P<0.05$) at 95% CI was considered significant for all statistical analysis. Bivariate analysis was computed to determine the association between socio-demographic characteristics and management of T2DM.

To determine the level of knowledge, a Likert scale was used. Each correct response from the cluster questions was assigned a score of 1.0 and each incorrect score was allocated 0. The overall score for each individual was calculated for all the nine (9) questions on knowledge. The maximum expected score was 9. The cut off point was 5 out of the maximum 9. The overall mean level of knowledge score on causes, signs, foods increasing blood sugar, complications, prevention, management interventions and whether one knew that T2DM is controllable was computed. Anyone scoring less than 3 was termed as having poor knowledge, between 4 and 5 as having average knowledge while above 5 was classified as having good knowledge. The results were summarized and presented in graphs and tables.

2.8 Logistical and Ethical Considerations

This study was approved by Kenyatta University Graduate School and ethical approval to carry out the study was obtained from Kenyatta University Ethics Review Committee (KUERC). Authority to conduct the study was sought from the National Commission for Science, Technology and Innovation (NACOSTI). Administrative authorization to carry out the study was sought from administration of both North Kinangop Catholic hospital and

Engineer sub-County in Nyandarua South sub-County. Informed consent was obtained from each prospective participant prior to their participation in the study. Participants' identity remained anonymous throughout the study to guarantee privacy. The study participants were assured of confidentiality of the information they gave. Copies of signed consent forms were kept in a lockable cabinet and access controlled by the researcher.

3.0 RESULTS

3.1 Socio-Demographic and Economic Characteristics of Study Respondents

3.1.1 Socio-Demographic Characteristics of Study Respondents

Table 1 shows socio-demographic characteristics of the study participants. The participants' median (range) age was 64.0 (18-91) with slightly more than half (56.7%) aged above 60 years. Most of the respondents (59.5%) were females. A larger proportion of the respondents (43.9%) had primary level of education while college/university was the least (5.8%). Majority of the participants (92.2%) were married.

Table 1 Socio-demographic Characteristics of Study Participants

Variable	Category	Frequency (n=294)	Proportion (%)
Age (Years)	Median (Range)	64.0 (19-91)	
	Mean (SD)	61.87 (± 15.34)	
	< 20	1	0.3
	20 - 29	12	3.9
	30 - 39	15	5.1
	40 - 49	29	10.0
	50 - 59	71	24.0
	≥ 60	167	56.7
Sex	Male	119	40.5
	Female	175	59.5
Marital status	Married	271	92.2
	Single	20	6.8
	Divorced	3	1.0
Level of education	Non-formal	83	28.2
	Primary	129	43.9
	Secondary	65	22.1
	College/university	17	5.8

3.1.2 Socio-economic Characteristics of the Study Participants

Table 2 shows participants' socio-economic characteristics. Majority of the participants (72.8%), were self-employed while casual labourers (1.4%) were the least. A larger proportion of the participants (53.7%) earned less than Kshs 5000 while the least (5.4 %) earned between Kshs 10,001 – 15,000 per month.

Table 2 Socio-economic characteristics of the study participants

Variable	Category	Frequency (n=294)	Proportion (%)
Employment status	Employed	26	8.8
	Self-employed	214	72.8
	Unemployed	50	17.0
	Casual labourer	4	1.4
Level of income per month (Kshs)	< 5000	158	53.7
	5000 – 10,000	90	30.6
	10,001 – 15,000	16	5.5
	≥ 15,000	30	10.2

3.2. Knowledge on Management Interventions for T2DM

3.2.1 Source of Information on Diabetes Mellitus

Figure 1 shows participants' source of information on diabetes mellitus. The highest proportion of the participants (42.2%) indicated that their first source of information on diabetes mellitus was health talks by health care providers while posters and billboards were the least (5.0%).

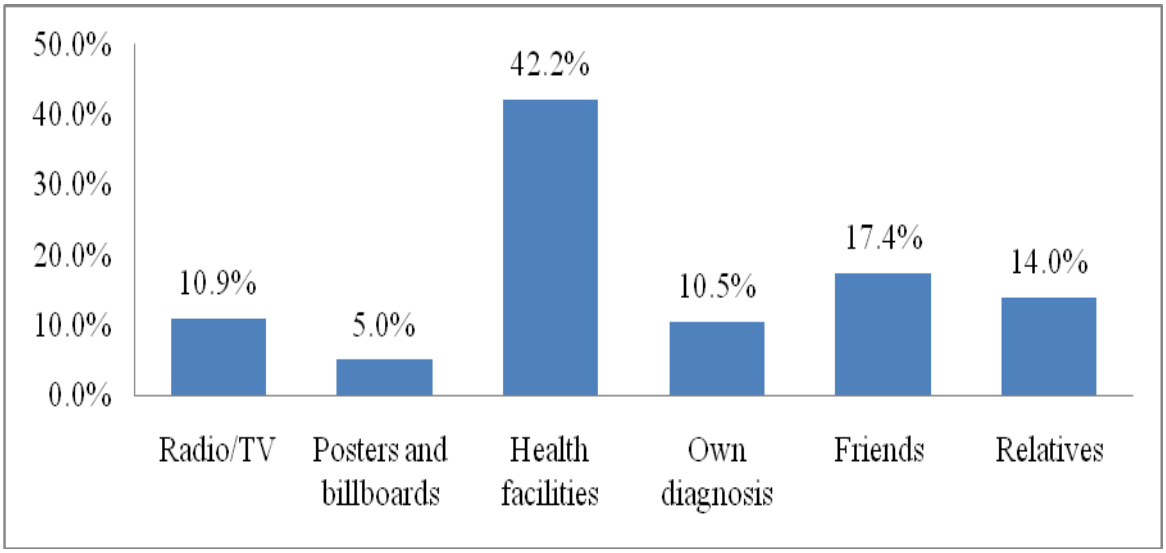

Figure 1 Participants' Source of Information about Diabetes Mellitus

3.2.2 Screening for Diabetes Mellitus

Figure 2 shows participants' reasons for screening for diabetes mellitus. The highest proportion of the participants (49.0%) indicated that they were screened for T2DM following health care providers' initiative at the clinics while (2.1%), were screened during health outreaches.

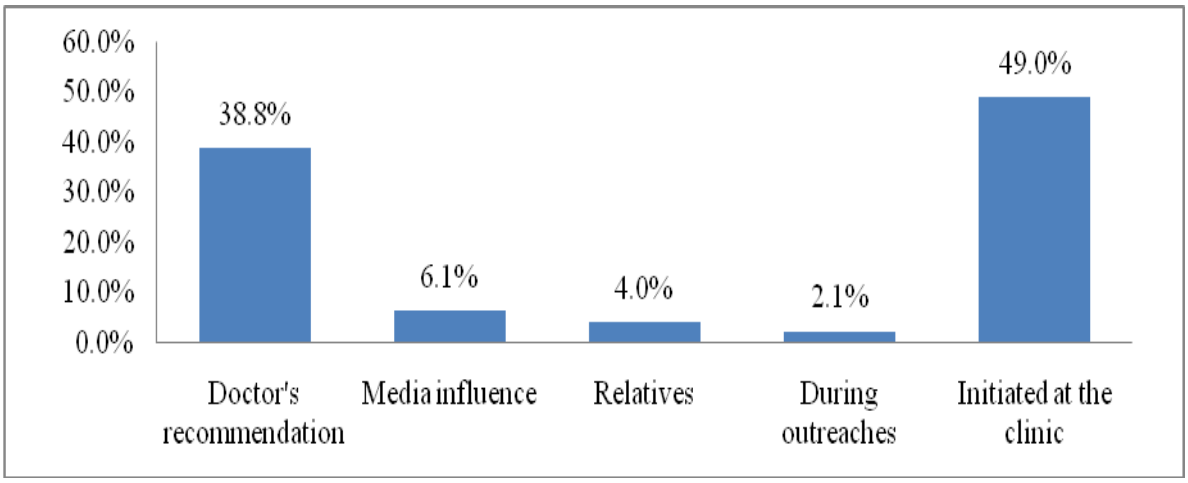

Figure 2 Reasons for Screening for Diabetes Mellitus

3.2.3 Enrolment into Diabetes Follow Up Program

Table 3 shows participants' enrolment into diabetes management program. A large proportion of the participants (82.7%), enrolled into diabetes management program immediately after they were diagnosed with the condition. Majority of the participants (85.2%), enrolled into the program following doctor's recommendation. Participants who delayed enrolment, (64.5%), indicated that they were not aware about the diabetes management program.

Table 3 Enrolment into Diabetes Management Program

Variable	Category	Frequency (n=294)	Proportion (%)
Immediate enrolment	Yes	243	82.7
	No	51	17.3
Reason for immediate enrolment	Doctor's recommendation	207	85.2
	Advice from relatives	4	1.6
	Friends' advice	3	1.2
	Fear of complications	3	1.2
	Perceived benefits from program	11	4.5
	To understand the condition	15	6.3
	Did not know about the program	33	64.5
Reason for delayed enrolment	Fear of being known to be diabetic	8	15.6
	Not believed the diagnosis	7	13.3
	Not aware of services offered	2	4.4
	Had to consult the family	1	2.2

3.2.4 Duration on Follow up in the Diabetes Management Program

Figure.3 shows participants' duration on follow up in the diabetes management program. A large proportion of the participants (76.4%), reported to have been on follow up for T2DM for at least ten (10) years while the least (2.1%), had been on follow up for more than thirty (30) years.

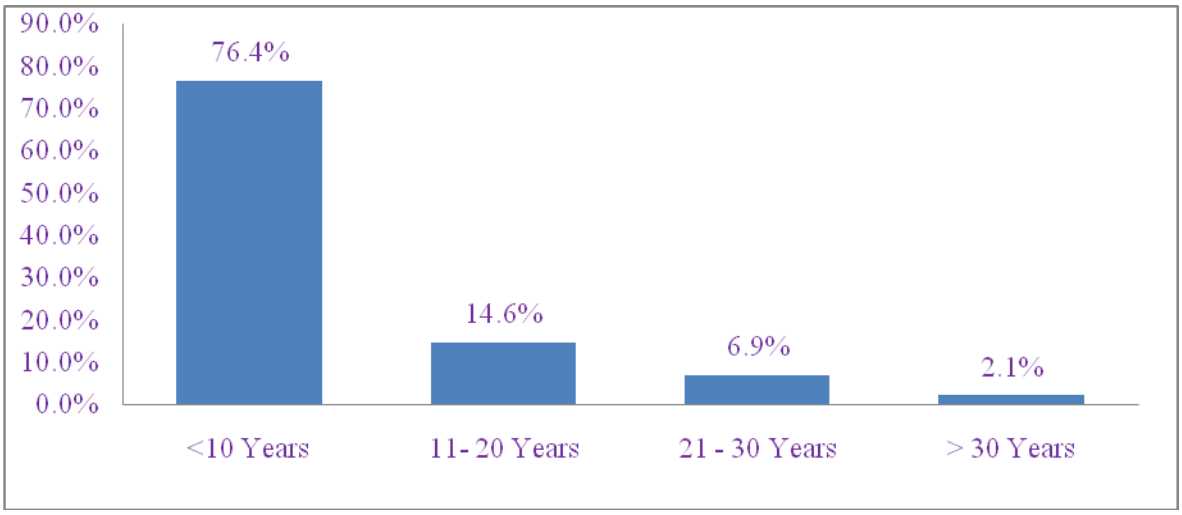

Figure 3 Participants' duration on Follow Up in Diabetes Management Program

3.2.5 Knowledge on T2DM Management Interventions among Study Participants

Figure 4 and 5 show participants' level of knowledge on T2DM management interventions. Majority of the participants (95.6%), knew that T2DM was controllable. Regarding the level of knowledge on T2DM management interventions, a large proportion of the participants (60%), had poor knowledge on signs of poor blood sugar level while the least (7.8%) being rated as having good knowledge. A large proportion of the participants (42.5%), had average knowledge on T2DM complications. Most of the participants (45.6%) had good knowledge on management of body weight while the least (23.5%) had poor knowledge. A small proportion of the participants had good knowledge on prevention of foot ulcers while the majority (50.3%) had poor knowledge

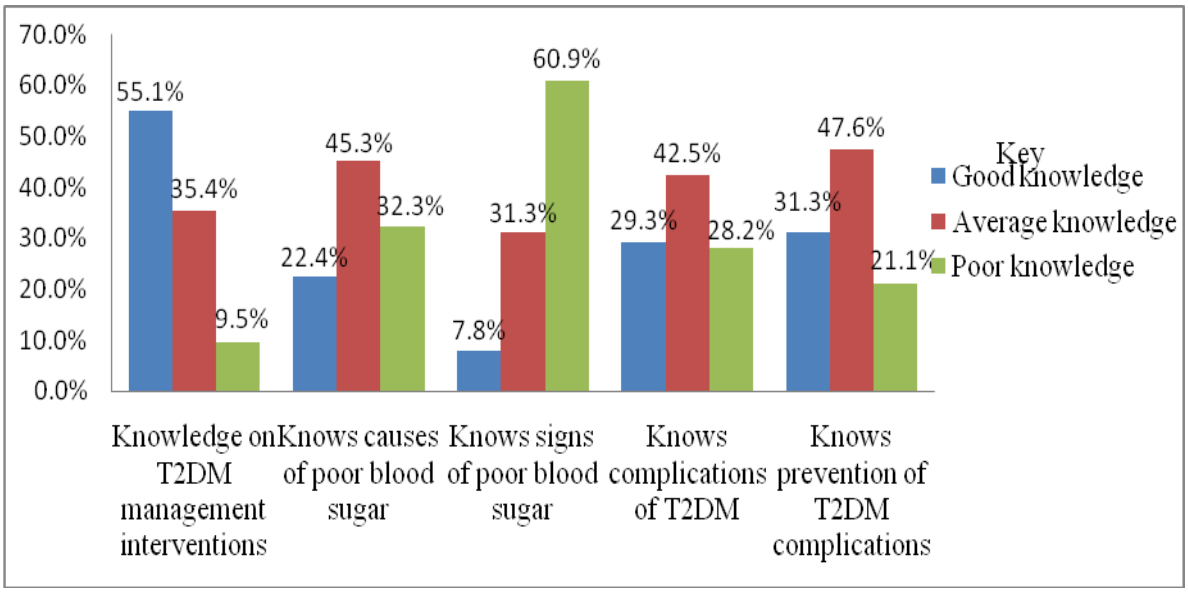

Figure 4 Participants' Level of Knowledge on T2DM Management Interventions

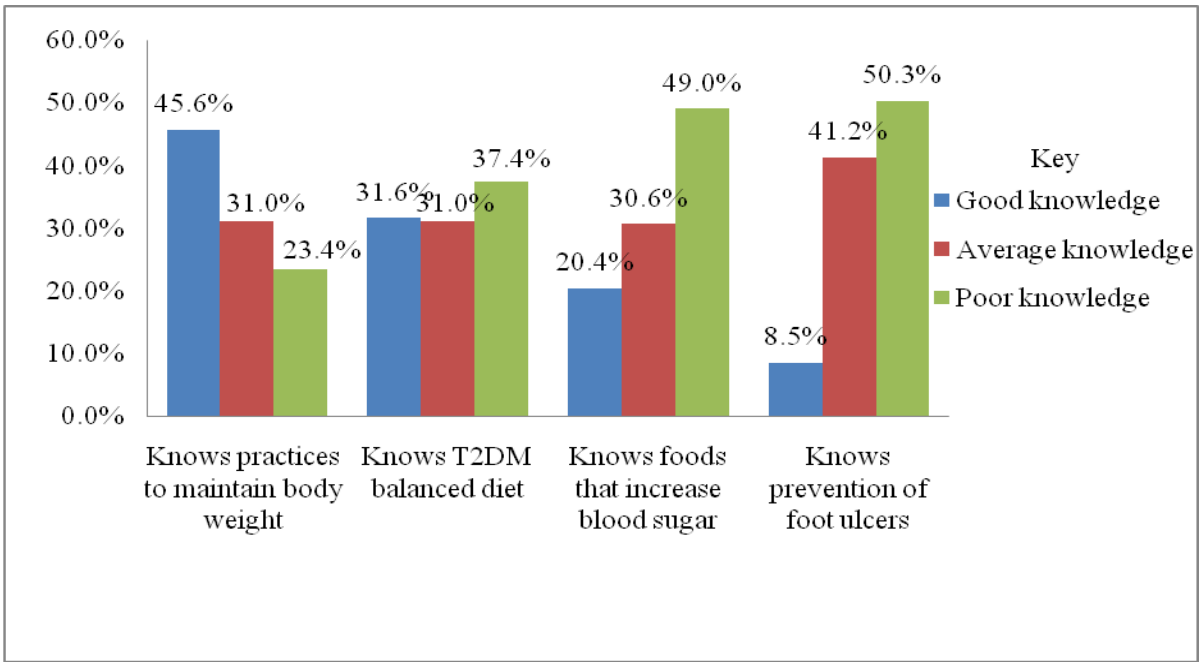

Figure 5 Participants' Knowledge on T2DM Management Interventions

3.3 Practices for Management of T2DM among Study Participants

3.3.1 Practice on Balanced Diet for Diabetics

Figure 6 shows participants' practice on balanced diet for diabetics. A large proportion of the participants (46.6%) had poor practices while the least (20.1%) indicated good practice. This was rated in reference to the diabetic plate outlining balanced diet for diabetics in the recommended nutrient proportions.

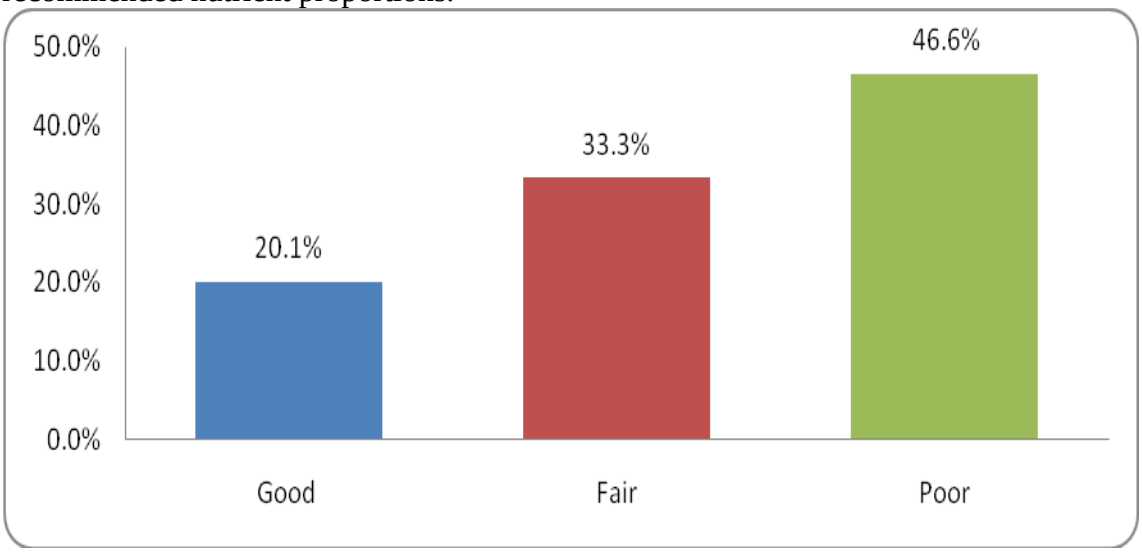

Figure 6 Participants' Practice on Balanced Diet for Diabetics

3.3.2 Duration of Physical Activity/Exercise Session

Figure 7 shows participants' duration of physical activity in a day. Slightly more than half of the participants (56.5%) exercised for at least thirty (30) minutes in a day while one fifth (20.4%) exercised for 0 - 15 minutes daily.

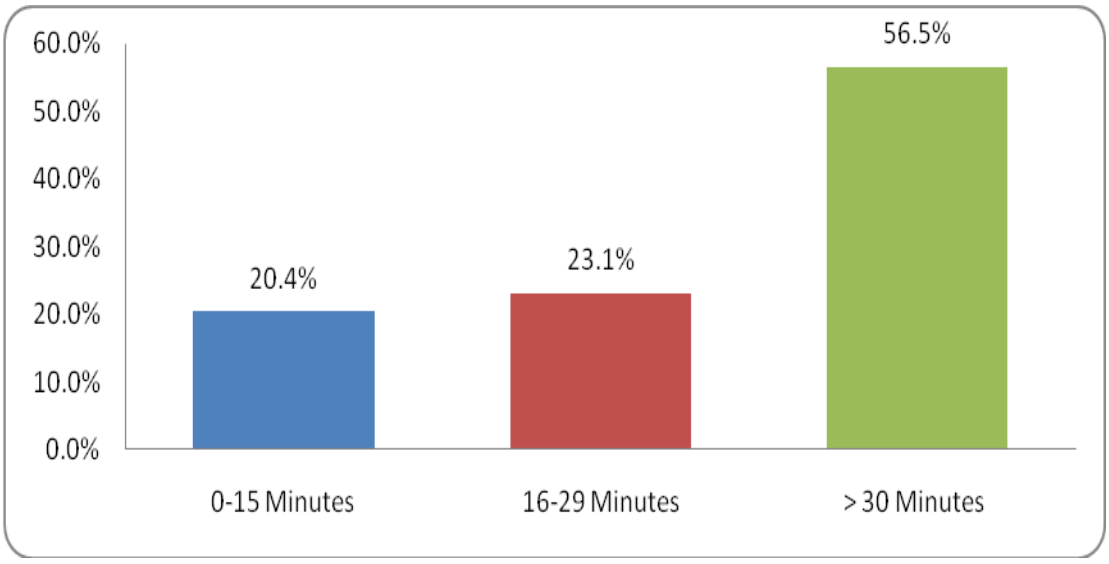

Figure 7 Duration of Physical Activity/Exercise Sessions in a Day

3.3.3 Frequency of Body Weight Monitoring

Figure 8 shows participants' frequency of body weight monitoring. Most of the participants (79.9%), indicated to have been monitoring their body weight once every month while the least (2.4%), monitored once every three (3) months.

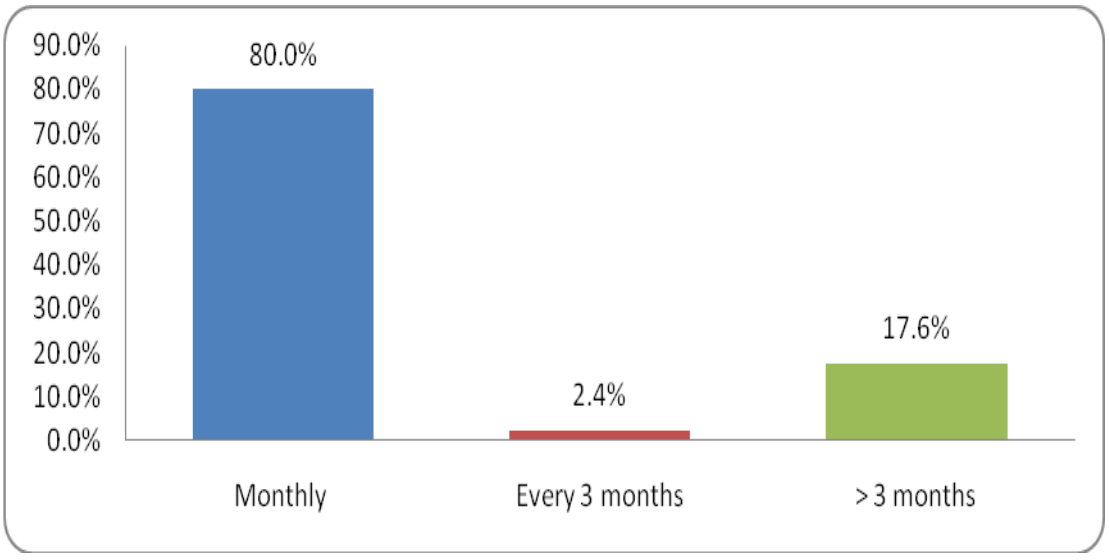

Figure 8 Frequency of Body Weight Monitoring by the Participants

3.3.4 Use of Anti-Diabetic Drugs (Medication Control)

Table 4 shows participants' management of T2DM using drugs. Majority of the study participants (98.3%), indicated to have been on drugs for type 2 diabetes treatment. A large proportion of the participants (70.6%) were on oral medications. Majority of participants (86%), were taking the drugs twice daily. Respondents who were not on medication (1.7%) indicated that they were on diet therapy. Slightly more than half of the participants (56.3%), indicated that they had been on anti-diabetic drugs for a period of between 0 - 5 years.

Table 4 Management of T2DM by use of Drugs

Variable	Category	Frequency (n = 294)	Proportion (%)
Participants on drugs	Yes	289	98.3
	No	5	1.7
	Oral medication	204	70.6
Mode of treatment	Insulin injection	67	23.2
	Combined (orals &injection)	18	6.2
Frequency of taking drugs (daily)	Once	26	9
	Twice	249	86
	Thrice	14	5
	0-5	166	56.3
Years since started on drugs	6-10	59	20.1
	11-15	33	11.1
	16-20	10	3.5
	21-25	17	5.9
	Above 25	9	3.1

3.4 Influence of participants' Socio-Demographic and Economic Characteristics On T2DM Management Practices

Table 5 shows association between respondents' socio-demographic and economic characteristics; and management of T2DM. Socio-demographic and socio-economic characteristics that were found to be significantly associated with management of T2DM were education level **(n = 294, df-3, χ^2 -4.433, *P*- 0.035)** and income level **(n = 294, df-3, χ^2 - 5.999, *P* - 0.006)**

Table 5 Association between Respondents' Socio-Demographic and Economic Characteristics and Management of T2DM

Variable	χ^2 - Value	P- value	No. of valid cases	df
Gender	0.043	0.836	294	1
Marital status	3.131	0.209		2
Education level	4.433	**0.035**		3
Employment status	0.049	0.825		3
Income level	5.991	**0.006**		3

3.4.1 Bivariate Analysis of Good and Poor Management of T2DM

Table 6 shows bivariate analysis results of socio-demographic characteristics of the participants. Participants who had College/ university education were 5.4 times more likely to

practice good management of T2DM **(OR 5.3666 (1.47-19.58), 95% CI, 1.47-19.58, *P*=0.0109)** compared to non-formal, primary, secondary education levels. There was no significant relationship between participants' age, gender and marital status.

Table 6 Bivariate Analysis of Good and Poor Management of T2DM

Variable	Good management (155)	Poor management (139)	OR (95% CI)	P-value
Age - median, (range)	68.00 (IQR=21)	62.00 (IQR=20.00)		
Gender				
Male	62 (40.00%)	57 (41.01%)	Reference	
Female	93 (60.00%)	82 (58.99%)	1.0427 (0.65-1.66)	0.8606
Education level				
Primary	69 (44.52%)	60 (43.17%)	Reference	
Secondary	33 (21.29%)	32 (23.02%)	1.1152 (0.61-2.03)	0.7204
College/university	**14 (10.07%)**	**3 (1.94%)**	**5.3666 (1.47-19.58)**	**0.0109**
Non-formal	50 (32.26%)	33 (23.74%)	0.7590 (0.43-1.33)	0.3340
Marital Status				
Single	9 (5.81%)	11 (7.91%)	Reference	
Married	144 (92.90%)	127 (91.37%)	0.7216 (0.29-1.80)	0.4835
Divorced	2 (1.29%)	1 (0.72%)	0.5337 (0.03-5.28)	0.4933

3.4.2 Bivariate Analysis of Good and Poor Management of T2DM

Table 7 shows bivariate analysis results of socio-economic characteristics of the study participants. Participants who had an income level of between Kshs 5,001-10,000 per month were 2.2 times more likely to practice good management of T2DM **(OR 2.1562 (1.27-3.66), 95% CI, 1.27-3.66, *P* = 0.0044).**

Table 7 Bivariate Analysis of Good and Poor Management of T2DM

Variable	Good management (155)	Poor management (139)	OR (95% CI)	P-value
Employment Status				
Self-employed	118 (76.13%)	96 (69.06)	Reference	
Employed	13 (8.39%)	13 (9.35%)	1.2292 (0.54-2.78)	0.6196
Casual labourer	1 (0.65%)	3 (2.16%)	3.6875 (0.38-36.02)	0.2618
Unemployed	23 (14.84%)	27 (19.42%)	1.44 (0.78-2.68)	0.2448
Monthly income (Kshs)				
0 - 5000	92 (59.35%)	64 (46.04%)	Reference	
5001 -10000	**54 (38.85%)**	**36 (23.23%)**	**2.1562 (1.27-3.66)**	**0.0044**
10001-15000	9 (5.81%)	7 (5.04%)	1.1181 (0.40-3.16)	0.8331
15001 and above	18 (11.61%)	14 (10.07%)	1.1181 (0.52-2.41)	0.7758

4.0 DISCUSSION

4.1 Knowledge on Management Interventions

The findings from this study show that the level of knowledge on the T2DM management interventions among the participants was low. This was also reflected in their knowledge of T2DM management interventions. These findings are similar to those by the Kenya National Diabetes Strategy which indicated that there was a low level of public knowledge about diabetes in Kenya (KNDS, 2010). Majority of the participants did not know foods which increase blood sugar level as they were not able to identify examples of the foods. These findings are similar to those from a study conducted in Mombasa which established that despite listing sugary and starchy foods, many patients were not able to mention many actual examples of these types of foods that increase blood sugar (Dropkin, 2010). This is because having good knowledge on foods which increase blood sugar results in good management of T2DM. Similar findings were reported in a study conducted in South Africa which indicated that proper diabetic diet among diabetics require good knowledge and proper control of the types of nutrients entering their digestive system, and hence allows indirectly, significant control over changes in blood glucose levels (Mollentze, 2012).

Knowledge on signs and symptoms of T2DM among the participants was poor. A large proportion of the participants were not able to identify T2DM related signs and symptoms. This is similar to findings from a study conducted in Sweden which indicated low level of knowledge on signs and symptoms of diabetes among diabetic clients (Trepp et al., 2010).

Level of knowledge on T2DM complications was poor among the study participants. Majority of the participants were not able to identify T2DM complications. These results are similar to those from a study conducted in sub-Saharan Africa which found out that T2DM clients knew one to three of the proven complications and that educating patients about the many complications of diabetes is an important step in motivating them to control their blood sugars (Tuei et al., 2010). This is critical because chronic complications occur in significant proportions of T2DM clients with both early and sub-optimally controlled long-standing T2DM. If left untreated or poorly managed, patients suffering from T2DM are at greater risk

of developing cardiovascular disease, diabetic retinopathy, diabetic neuropathy (resulting in autonomic dysfunction), and potential complications resulting in lower extremity amputation (Mollentze, 2012).

The study indicated low uptake of screening for T2DM in the area as only a small proportion of the participants had been screened for diabetes before they were diagnosed with the condition. The participants reported reasons for not screening including fear of being known to be diabetic, not feeling like they had the condition, lack of information on diabetes screening and lack of awareness about screening services. The participants reported various reasons for screening including doctors' recommendation, media and relatives influence as well as health care providers' initiative at the clinics. Most of participants had not been screened for T2DM due to fear of being diagnosed with the condition and consequently being labelled as diabetic. These findings are similar to those from a study conducted in South Africa which indicated that a large population of T2DM patients had remained undiagnosed because of the lack of early screening and knowledge of symptoms (Mash, 2007). This delayed diagnosis is costly to diabetics since most of clients end up being admitted to hospitals for treatment of complications which could have been averted through early screening (Maina et al., 2011).

The participants' main source of information on diabetes was health talks by health care providers which was mainly accessible at the hospitals. The findings are similar to those by the KDHS which indicated that health education talks done within health facilities is a major source of information only that it targets those with diabetes (KDHS, 2014). The KNDS also reported that health education is central to implementing changes when provided through multiple methods and sites, such as community groups, schools, workplaces, mass media, religious organizations and health centres (KNDS, 2010).

Majority of the participants enrolled into diabetes management program immediately after diagnosis following doctors' recommendation. Participants who delayed enrolment reported that they were not aware about the diabetic management program while others feared being known to be diabetic. These results are similar to those from a study conducted in Canada which established that lack of enrolment and consistent follow up at diabetic management centres was a stumbling block among most diabetics who chose to keep off follow up due to negative perception and fear of disclosure of their diabetic status (Huang et al., 2007).

4.2 Practices for Management of T2DM

A large proportion of the participants knew that T2DM is controllable. However, their responses on practices for control of the condition rated poorly. The participants reported to have been undertaking exercise as they could tolerate with slightly more than half of them reporting to have been exercising for at least thirty (30) minutes daily. These findings are similar to those by Knowler et al., (2002) who established that exercising for thirty (30) minutes daily, (usually by walking), for at least five (5) days a week would alleviate severity of the condition.

Most of the participants monitored their blood sugar level once every month during review clinics. This is not an appropriate approach to monitoring blood sugar because it only gives the patient a short term picture of their control and general blood sugar level. Similar findings are found in a study carried in Canada which established that many T2DM patients check their blood sugar with a glucometer once a month mostly in health facilities while others tested when they experienced symptoms of high blood sugar (Huang et al., 2007).

The use of oral hypoglycemics was the main treatment modality for a large proportion of the study participants. Participants who were not on anti-diabetic drugs indicated that they were on nutritional therapy. The participants were compliant to the treatment regimen and did not report any side effects from the drugs. These findings are similar to those from a study in Armenia which established that the most prevalent form of medication administration for T2DM treatment was oral administration which was tolerable and with minimal or no side effects (Mealey, 2006).

4.3 Influence of Participants' Socio-Demographic Characteristics on Management of T2DM

On the influence of socio-demographic and socio-economic characteristics on management of T2DM, the study established a significant association between education and income levels among the diabetes mellitus clients and management of T2DM. There was no association between age, gender, marital status and employment and management practices for T2DM among the clients. Education and income were significantly associated with management of T2DM. Participants with college and university education were more likely to manage the condition effectively. This finding is dissimilar to those from a study carried out in Qassim which found out that education level had no influence on diabetes management (Ahmad & Rasheed, 2014).

Participants' level of income was also found to be associated with management of T2DM. Higher income level was associated with good management of T2DM including consistent access to health care, and improved access to affordable healthful foods. This was found to be similar to findings from a study carried out in Amman city in Jordan which established that as the diabetic client's annual income increased their management of diabetes was better as they were able to afford new methods of diabetes self-management (Mezyed & Yahya, 2013).

5.0 CONCLUSIONS

The study revealed low level of knowledge on T2DM management interventions among the participants. Most of them did not know the causes of poor blood sugar level, signs of poor blood sugar control, T2DM healthy dietary measures and measures prevention of T2DM complications. The major source of information on diabetes mellitus among the participants was health care facilities.

Practices applied in management of T2DM amongst the participants included anti-diabetic drugs, balanced diet for diabetics, tolerable physical activity/exercise and monthly body weight monitoring which were fairly undertaken leaving out self blood glucose monitoring.

Participants' levels of education and income were found to be significantly associated with management of T2DM. Participants with College/university education and higher income level practiced good management of T2DM.

6.0 RECOMMENDATIONS

i. The national and Nyandarua County government's Department of Health to improve on creation of awareness on T2DM management interventions and diversify the media so as to reach most people. This should be standardized across the health

facilities in order to improve the level of knowledge on management interventions for T2DM among diabetic clients.

ii. The County's Department of Health to organize for health education sessions on practices for management of T2DM in the County through community outreach programs and barazas. This will empower T2DM clients to understand and effectively apply the practices for good management of T2DM.

iii. The County Department of Education to plan for academic seminars through which to create awareness on the importance of formal education because a higher level of education significantly influences the management of T2DM.

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