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Research Article

Management of Type 2 Diabetes at Vihiga County referral hospital, Kenya: compliance with guidelines and prevalence of complications

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Background: In 2013, 382 million people suffered from diabetes globally, with 19.8 million in Africa and a Kenyan prevalence of 4.2%. Poor diabetic related outcomes such as complications, high blood sugar levels have resulted due to inadequate management of the condition. To ensure effective diagnosis, management and monitoring of Type 2 diabetic patients, the healthcare team should adopt and adhere to standard treatment guidelines that are valid and up-to date

Objective: To assess the management, monitoring and complications of Type 2 diabetes among adult outpatients at Vihiga County Referral Hospital, Kenya.

Methodology: A retrospective cross sectional study design was used to obtain data from 212 patient files selected through a systematic random sampling. Using a pre-designed data collection form, data on patient demographics, blood pressure, blood sugar, weight and complications was collected. Descriptive statistics were used to summarize findings to determine the proportion of adult Type 2 diabetic cases diagnosed, managed and monitored as per the Institute of Clinical Systems Improvement (ICSI) guidelines. Inferential analysis using t-test and chi square test were also carried out to ascertain extent of adherence to the guidelines.

Results: Majority of the participants (31.1%) were aged 50 – 59 years (31.1%), and most were female (70.3%). Most, 39.6% had had diabetes for 1 to 5 years. Random blood sugar test was the most used method of diagnosis (58.5%) whilst fasting blood glucose test was performed in 34%. A compliance rate of 72.2% was reported in ensuring metformin was part of first line therapy as recommended. The recommended blood pressure, weight and cholesterol monitoring at initiation of treatment was observed in 96.7, 1.4 and 6.1% of the patients, respectively. Of the 141 patients monitored using fasting blood sugar, 113 (80.1%) had uncontrolled blood sugar levels (median blood sugar = 8.9(IQR.7.4, 12.75) mmol/L; P=0.741). The prevalence of reported neuropathy, retinopathy and nephropathy were 41, 33 and 0.9% respectively.

Discussion: The diagnosis, management and monitoring of most patients fell short of the ICSI treatment guideline recommendations especially to monitoring of blood sugar, lipid levels and weight. The presence of anomalies calls for sensitization of healthcare workers on the importance of adoption and adherence to evidence based, up to date treatment guidelines and optimize patient health outcomes.

Key words: Type 2 diabetes, treatment guidelines, healthcare providers

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1. Introduction

In 2013, almost 382 million people suffered from diabetes indicating globally a prevalence of 8.3%. An approximate 19.8 million adults in the Africa had diabetes, an equivalent prevalence of 4.9% (Aguiree et al, 2013). The epidemiology of diabetes in Kenya has not been studied to any great extent but an opportunity sample of an urban and rural population reported a non-age adjusted prevalence of 4.2% in 2013 (Ayah et al, 2013).

Diabetics should receive medical attention from a joint, integrated team of health practitioners with proficiency in diabetes. Treatment goals and plans should be identified and all patient factors, desires and wellbeing taken into consideration (American Diabetes Association, 2015). In management of Diabetes Mellitus, it is important that health practitioners use evidence-based, clear, valid treatment guidelines (Woolf et al, 1999).

The Institute for Clinical Systems Improvement (ICSI) Healthcare guideline for Diagnosis and Management of Type 2 Diabetes Mellitus (Redmon et al, 2014), supplemented by The Kenya National Clinical Guidelines for Management of Diabetes Mellitus (2009), were used in this study to benchmark the diagnosis, management and monitoring of Type 2 Diabetes patients in the study area.

As per the ICSI recommendations, diagnosis of type 2 diabetes should be through the use of either an A1c (glycated haemoglobin) test with a threshold ≥ 6.5%, Fasting blood Glucose(FBG) ≥ 126 mg/dL or a two-hour plasma glucose ≥ 200 mg/dL on a 75g Oral Glucose Tolerance Test(OGTT) (Redmon et al, 2014). The Kenyan Guidelines recommend that a patient with symptoms of hyperglycemia and casual plasma glucose or random blood sugar (RBS) ≥200 mg/dL (≥ 11.1 mmol/L) should be diagnosed as diabetic.

For management and monitoring, a clinician should personalize goals with patients to achieve glycemic control depending on individual patient factors. Allowing for normal variation in test accuracy, HbA1c results which range between 6.5 and 7.5% or 4.0–6.7 mmol/L fasting blood glucose and 8–10 mmol/L postprandial blood glucose would reflect this goal (Redmon et al, 2014). When hypertension is identified, it should be aggressively treated to achieve target blood pressure levels of less than 140/90 mmHg (Redmon et al, 2014).

Diabetes complications occur as result of the injurious effects of hyperglycemia, and include macrovascular complications (coronary artery disease, peripheral arterial disease, and stroke) and microvascular complications (diabetic nephropathy, neuropathy, and retinopathy) (Fowler, 2008). Studies elsewhere report varied prevalences of these diabetic complications (Litwak et al, 2013).

The incidence of diabetes is increasing in Kenya (Ayah et al, 2013), and poor diabetic related outcomes have perhaps contributed to inappropriate management of the condition. There are few studies on compliance to Type 2 diabetes treatment guidelines in our setting therefore this study intended to address this knowledge gap. The main objective of this study was therefore to assess the management, monitoring and complications of Type 2 diabetes among adult outpatients at Vihiga County Referral Hospital, Kenya.

2. Methods

2.1 Study site

The study site was Vihiga County Referral Hospital, the largest public hospital in Vihiga County that has a bed capacity of 160 beds. The hospital is situated in a rural set up and no such study has been previously carried out in a rural set up in Kenya. According to Kenya County Data Sheets 2014, the county has an adult population of approximately 246,000 persons.

2.2 Study design and population

A retrospective cross sectional study design was used, whereby the 212 patient files for adult patients aged ≥18years with Type 2 diabetes as the primary diagnosis and who attended routine medical outpatient clinic between January and June 2015 were included in the study.

2.3 Data collection

The sampled files were retrieved and data on the variables and outcomes of interest extracted. The data collected was entered into a predesigned data collection form. The primary outcome of interest was the cases diagnosed and managed in accordance with ICSI treatment guidelines. The independent variables included age, gender, duration of disease, methods of diagnosis, prescribed diabetes drug therapy and diabetes associated complications. Achievement of the standard treatment targets was determined during analysis.

2.4 Data analysis

The collected data was entered to IBM^R SPSS^R Statistics version 22 and summarised using descriptive statistics to determine the proportion of adult Type 2 diabetic cases diagnosed, managed and monitored as per the Institute of Clinical Systems Improvement (ICSI) guidelines. Inferential analysis using t-test and chi square test were then carried out to ascertain extent of adherence to the ICSI guidelines.

2.5 Ethical considerations

Ethical approval was sought and obtained from the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee (Ref: **P641/10/2015**)

Patient records were anonymised and any patient identifiers removed to assure confidentiality of patient information.

3. Results

From the 212 patient files that were retrieved majority of the participants were between ages 50 and 79 years

with females being most affected (70.3) as shown in **Table 1**. Most reported duration of illness was for less than 5 years.

Table 1: Distribution of patients as per the Age and duration of illness (n=212)

Demographics	n	%
Age(years)		
20 - 29	4	1.9
30 - 39	7	3.3
40 - 49	23	10.8
50 - 59	66	31.1
60 - 69	63	29.7
70 - 79	41	19.3
≥80 years	8	3.8
Duration of Illness(years)		
≤5	84	39.6
6 - 10	16	7.5
11 - 15	12	5.7
16 - 20	1	.5
≥21	2	.9
Not indicated	97	45.8

A greater majority had their illness diagnosed by a medical officer (48.1%) while medical officers on internship diagnosed 22.2% of the patients. Only 1 of the respondents had their condition diagnosed by a Registered Clinical Officer.

Measurements of RBS was the most used method of diagnosis with 58.5% of the patients having been diagnosed using this method while FBG test was used in 34% of the respondents. Only 1% of the patients were diagnosed using HbA1c tests while 6.5% patients lacked details on method of diagnosis.

Newly diagnosed diabetic patients initiated on Metformin either on monotherapy or dual therapy constituted 15% and 56% respectively as shown in **Figure 1**.

Based on the patient records, almost all the patients (96.7%) had their blood pressure checked at initiation of treatment while only 6.1% of the patients had cholesterol levels checked and even fewer (1.4%) had weight measurements taken.

The ICSI treatment guidelines recommend that patients on follow up have blood sugar levels monitored using Hb1Ac or FBG (Redmon et al, 2014). The HbA1c level should be maintained at <7% whereas FBG should be maintained in 4.4-7.0 mmol/L range. The use of RBS is not explicitly recommended for monitoring of blood sugar levels. A majority of the patients (66.5%) had their blood sugar monitored using the FBG test compared to RBS test (31.6%); none were monitored using Hb1Ac. Some 1.9% of patients' records had no details on blood sugar monitoring.

Of the patients who had their blood sugar monitored using the FBG, 80% did not have their blood sugars controlled adequately as per the guidelines. The guidelines indicate that the blood sugars should be maintained below 7mmol/L. The median blood sugar for the participants tested with FBG was compared against the threshold value (7 mmol/L) to find out if they were significantly higher than this recommended threshold. The independent sample Mann Whitney result showed the median blood sugar was not significantly higher than the target threshold of 7mmol/L (p=741).

Blood pressure monitoring on follow-up was available for all patients with an overall mean systolic blood pressure of 139.56±20.94mmHg and mean diastolic blood pressure of 79.81±11.03mmHg during this follow up period.

Amongst the patients, 188 (97.2%) had hypertension as comorbidity at initiation of antidiabetic treatment, and were therefore also put on antihypertensive treatment. About 52.3% of known hypertensive patients had maintenance blood pressures exceeding the recommended threshold. The ICSI guidelines recommend that hypertensive patients with type 2 diabetes should be initiated on antihypertensive treatment and treat to a goal of < 140/90 mmHg.

The compliance status profile for blood pressures levels for both systolic and diastolic is shown in **Table 2**.

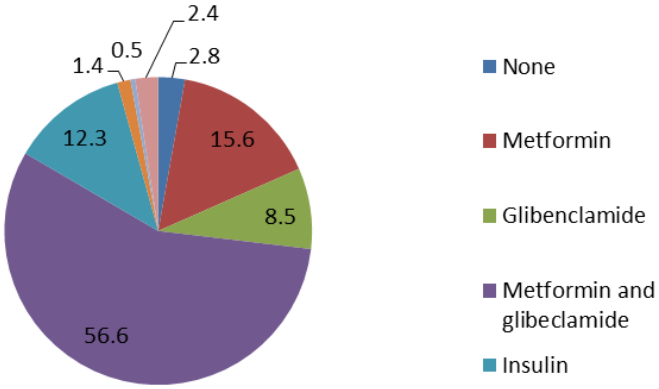

Figure 1. Drugs administered at initiation

Table 2: Compliance status for blood pressure control (n=212)

Compliance status	n	%
Compliant		
Systolic ≤ 140mmHg	96	51.1
Diastolic ≤ 90mmHg	162	86.2
Non-compliant		
Systolic > 140mmHg, compliant diastolic	73	38.8
Diastolic > 90 mmHg, compliant systolic	8	4.3
Systolic > 140mmHg and Diastolic > 90 mmHg	19	10.1

The mean systolic blood pressure of 156.54± 13.05 mmHg in hypertensive patients with their maintenance systolic pressure above 140mmHg (48.9%) was found to be significantly higher than the target maximum value of 140mmHg ($p<0.001$).

Similarly, the mean diastolic blood pressure of 95.77±4.1 mmHg (13.8%), was found to be significantly higher than the target maximum value of 90mmHg ($p<0.001$).

Upon follow up, only 6 (2.8%) of the patients had their cholesterol levels checked and recorded. None of the patients had their weight nor BMI recorded.

The most common complication experienced by the patients was neuropathy (41%) followed by retinopathy (33%). The least recorded complication was nephropathy in only 0.9% of the patients which could be due to under-reporting as there were no records on requests for renal function tests.

4.0 Discussion

This study reports that patients were diagnosed according to the recommendation of the ISCI treatment guidelines with regards to the diagnostic methods used in testing for blood glucose levels which was a positive impact on practise by clinicians. The most commonly used methods of diagnosis were RBS and FBG compared to HbA1c. This is despite the fact that HbA1c is most prefered test as it measures chronic glucose exposure over a two- to three-month period and is less influenced by internal factors including stress and/or illness compared to FPG, OGTT or RBS (Redmon et al, 2014). None-use of HbA1c can be attributed to unavailability of technical resources (laboratory testing materials and equipment) and inadequate financial resources necessary to support this as a primary diagnostic procedure at the facility (The Kenya National Clinical Guidelines for Diabetes Mellitus, 2010). A study on laboratory medicine in Africa indicated that allocation of resources to diagnostic laboratory testing has not been a priority for resource-limited health care systems (Petti et al, 2006).

When an individual's glycaemic targets are not met by the combination of dietary modifications and physical activity, it is then recommended that oral pharmacotherapy be indicated with metformin as part of the initiation treatment (The Kenya National Clinical Guidelines for Diabetes Mellitus, 2010). This study reports a compliance of 72% to the ICSI guidelines with regards to first line therapy use of metformin, though there is much room for improvement. This finding is comparable to another study that reported a non-adherence rate of 39.7% (Farsaei et al, 2010).

In this study, almost all the patients had their blood pressure levels checked at diagnosis of their type 2 diabetes, and almost all of them (89%) were hypertensive. These findings are consistent with other studies that report diabetes and hypertension comorbidity in approximately 40 to 60% of patients with type 2 diabetes and Diabetics had a 1.5 – 3 times increased prevalence of hypertension compared to non-diabetics, with 50% of adults with diabetes having hypertension at the time of diagnosis (Palacio et al, 2007).

In this study, monitoring of weight and BMI was rarely done contrary to the recommendation by the ICSI treatment guidelines. Literature suggests that over 70% of the people with Type 2 diabetes are either overweight or obese (WHO Screening for Type 2 Diabetes, 2003). Due to this inconsistency in taking weight measurements, it was not clear what proportions of patients were overweight or obese. For those patients with some degree of dyslipidaemia, the risk of coronary artery disease and other macro-vascular disorders is 2 to 5 times higher in people with diabetes than in non-diabetic subjects (Colagiuri et al, 2004). Measurement of fasting lipids including total cholesterol, triglycerides and High Density Lipoprotein and Low Density Lipoprotein should be done annually if lipids are normal whilst if abnormal or on treatment, every 3-6 months. Over the study period, it was noted that very few patients had their lipid profile tested. The data obtained was not sufficient enough to ascertain extent of dyslipidaemia amongst the patients. A study by Krauss and Siri reported that the profile of cholesterol levels is important in people with type 2 diabetes as it reflects atherogenic dyslipidemia characterised by small LDL-C and low HDL-C (Krauss and Siri, 2004).

The ICSI treatment guidelines recommend HbA1c, FBG and post prandial glucose tests as ideal methods of monitoring glycaemic control. On contrary, not all patients had their blood glucose levels monitored as per recommendation as almost 32% of the patients were monitored using RBS test that is only recommended for purposes of diagnosis. In this study, RBS might have been used as an alternative monitoring test rather than FBG because the patients had probably taken a meal during the fasting period of six to eight hours required

before performing FBG test. For the 67% of patients who were tested with FBG test on follow up, 80% did not have their blood sugar levels controlled adequately. The benefits of achieving near-normal glycaemic control lowers risk of diabetes micro-vascular complications (Diabetes Trial Research group. 1995).

The prevalence of neuropathy (41%) and retinopathy (33%) microvascular complications are comparable to that of a study done in Malawi that showed the prevalences of (46.4%) and (34.7%) respectively and nephropathy at 34.7% (Msyamboza et al, 2014). The prevalence of retinopathy, neuropathy, and nephropathy observed in this study may have either been due to variation in methods of clinical care practised in this facility or inadequate diagnostic criteria for verifying presence of complications.

A major limitation of this study could be the poor quality of documentation of patient characteristics and clinical findings in kept records, which may have resulted in under reporting (or over-reporting) of treatment target indicators and presence of severe complications associated with diabetes.

5.0 Conclusion

Majority of type 2 diabetes patients do not receive the right care at the right time because healthcare providers do not follow the clinical guidelines in the execution of type 2 diabetes patient care. Absence of diabetic specific outpatient booklet that prescribes key patient indicators that should be captured at every clinic visit has resulted in enormous missing information that could help in monitoring the individual patient progress. Healthcare providers should therefore either be re-oriented or trained on the importance, adherence and use of diabetes clinical treatment guidelines to optimise patients' health outcomes.

Conflict of Interest declaration

The authors declare no conflict of interest.

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