An assessment of quality of care among diabetic adult patients as a guide towards optimum care requirements, a cross sectional study among five health facilities in Kenya

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Abstract

Background: Diabetes is a major public health problem with an estimated global prevalence of 9.3% (463 million people) by 2019 and a projection of 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045 (WHO 2013). Majority of diabetes mortality occurs in low and middle income countries where approximately 80% of people with diabetes live. Diabetes care is expensive and exerts a big economic burden on patients, their families, health systems and the society as a whole. Hence great need to evaluate indicators for a successful service delivery system. The objective of this study was to assess the diabetic care indicators and the associated factors among diabetic patients as a guide towards optimum care requirements.

Methods: A cross sectional survey was conducted among diabetic patients receiving care from five health centres in Makandara sub-county between August and November 2019. Pre-tested questionnaires were used to collect the socio-demographic and quality of care data. The recruitment of the participants was done using the consecutive systematic sampling plan among the patients seeking care in the diabetic clinics and statistical analysis of data performed using excel and STATA.

Results: A total of 201 diabetic patients (Male-57, Female-144) aged 18 years-93 years were interviewed. Study findings indicated that all (100%) of the facilities had clinical officers and nurses to offer quality care services but 40% of them lacked trained pharmaceutical technicians and 20% of them lacked trained laboratory technologists. Four out of five facilities had the clinical officers trained on diabetes care standards. On process of care indicators study results indicated that blood pressure and urinalysis were performed in 100% and 96.5% respectively of the patients while serum creatinine, serum lipid profiles and dilated eye examination were reported at a prevalence of 7.5%, 4.5% and 0.5% respectively. Health education was also a common practice in all the facilities which involved nutritional advice, diabetes education and exercise counselling. On diabetes management pharmacologic approach using oral hypoglycaemias was the most used method at 87%, followed by insulin at 13% and oral Insulin at 1% prevalence. On outcome of care indicators 58% of the patients had their systolic pressure below 140 mm/Hg with the overall mean of systolic blood pressure in the five facilities being 135.8 while 89% of the patients had their diastolic blood pressure below 90 mm/Hg with the overall mean in the five facilities being 78.2 mm/Hg.

Conclusion: Majority of the health facilities had trained clinical officers and nurses with considerable training on diabetes management. However, lack of trained pharmaceutical technicians and laboratory technologists was hampering the quality of care given.

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Keywords: Insulin delivery; Wearable system; Closed Loop; Embedded platform

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Introduction

Diabetes is a major public health problem with an estimated global prevalence of 9.3% (463 million people) by 2019 and a projection of 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045 (WHO 2013). Majority of diabetes mortality occurs in low and middle income countries where approximately 80% of people with diabetes live. Diabetes care is expensive and exerts a big economic burden on patients, their families, health systems and the society as a whole. Hence great need to evaluate indicators for a successful service delivery system.

Studies performed in diverse settings, including community health centres, consistently indicate that many physicians are not providing key processes of care to their diabetes patients. Some studies done in New York, USA, and Ethiopia found that the quality of care differed significantly across community health centres, and between referral hospitals and health centres. The community health centres met quality of care standards at relatively low rates compared with ideals and adherence to quality standards varied widely across community health centres. Comparative benchmarking was recommended as a possible intervention to help community health centres learn the best practices from other community health centres performing well for given quality measures.[1]

Effective utilization of multidisciplinary approach can reduce clinical and economic burden associated with diabetes through decreased risk of macro and micro vascular complications due to hypo/hyperglycemia.[2] Medical care for diabetes requires different types of healthcare providers to aggressively manage associated risk factors, including blood pressure and lipid disturbances, alongside on-going patient self-management.[3] Studies have identified self-monitoring of blood glucose as key to quality diabetes care, and concluded that self-monitoring of blood glucose for diabetes patients is a fundamental component for quality of care.[4-6] The clinical benefits of this multidisci-

plinary approach have been demonstrated in randomized trials of diabetics who registered reduced rates of micro vascular complications and other key cardiovascular endpoints, over the long term.[7]

The objective of this study was to assess the diabetic care indicators and the associated factors among diabetic patients as a guide towards optimum care requirements.

Methods

Setting

The study was conducted in five public health facilities in Makadara sub-County Nairobi which serves around 204,000 of the population.

Participants

The study participants were the diabetic patients aged 18 years-93 years, attending the five health facilities in Makadara Sub-County in the months of August to November 2021 where the quality of diabetic care to patients was considerably poor. Risks and benefits of the study were well explained to each of the participant before they consented in writing. Those who consented to participate in the study were issued with the pre-tested questionnaires to seek information on their basic demographic data, structural care indicators, process of care indicators and outcome of care indicators as a tool to ascertain optimum care requirement. This study was carried under strict follow up of guidelines and regulations by FHI 360.

Sampling

The random sampling method was used to choose files of diabetic patients attending the health facilities. This involved randomly selecting 3 files from a batch of 10 files using randomly generated numbers. Interviews for recruitment of the participants were performed upon exit after they were through with the healthcare provider to avoid interfering with the normal running of the clinic.

Data collection

Pre-tested questionnaires in English or Kiswahili were used for data collection among the sampled participant. Those that could read and write filled the questionnaires by themselves but those that could not had them filled in an interview format using the language preferred by each participant. Check list was also used to collect structural indicators from each of the five health facilities.

Statistical analysis

Data was entered using Microsoft Access (Microsoft Corporation, Redmond, Washington) and statistical analysis performed using SPSS version 16.0. We present odds ratios (OR), and 95% Confidence Interval (CI) for factors associated with quality of diabetic care indicators as a tool towards acquiring optimum diabetic care.

Structural indicators of diabetes care were indicators beyond patient and caretakers associated with quality of care. The commonly identified included material resources in the management of diabetes involving the available health care personnel, facilities, equipment and organizational characteristics done by assessing the available personnel and their training; available basic equipment and supportive drugs and supplies in the five health care facilities.

Process of care indicators were indicators on the entire process of care support to the diabetic patients involving diagnosis process and the diabetic management process. Diagnosis process indicators involved assessment of blood pressure, urinalysis and fasting lipid profiles. Diabetic management involved assessing indicators on pharmacologic approach and no pharmacologic approach.

Outcome of care indicators were assessed by checking various labels of specific parameters after diabetic treatment which included blood pressure, BMI and Glycaemic control Fasting blood glucose levels.

Results

Staffs in the 5 facilities were almost evenly distributed based on the patient workload. Facilities with higher proportion of nurses offered 24 hour maternity services. None of the facilities had a medical officer although one of the facilities had twice as many clinical officers than other facilities. 80% of the facilities had laboratory technologists and 60% of them had one pharmaceutical technologist (Table 1).

Table 1: *Human Resource in the Five Facilities*

Staffs	Makadara	Jericho	Lungalunga	Bahati	Kaloleni	Total
Clinical officers	3	7	2	4	3	19
Nurses	25	14	9	23	5	76
Laboratory Technologists	3	4	3	3	0	13
Pharmacy Technologists	1	1	0	0	1	3
Medical officers	0	0	0	0	0	0

Over half of clinical officers in four facilities had attained diabetic training and only one of the facilities had none of its clinical officers trained. However only one health facility had 8% of its nurses trained on diabetic management (Table 2).

Table 2: *Staff Training On Diabetic Care*

Staffs trained in diabetes care	Makadara	Jericho	Lungalunga	Bahati	Kaloleni	Total
Total number	cil	cil	cil	cil	cil	cil
Clinical officers	3	7	2	4	3	19
Total number Nurses	25	14	9	23	5	76
Clinical officers trained	2(66.7%}	4 (57.1%)	1(50%)	2 (50%)	0 (0%)	9 (47.4%)
Nurses trained	2 (8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (2.6%)

All facilities had a weight scale and a height scale but only 2 (40%) of the facilities had a BMI calculator. Glucometers were available in all facilities but reported stock out of glucose strips, basic oral hypoglycaemic and antihypertensive drugs at the time of the survey. Eye examination equipment like ophthalmoscope and smeller's chart were unavailable implying compromise on delivery of this care (Table 3).

The study reported common diabetes management procedures as BP measurement (100%); Urinalysis (97%) and weight and height measurement at 84%. Dilated eye examination was reported in only one facility by 2% of its patients interviewed (Table 4).

The commonly used treatment among the patients was Oral hypoglycaemias (87%) and Insulin (12%). About 2% of the patients were on combinations of both Insulin and oral hypoglycaemias (Table 5).

The most reported diabetes associated complications was hypertension (55%) followed by neuropathy (38%) and vision loss (38%). Significantly higher rates of erectile dysfunction were reported at different prevalence across the facilities (Table 6).

Capillary blood sugar was high in two of the facilities Lunga lunga at 11.95 and and Kaloleni at 12.67. Blood pressure was well controlled across the five facilities (Table 7).

Generally, there was nearly 100% dissatisfaction in all the five facilities in terms of drug availability (Table 8).

Table 3: *Facilities Equipment & Materials*

Item	Makadara	Jericho	Lungalunga	Bahati	Kaloleni	Total
Examination couch	1	1	1	1	1	5(100%)
Fridge for insulin	1	1	1	1	0	4(80%)
Tape measure	1	0	1	1	0	3(60%)
Weight scale	1	1	1	1	1	5(100%)
Sphygmomanometer	1	1	1	1	1	5(100%)
Height Measure	1	1	1	1	1	5(100%)
Microfilament	0	0	0	0	0	0(0%)
Glucometer	1	1	1	1	1	5(100%)
Glucose Strips	0	0	0	0	0	0(0%)
Guidelines	1	1	0	0	0	2(40%)
Patient Registers	1	1	1	1	1	5(100%)

Ophthalmo-scope	0	0	0	0	0	0(0%)
BMI calculator	0	0	1	1	0	2(40%)
Smeller's chart	0	0	0	0	0	0(0%)
Oral hypogly-caemics	0	0	0	0	0	0(0%)
Antihyperten-sive	0	0	0	0	0	0(0%)
Biochemistry Analyzer	0	0	0	0	0	0(0%)
Urine strips	1	1	1	1	0	4(80%)
Access to Nu-tritionist	1	1	1	1	1	5(100%)
Diabetes Edu-cation	1	1	1	1	1	5(100%)
Eye examina-tion	0	0	0	0	0	0(0%)
Feet examina-tion	1	1	1	0	0	3(60%)

Table 4: *Diabetic Management Procedures*

Procedure	BAHATI (N=32)	JERICHO (N=46)	MAKADARA (N=53)	LUNGA LUN-GA (N=61)	KALOLENI (N=9)	Total (N=201)
DILATED EYE EXAMINA-TION	0.0%	0.0%	0.0%	0.0%	1.6%	.5%
BP MEA-SUREMENT	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
HEIGHT ME-SUREMENT	0.0%	100.0%	96.2%	100.0%	100.0%	83.1%
BODY WEIGHT MEASURE-MENT	3.1%	100.0%	98.1%	100.0%	100.0%	84.1%
URINALYSIS	100.0%	100.0%	98.1%	100.0%	90.2%	96.5%
SERUM CRE-ATININE	0.0%	4.3%	3.8%	11.1%	16.4%	7.5%
SERUM LIPID PROFILE	0.0%	2.2%	1.9%	11.1%	9.8%	4.5%

Table 5: *Diabetic Treatment Procedures*

Pharmaco-logic	Bahati (N=32)	Jericho (N=46)	Makadara (N=53)	Lunga-Lunga (N=61)	Kaloleni (N=9)	Total (N=201)	CHISQ	P-Value
Oral hypo-glycaemics	81.3%	87.0%	90.6%	85.2%	88.9%	86.6%	5.26	0.729
Insulin	18.8%	10.9%	9.4%	14.8%	11.1%	12.9%	DF=8	
Oral+Inu-lin	6.3%	2.2%	0.0%	0.0%	0.0%	0.5%		
Non phar-macologic							8.08	0.779

Dietary Advice	28.1%	34.8%	45.3%	36.1%	44.4%	37.3%	DF=12	
Weight reduction	15.6%	17.4%	7.5%	14.8%	22.2%	13.9%		
Physical exercise	0.0%	0.0%	1.9%	0.0%	0.0%	0.5%		
All above	56.3%	47.8%	45.3%	49.2%	33.3%	48.3%		
Glucose monitoring								
Home monitoring	15.6%	26.1%	28.3%	24.6%	44.4%	25.4%	3.607	0.462
Glucom-eter	15.6%	26.1%	28.3%	23.0%	44.4%	24.9%	6.065	8.64
Uristix	0.0%	0.0%	0.0%	1.6%	0.0%	0.5%		
Both	84.4%	73.9%	71.7%	75.4%	55.6%	74.6%		

Table 6: *Diabetic Related Complications*

Complica-tion	Bahati (N=32)	Jericho (N=46)	Makadara (N=53)	Lunga-Lunga (N=61)	Kaloleni (N=9)	Total (N=201)	CHISQ	P-Value
Hyperten-sion	46.9%	54.3%	56.6%	55.7%	66.7%	54.7%	1.417a	0.841
Heart Dis-ease	3.1%	0.0%	3.8%	3.3%	0.0%	2.5%	4.518a	0.104
Vision loss	46.9%	37.0%	35.8%	36.1%	33.3%	37.8%	3.931a	0.863
Neuropa-thy	25.0%	45.7%	34.0%	42.6%	44.4%	38.3%	9.073a	0.336
Foot com-plication	15.6%	30.4%	22.6%	9.8%	0.0%	18.4%	16.129a	0.041
Nephrop-athy	0.0%	10.9%	3.8%	4.9%	0.0%	5.0%	17.474a	0.026
Erectile dysfunc-tion	3.1%	10.9%	3.8%	9.8%	22.2%	8.0%	168.142a	0.000

Table 7: *Glycaemic Control-Fasting Blood Glucose Levels & The Blood Pressure*

Facility	Patient Age	Capillary blood glucose (mm/L)	Blood pressure systolic	blood pressure diastolic	ole
Bahati	Mean	54.25	10.25	134.00	74.66
	Std. Deviation	13.842	4.879	20.053	10.465
Jericho	Mean	56.17	10.67	138.96	79.87
	Std. Deviation	15.031	4.110	23.176	9.754
Makadara	Mean	54.32	9.70	135.77	77.85
	Std. Deviation	14.219	3.635	17.984	11.084
Lunga lunga	Mean	49.84	11.95	132.39	79.07
	Std. Deviation	12.603	4.938	17.194	11.319
Kaloleni	Mean	62.00	12.67	139.11	77.67
	Std. Deviation	9.314	4.153	13.308	6.782

	Mean	53.72	10.83	135.34	78.16
Total	N	201	201	201	201
	Std. Deviation	13.908	4.457	19.227	10.655

Table 8: *Level of Satisfaction with Drug Availability*

satisfaction with availability of drugs by facility	Bahati (N=32)	Jericho (N=46)	Makadara (N=53)	Lunga lunga (N=61)	Kaloleni (N=9)	Total (N=201)	P-Value
Somewhat satisfied	0.0%	0.0%	0.0%	1.6%	0.0%	.5%	0.000
Somewhat dissatisfied	0.0%	58.7%	54.7%	32.8%	11.1%	38.3%	
Very dissatisfied	100.0%	41.3%	45.3%	65.6%	88.9%	61.2%	

Discussion

Study findings indicated lack of trained pharmaceutical technicians and trained laboratory technologists depicting low health care workforce as a requirement for successful fight against diabetes as supported by Nam et al who reported poor accounting of factors beyond patients and their physicians related to the health care system in a clinic, such as under staffing, health worker turnover, as well as system fragmentation leading to lack of a collaborative diabetes team with the skills necessary for effective management.[8]

The study reported over 50% in four of the health facilities with clinical officers trained on diabetes care standards. This was in support of other studies that recommended health providers to adhere to the recommended care standards since they are necessary for quality diabetes care.[9,10] Good training of the personnel is also a pre-requisite for good diabetic care including diagnosis and treatment of diabetes together with associated complications as supported by Beran and Yudikin studies.[11]

The study findings indicated shortage of instrumentations like BMI calculator, ophthalmoscope and smeller's chart. This limited availability of BMI calculator and an ophthalmoscope was also reported in earlier studies in different settings who reported low levels of annual eye and foot, examinations as an indication of poor quality of care.[12,13]

Fasting lipid profiles of diabetes patients should be done at least once a year (ADA 2009) to manage the dyslipidaemia if present or to detect it earlier, as about 50% of diabetes patients also have concurrent dyslipidaemia which is strongly related to macro vascular complications.[14] According to a study done in India, 68% of diabetes patients had not had their cholesterol tested in the last year.[15] Results of our study are comparable 95.5% of subjects had not been tested for lipid profile in the last 12 months.

Oral hypoglycaemias was reported in this study as the most common method of diabetic management which was also supported by Otieno et al., study that reported 77% of the study population on oral glucose lowering agents with or without insulin. This also concurred with some studies that identified physical activity as being vital to diabetes care among patients with evidence that regular physical activity enhances insulin sensitivity, increases cardio respiratory fitness, improves glycemic control, reduces the risk of cardiovascular mortality and enhances psychosocial well-being.[16-19] Other studies reported that varying the diet of diabetes patients denote the quality of care since food habits of diabetic patients are related to their glycemic control.[20,21]

On glucose monitoring the study reported use of glucometer and uristix which corresponded with Beran et al studies that reported care of diabetes to constitute of equipment like glucometer and glucose measuring strips. The study also reported shortage of diabetic medication and financial constraints which concurred by other studies that documented deficiencies in the quality of diabetes care as a challenge for the health care system. Some of these studies reported high cost and low availability of insulin coupled with inadequate patient follow up.[22-24] Mcferran also reported that irrespective of the subsidized insulin cost for patients in Kenya, frequent stock outs and inconsistent supplies still remains a challenge.[25]

On the patients' blood pressure study findings indicate that 58% of the patients had their systolic pressure below 140 mm/Hg with the overall mean of systolic blood pressure in the five facilities being 135.8 while 89% of the patients had their diastolic blood pressure below 90 mm/Hg with the overall mean in the five facilities being 78.2 mm/Hg. This differed with findings from Kemundo et al study

that reported 23.4% of the patients with blood pressure of <140/90 mmHg.[26]

The study also attempted to look at some of the factors that influence outcome of treatment such as BMI. Monitoring of weight and BP are important indicators in assessing the quality of care provided to persons with diabetes and should be monitored in every visit (ADA2009, IDF 2005). Elevated BMI more than 25 kgs/m2 increases the likelihood of higher blood glucose levels which is consistent with what is known in the literature.[27]

On Glycaemic control Fasting blood glucose (FBG) levels or Glycosylated Haemoglobin A1c (HBA1c) levels study reported 77% of the diabetes patients with their capillary blood sugar above 7 mmols/l and overall mean capillary blood sugar in the five facilities of 10.8 mmols/l. The older group of patients recorded highest mean capillary blood sugar of 12.7 mmols/l and with younger patients recording 9.7 mmols/l. This concurred with Kemundo et al. study that reported HbA1c above 7% at prevalence of 60.5% (95% CI, 55.6-65.5) and Female gender and age as significant determinants of high levels of serum LDL-cholesterol study that reported less than 30% of the participants having achieved HbA1c <7%.16. The mean duration of illness since diagnosis in this study was lower compared to what has been reported in other studies which on average was 10 years.[28]

Conclusion

The study found the majority of the health facilities had trained clinical officers and nurses who support the provision of quality diabetes care. About half of the clinical officers had been trained on diabetes care standards and should support moderate quality of diabetes care among the patients. However, lack of trained pharmaceutical technicians and laboratory technologists were hampering the provision of quality acre due to in-availability of integrated teams to support the care given.

Acknowledgment

None

Conflicts of Interest

None

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