

Factors Affecting the Availability of Drugs Used to Manage Hypertension and Diabetes Mellitus in Public Health Facilities at Nakuru County, Kenya

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Abstract

Background: Continuous access to medicines to ensure adherence and prevent the long-term complications associated with poor management of hypertension and diabetes mellitus is critical in primary health care.

Objective: This study sought to mainly evaluate some of the factors that affect the availability of drugs used to manage hypertension and diabetes mellitus in public health facilities at Nakuru County.

Methods: A cross-sectional research design was used which targeted the public health facilities in Nakuru County, the study utilized survey questionnaires to collect data. Quantitative data from the questionnaires was analyzed statistical tools like mean, standard deviation, frequency and percentages. Further a multivariate regression analysis as an inferential statistical tool to assess the extent to which the factors (procurement practices and inventory practices) had impacted on availability of anti-hypertension and anti-diabetes drugs in the public health facilities.

Results: The anti-hypertensives and anti-diabetics were inadequate or unavailable predominantly in the lower level of care facilities, with higher levels of care having majority of the different classes of drugs. The adjusted R square of .619 show that factors; procurement practices, storage and inventory management practices factors significantly predicted the availability of anti-hypertensives and anti-diabetic drugs at, 61.9%. Further, the p-value of .001 which is <0.05 shows that factors procurement practices, storage and inventory management practices factors have a significant relationship with availability of drugs used to manage hypertension and diabetes mellitus.

Discussion: Supply chain elements such as procurement practices which includes drug selection, quantification, and transparency are key to ensuring access to drugs, other factors such as inventory management, proper storage all contribute to effective and efficient access of drugs.

Keywords: Availability of drugs; Anti-hypertensive and anti-diabetic drugs; Procurement practices; Storage and inventory management practices

Introduction

The global burden of non-communicable diseases has continued to rise, especially in the last four decades [1]. Hypertension is the leading risk factor for cardiovascular diseases, the leading cause of death in the world, with more than three quarter of heart diseases and stroke related deaths occurring in middle income [2]. According to current research and evidence-based practice, these trends can be changed if early diagnosis and treatment are part of the care process. However, whereas such recommendations are practical in developed nations, the developing countries such as Kenya often find their healthcare systems unable to cope with the demand for screening and medication [3]. In effect, the burden of disease continues to rise, negatively affecting the economy.

In Kenya, according to WHO the prevalence of hypertension is 24.5%. Despite availability of antihypertensive therapy, control rates remain low, largely due to lack of awareness and other factors such as access to the necessary drugs. A recent study in Kenya reports a 5.3% prevalence in diabetes mellitus and reported deaths of more than 800 due to diabetes and its complications per year [4]. A commitment by the United Nations General Assembly in 2015 targets to reduce the mortality rates related to non-communicable conditions by one-third by 2030. Among the most affected areas in healthcare delivery in the country is the access to drugs to manage non-communicable diseases. This problem has been quite evident in the devolved units, including Nakuru county and serious concerns have been raised especially by the healthcare professionals and experts.

Research conducted in 2013 on hypertension and diabetes mellitus in Nakuru revealed that more than 4000 people are diagnosed with diabetes mellitus in the county health facilities every year [5]. Hypertension was also estimated to affect close to 4% of the population in the region. Undiagnosed cases of the two non-communicable diseases were also estimated to be among the highest in the country [6,7].

It has been shown that the availability of essential medicines for NCD in LMIC is poor [8]. Kenya being a lower middle income country, access to drugs used to manage non-communicable diseases is a challenge, indeed this problem has been quite evident in the devolved units, including Nakuru County and serious concerns have been raised especially by healthcare professionals in the region particularly an increase in patients suffering from long term complications such as kidney failure, cataracts, heart attacks and brain aneurysms. All this can be effectively controlled by good management with availability of drugs a key factor in their primary management of the two conditions, hence the need to examine factors that hinder the availability of the medicines necessary for optimal management.

Materials and Methods

Study setting

The study was done in Nakuru County which is one the most populous county in Kenya with a population of 1,997,222. Nakuru is the most cosmopolitan county with a mix of urban and rural setting. The study was carried out between October 2022 and April 2023.

Study design

This study was anchored on a descriptive research design as it sought to describe events and happenings related to availability of drugs within public hospitals, under the descriptive form, a cross-sectional research design was used to evaluate the factors that affect availability of drugs used to manage hypertension and diabetes mellitus in public health facilities in the County.

Sample size

The study targeted all the 198 public health facilities in their different categories depending on their level of healthcare public within Nakuru County. From the Yamane, formula a suitable sample size 132 public health facilities was obtained with a reliability level of 95%. The inclusion criteria involved health care workers directly involved in procuring, inventorying, handling and administration of anti-hypertensive and anti-diabetic drugs; one procurement officer and one pharmaceutical officer, which led to 264 health care workers to be included in the study.

Data collection

The study focused on procurement practices, inventory and storage practices and documents for this reason questionnaires together with a documentary checklist were used as the primary tools for data collection. A pilot study was done on 26 respondents from the sub county (10% of the sample size) to ascertain the reliability of the questionnaires and the documentary checklist. The tools were adjusted according to the results of the pilot test before data collection.

Data analysis

Quantitative data from the questionnaires was analyzed using key statistical tools like the mean, counts, standard deviation and percentages. The data outcomes were presented using the Statistical Package for Social Sciences (SPSS) version 25 that helped to input and present data outcomes. Then, the study employed multivariate regression analysis as an inferential statistical tool to assess the extent to which the factors (types of drugs, procurement practices and inventory practices) had impacted on availability of anti-hypertension and anti-diabetes drugs in public health facilities in Nakuru County.

Ethical considerations

Prior to data collection, ethical approval was obtained from Nakuru County department of health and NACOSTI (National Commission for Science, Technology and Innovation). Informed consent was also sought from the respondents. All respondents gave their consent prior to participation.

Results

Respondents and social demographic characteristics

A total of 216 responses were received. More than half of the respondents were male (62.9%) with predominant ages of 26-45 years (64.3%). Further, the respondents were experienced in the service with majority working for over 10 years (69.4%). Majority of the staff had either diploma or first degrees as their level of education (91.6%). More information about the participant demographics can be found in Table 1 below.

Table 1: Socio-demographic characteristics of the respondents (n=216).

Variable	Frequency	Percentage
Gender		
Male	136	62.9
Female	80	37.1
Age		
19-25 years	25	11.6

26-35 years	55	25.5
36-45 years	84	38.8
46-55 years	38	17.6
>55 years	19	6.5
Cadre		
Procurement officers	13	6
Doctor	14	6.5
Nurse	54	25
Pharmacist	75	34.7
Records management officers	49	22.7
Other	11	5.1
Experience in the service		
<5 years	19	8.7
5-10 years	47	21.8
10-15 years	69	31.9
>15 years	81	37.5
Level of facility		
Dispensaries (Level 2)	101	46.8
Health centres (Level 3)	97	44.9
Sub county hospitals (Level 4)	16	7.4
Referral hospital (Level 5)	2	0.9
Level of education		
Certificate	7	3.2
Diploma	102	47.2
Degree	96	44.4
Post graduate	11	5

Types of anti-hypertensive and anti-diabetic drugs

Antihypertensive drugs: Anti-hypertensive drugs that were available in Nakuru County were the thiazide and thiazide-like diuretics called Hydrochlorothiazide (M=1.58: SD=.761); the loop diuretic, Furosemide (M=1.58: SD=.761); the Angiotensin Converting Enzyme Inhibitors (ACEIs) called Enalapril (M=1.63: SD=.779); two of the Calcium Channel Blockers (CCBs), Amlodipine (M=1.77: SD=.708) and Nifedipine (M=1.77: SD=.

708). Those that were available but inadequate was the centrally acting anti-hypertensive agents represented by Methyldopa (M=2.34: SD=.760). Many of the other classes of drugs were however unavailable and they included: Potassium sparing diuretics, Angiotensin Receptor Blockers (ARBs) (Losartan and Telmisartan), beta blockers, hypertensive agents, vasodilators and alpha 1 receptor blockers. Table 2 below shows the exact figures indicating the level of doses available for each antihypertensive drug.

Table 2: Stock availability of antihypertensive drugs in numbers (doses).

Classes of drugs	Type of drugs	Number of doses (n)	Mean	SD
Thiazide and thiazide-like diuretics	Hydrochlorothiazide	216	1.58	0.761
Loop diuretics	Furosemide	216	1.58	0.761
	Torsemide	216	3.03	0.953
Potassium sparing diuretics	Spironolactone	216	2.9	0.346
Angiotensin Receptor Blockers (ARBs)	Losartan	216	2.9	0.346
	(Losartan and Telmisartan)	Telmisartan	216	3.02
Angiotensin Converting Enzyme Inhibitors (ACEIs)	Enalapril	216	1.63	0.779
Beta blockers	Bisoprolol	216	3.13	0.953
	Carvedilol	216	3.08	0.846
	Labetalol	216	2.93	0.353
Calcium Channel Blockers (CCBs)	Amlodipine	216	1.77	0.708
	Nifedipine	216	1.77	0.708
	Verapamil	216	3.14	0.833
Centrally acting anti-hypertensive agents	Methyldopa	216	2.34	0.76
	Phenoxybenzamine	216	3.03	0.834
Vasodilators	Hydralazine	216	3.53	0.942
Alpha 1 receptor blockers	Doxazosin	216	3.62	0.945
	Prazosin	216	3.43	0.838

A cross-tabulation done to determine availability of anti-hypertensive drugs within the levels of hospitals showed the county referral hospital had more of the available drugs (100.0%), followed by the health center (62.9%) then the sub county hospitals (56.3%) lastly the dispensaries (54.5%).

Anti-diabetic drugs: As far as diabetes mellitus drugs was concerned, only soluble insulin was available (M=1.77: SD=.708).

The Biphasic (premixed) insulin (M=2.24: SD=.708) and Biguanides represented by Metformin (M=2.24: SD=.598) were available but inadequate. Other classes of diabetes mellitus drugs like Sulphonylureas, Thiazolidinediones, Dipeptidylpeptidase (DPP)-4 Inhibitors and SGLT-2 Inhibitors were unavailable. Table 3 below shows the exact figures indicating the dose levels of available for each anti-diabetic drug.

Table 3: Availability of diabetes mellitus drugs (doses).

Classes of drugs	Type of drugs	Number of doses (n)	Mean	SD
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Table 3: Availability of diabetes mellitus drugs (doses).

Classes of drugs	Type of drugs	Number of doses (n)	Mean	SD
Insulin	Soluble insulin	216	1.77	0.708
	Biphasic (premixed) insulin	216	2.24	0.598
Sulphonylureas	Gliclazide	216	3.24	0.998
Biguanides	Metformin	216	2.24	0.598
Thiazolidinediones	Pioglitazone	216	3.24	0.998
Dipeptidylpeptidase (DPP)-4 Inhibitors	Sitagliptin	216	3.77	0.708
SGLT-2 Inhibitors	Empagliflozin	216	3.24	0.999

A cross-tabulation done drugs against the levels of hospitals showed that county referral hospital had the highest score for the availability of diabetes mellitus drugs at 50.0% followed by health center at 46.4%, then the sub-county hospital at 43.8% while dispensary had the lowest percentage of available diabetes mellitus drugs at 30.7%

Procurement practices of anti-hypertensive and anti-diabetic drugs

The results for procurement practices are seen in Table 4 below. The results show that the hospitals did not have a clear

drug forecasting template (M=2.33: SD=.876); there was no forecasting that always made it clear about the actual demand and expected demand (M=2.35: SD=.598) and the health facilities did not procure anti-hypertension and anti-diabetic drugs in sufficient quantities (M=2.45: SD=.988). Also, the tendering process for anti-hypertension and anti-diabetic drugs was not transparent (M=2.55: SD=.655) and neither was procurement technology adopted significantly to help in anti-hypertension and anti-diabetic drugs procurement (M=2.55: SD=.655). Generally, therefore, the procurement practices of anti-hypertension and anti-diabetic drugs were not effective and efficient (M=2.63: SD=.709).

Table 4: Procurement practices of anti-hypertensive and anti-diabetic drugs.

Questions	N	Mean	SD
We have a clear drug forecasting template	216	2.33	0.876
Through the forecasting we are always clear about the actual demand and expected demand	216	2.35	0.598
The procurement of anti-hypertension and anti-diabetic drugs is based on accurate information from credible sources	216	2.32	0.511
We procure anti-hypertension and anti-diabetic drugs in sufficient quantities	216	2.45	0.988
The tendering process for anti-hypertension and anti-diabetic drugs is transparent	216	2.55	0.655
We have adopted procurement technology significantly to help in anti-hypertension and anti-diabetic drugs procurement	216	2.55	0.655

Generally, the procurement practices of anti-hypertension and anti-diabetic drugs is effective and efficient	216	2.63	0.709
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Procurement practices within each level of health facility was also determined, the results showed that procurement practices are not effective and efficient mainly at the dispensary level (73.3%) then at the sub county hospitals (56.3%) then the health centres (43.3%) and finally at the county referral hospital (50.0%).

Storage and inventory management practices of anti-hypertensive and anti-diabetic drugs

The results showed that the health facilities had enough warehousing space for anti-hypertension and anti-diabetic drugs (M=4.24: SD=1.976); used just-in-time inventory practice which had helped in inventorying anti-hypertension and anti-diabetic

drugs (M=4.98: SD=1.511); and used pull inventory practice which had helped in inventorying anti-hypertension and anti-diabetic drugs (M=4.02: SD=1.711). The health facilities did not prefer the push inventory practice (M=2.48: SD=.968). Generally, the storage and inventory practices of anti-hypertension and anti-diabetic drugs was effective and efficient (M=4.12: SD=1.785). Thus, the storage and inventory practices of anti-hypertension and anti-diabetic drugs were effective and efficient at the public health facilities in Nakuru County. Table 5 below shows the results.

Table 5: Storage and inventory management practices of anti-hypertensive and anti-diabetic drugs.

Questions	N	Mean	SD
We have enough warehousing space for anti-hypertension and anti-diabetic drugs.	216	4.24	1.976
We use Just-in-time inventory practice which has helped in inventorying anti-hypertension and anti-diabetic drugs.	216	4.98	1.511
We use pull inventory practice which has helped in inventorying anti-hypertension and anti-diabetic drugs.	216	4.02	1.711
We use push inventory practice which has helped in inventorying anti-hypertension and anti-diabetic drugs.	216	2.48	0.968
Generally, the storage and inventory practices of anti-hypertension and anti-diabetic drugs is effective and efficient.	216	4.12	1.785

Inferential statistics: Multiple regression analysis

Univariable regression analysis was done by computing the mean values from the descriptive analysis. The results are shown in Table 6 below. The adjusted R square of .619 show that type of antihypertensive and diabetes drugs, procurement practices and storage and inventory management practices factors predicted availability of those drugs at 61.9%. This is a significant predictor value that implies that type of antihypertensive and diabetes drugs, procurement practices and storage and inventory management practices factors have a

significant influence on availability of drugs used to manage hypertension and diabetes mellitus. Further, the p-value of .001 which is <0.05 shows that type of antihypertensive and diabetes drugs, procurement practices and storage and inventory management practices factors have a significant relationship with availability of drugs used to manage hypertension and diabetes mellitus.

Table 6: Summary of regression results for factors against availability of medicines.

Model	Adjusted R square	Standardized coefficients beta	T	Sig.
	0.619			
Constant		0.238	0.0987	0.739
Type of antihypertensive and diabetes drugs		0.582	2.483	0
Procurement practices		0.591	2.443	0.001
Storage and inventory management practices		0.516	2.431	0.001

Discussion

The study found that both antihypertensive drugs and anti-diabetic drugs were mainly inadequate or totally unavailable especially at the primary and secondary level of care. The KEML 2019 provides the various classes of drugs that should be available at the public health facilities for optimal management of the two conditions, their unavailability obviously having direct negative impact on the continuous management of the chronic conditions. Despite the factor of available financial resources for the purchase of medicines, other key factors such as poor procurements practices such as poor quantification, no clear procurement guidelines on award of tenders. On the other hand inventory and storage management was adequate and therefore promotes rational drug use of the already available drugs, therefore an improvement in procurement practices would have a huge impact since there's already an infrastructure to properly handle the drugs upon availability.

On specific type of drugs available, the study agrees with studies done previously within the Kenyan public health facilities in Kenya [9]. The studies found that thiazide diuretics and rennin inhibitors were the primary antihypertensive drugs available and predominantly dispensed and therefore indicates dispensing patterns may have an influence on drug selection and subsequent availability of the drugs.

Primary and secondary level of care facilities had the most procurement practice challenges and subsequent types of available drugs this similar to a study carried out to establish pharmaceutical availability across levels of care in Ghana, Kenya, and Uganda [10]. The study showed a similar pattern in all three countries whereby low level of care facilities were most affected in terms of unavailability of essential drugs.

Other factors such as financial resources may have a considerable significant effect on availability of drugs and the level of significance should be investigated in terms resource allocation over a given period of time, other factors such as adoption of technology in supply chain may also need to be investigate and significance established [11].

Conclusion

Nakuru County, being one of the flagship counties in implementing the government vision 2030 on universal healthcare, should in conjunction with the national government strengthen the supply chain infrastructure such as procurement practices, optimize inventory and storage management at all levels of care for a comprehensive realization of universal health coverage.

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