

Original Research Article

Assessment of consumption patterns for essential medicines: a study of the Nyeri county referral hospital

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ABSTRACT

Background: Nyeri is one of the pilot Universal Health Coverage roll-out counties aimed at guaranteeing healthcare service access to all households in the region by 2022. The aim of the study was to provide management insights into ways of optimizing pharmaceutical management to ensure essential medicines are consumed by majority of population in need by 2022.

Methods: A mixed-methods approach was used, combining quantitative and qualitative data collection techniques.

Results: Amoxicillin had the highest (751,000) consumption over the study period. Other essential medicines with high consumption include paracetamol (432,000), metformin (280,264) and enalapril (111,800). The most cited reason for stock-outs was limited allocation of budget for medicines, a point that was mentioned by eight of the ten respondents.

Conclusions: The study concludes that the stock-out frequency for essential medicines at the Nyeri County Referral Hospital is high. The frequent and persistent stock-out frequency for essential medicines is a problem considering the high consumption for essential medicines.

Keywords: Stock out, Essential medicines, Affordable, Consumption

INTRODUCTION

A well-functioning health care system ensures equitable access to vital health products and technology (HPT) of assured quality, and that are sufficiently cost effective for wide coverage. The WHO identified improving health, enhancing responsiveness to populations and promoting fairness in financial contributions the primary goals of health systems.^{1,2} To achieve this, six health system building blocks were identified, namely, health products and technology, human resource for health, health finance, leadership and governance, service delivery and health information management systems.³ Of the six blocks, HPT and service delivery reflect the most immediate outputs of

health systems, the tangible benefits that are clearest to the clients. To the public, reliable medicine availability is a key marker of how well the health system functions, and whether they would want to seek care at a government facility. According to WHO, there must be equitable access to essential medicines at all levels of healthcare, as these ensure priority needs are met.⁴

Essential medicines are those that satisfy the health care needs of the majority of the population at a price the individual and the community can afford. They are selected with due regard to disease prevalence, evidence on efficacy and safety and comparative cost effectiveness. They are also intended to be available within the context

of a functioning health system at all times, and in adequate amounts. Improving hospital pharmaceutical management for essential medicines is a vital strategy to achieving stocks availability.⁵

WHO defines essential drug list as drugs required for primary health-care system. Such drugs are the most potent and cheaper with a favorable safety profile. EMLs ensures equal access to drugs in all nations.⁶ The WHO Universal Declaration of Human Rights and the Millennium Development Goals' (MDGs) targets, highly endorses global adoption and frequent updates of national EMLs, to guarantee acceptable accessibility of crucial drugs, more so in poor and middle-income nations.⁷ EMLs exists in about 134 nations, whereby 94% use them for prioritization of purchasing of drugs in public sector for the disadvantaged.⁸

Although many countries have formulated an essential medicine list, almost half of the global population still lack regular access to essential medicines.⁹ Mujinja stated that the median accessibility of crucial drugs was suboptimal at 61.5% but greatly higher when compared to non-essential drugs at 27.3%.¹⁰ In Ghana, the accessibility of vital drugs in private health institutions is greater when compared to public facilities both within the rural and urban regions.¹¹ Accessibility to drugs and vaccines to cure and prevent illnesses is very low and majority of Africa's crucial drugs needed are imported at higher costs.

The capacity of local pharmaceutical producers to meet demand is very low. It has been approximated that the local pharmaceutical sectors have capacity to manufacture 30% of the needs of the nation.¹² In a study conducted in health facilities in Kenya it was found that public health facilities experience stock outs of essential medicines for about 46 days per year. The public supply chain was particularly prone to significant interruptions and critical stock-outs, extending beyond 30 or even 90 days consecutive days.¹³

An inventory is a detailed itemized list of assets held by an organization or institution like goods in stock, drugs and equipment. It is a method of maintaining stock of drugs at a level of lowest purchasing and stocking cost, and without interference with supply.¹⁴ Inventory management is the core of pharmaceutical supply system. Inventory control of medicines includes the placing of orders from the pharmaceutical depots as well as how the stock levels are maintained at the health facility to ensure uninterrupted availability of medicines.¹⁵ It is all about ordering, receiving, storing, issuing, and again reordering of limited list of products. On a realistic bases inventory management is a difficult task, because in many countries possession of a poor inventory management system in the pharmaceutical supply system has resulted in wastage or blockade of financial resources, shortage and overage of essential drugs, increase in out-of-pocket expenditure and decline in quality of healthcare services.¹⁶ According to Munedzimwe, forecasting is another important aspect of inventory control as it is used to determine the quantities

of stock that a facility may potentially use in a certain time period in the future.¹⁷

In Nigeria poor planning and forecasting, insufficient information about consumption and current stock levels, funding and capacity constraints and a poor infrastructure are reasons for inappropriate stock levels.¹⁸ According to Gallien the inventory control problem associated with the distribution of essential medicines in Zambia involves seasonality and uncertainty in both demand and lead-times, heterogeneous delivery locations, and lost sales.¹⁹ The Kenya Medical Supplies Agency (KEMSA) is the sole supplier of all pharmaceuticals and other medical products for the 3,936 facilities in the public health sector in the country with an annual budget of roughly 10 billion Kenyan Shillings, KEMSA supplies all public facilities in the country with medicine, non-pharmaceutical supply, and medical equipment free of charge.²⁰ In Nyeri County, respiratory tract infections (RTIs), diarrheal diseases, skin diseases, diabetes, cardiovascular diseases and peptic ulcer disease account for the most prevalent in hospital.²¹ Whereas diabetes prevalence in the country is at 5.6%, in Nyeri County, it stands at 12.6%, with related complications contributing to significant suffering.²² This statistic underscores the value of ensuring the public hospitals are well stocked. Further, there is an increase in the number of patients seeking health services in the existing public health facilities mainly because they consider these services affordable to them. Despite this, often times patients do not get all the medicines prescribed to them because they are out of stock in these facilities. For this reason, there is need to ensure that essential medicines are available at all times to serve the clients according to their needs.

A study by Health Action Africa International (HAI) revealed that essential medicines were available in only 50% of the health facilities and 65% of hospitals in Kenya.²³ Another survey by WHO established wide variation in the availability of essential drugs between private and public institutions, with the latter performing poorly.²⁴ The drug supply systems must serve to ensure continuous availability of essential medicines and medical supplies of assured quality. Supply should be well planned and dependable to avoid stock-outs, and costs kept low. To meet increasing expectations, the public health facilities and county governments should look for new and cost-effective ways of financing and managing drug supplies. This study seeks to establish the availability and consumption patterns for essential medicines at public health facilities in Nyeri County, to inform policy on ways of strengthening and streamlining the pharmaceutical management.

METHODS

Study type

The study utilized a mixed methods approach combining quantitative and qualitative data collection techniques. The

archival method was used to collect data (in this case quantitative data) to address research questions one, two and three. For the qualitative approach, the questionnaire had open ended questions.

Study area

The study was conducted at the Nyeri County Referral Hospital in Nyeri County. This is a Level 5 facility, the largest hospital in the region, serving as a referral Centre for all healthcare facilities in the county. Nyeri County has 140 public facilities hospitals which offer a wide range of preventive, promotive, curative and rehabilitative health services. They include five public hospitals, three hospitals run by faith-based organizations (FBO) and three private hospitals in tier three that act as the county referral facilities (County Government of Nyeri, 2015). There are 108 public health centers and dispensaries and 32 community units provide care at tier one. In addition, there are 17 health centers and dispensaries run by FBOs, and 228 private clinics providing a wide range of health services to the Nyeri county population (County Government of Nyeri, 2015).

On average, the majority of the population can access a health facility within seven kms. In general, the availability of public health facilities, doctors and nurses in Nyeri County is above the national norms and standards but below WHO standards. The health staffing levels in Nyeri County is at 20 doctors and 117 nurses per 100,000 population, below the WHO-recommended average of 21.7 doctors and 228 nurses per 100,000 population, which is the required standard for optimal delivery of services. The county has 113 public health facilities compared to the national standard of 106 for a population of 700,000. The population to nurse ratio is 1:654 which is above the national norm of 1:2,054. The doctor to population ratio is 1:5,000 which is higher than the national norm of 1:25,000.

Population and sampling

The study included all pharmacists at the Nyeri County Referral Hospital in Nyeri County since they are involved in pharmaceutical management hence provided the relevant data for the study. NCRH was chosen because it is a Level 5 facility, the largest hospital in the region, serving as a referral center for all healthcare facilities within the county.

As at February 2019, there were ten pharmacists. Due to the small number of the population comprehensive sampling and census was done to include all ten pharmacists in the study.

Study time and data collection methods

The study was conducted between January and May 2019. Secondary data was obtained from pharmacy department administrative documents used in the pharmaceutical

commodity management. These included S3 cards (stores ledger and stock control cards, which indicate stock balances), S5 cards (bin cards, which indicate stock movement), S13 cards (counter receipt voucher cards which show the inflow of purchases and donations), S11 (issue voucher, which track issuance of commodities) and security receiving book (record all medicines entering the stores).

Additional information was obtained from the Hospital's health management information system (HMIS) and other relevant records to obtain data on medicine. Data captured all commodities received (purchased, donated), and those issued to patients and hospital departments. Data was collected for a period of five years (2014-2018) after devolution of health care services. The study was guided by a tracer essential list of 20 essential medicines that are the most mostly used at the facility, with effort made to include different therapeutic categories. For the qualitative component, the questionnaire had open ended questions. Those issued were ten pharmacists, who are involved in pharmaceutical management in the hospital. After initial analysis of data, the pharmacists were interviewed again via telephone call to provide insights to trends that were found.

Statistical analysis

Statistical package for social sciences (SPSS) was used to perform the quantitative analysis. The methodology involved the utilization of frequencies and percentages, for qualitative data, transcripts were read iteratively, and, major themes identified and developed into a thematic tree. Coding was then done, with the thematic tree being modified based on emerging information. A narrative synthesis then followed, and findings presented to complement the quantitative results.

Research quality

Even though the study employed few participants, the reliability of this study was ensured by giving the participants enough time to answer the questions. The validity of the data collection instruments used in this study was guaranteed via a pilot study and consultation between the researchers and supervisor. The structure of the questions was such that the elements in the questions are relevant, focused and accurate.

Ethical approval

Ethical clearance was sought from the Director of Health Services, Nyeri County Referral Hospital, University's Research Committee and National Commission for Science, Technology and Innovation (NACOSTI).

Confidentiality and anonymity of the respondents was upheld throughout the research process including at analysis and dissemination phase. Individual names were avoided. Participation was on a voluntary basis.

RESULTS

Consumption patterns for essential medicines

Overview of consumption for essential medicines

Findings in Table 1 show that amoxicillin had the highest (751,000) consumption over the study period. Other essential medicines with high consumption include paracetamol (432,000), metformin (280,264) and enalapril (111,800).

Table 1: Consumption patterns for essential medicines.

Drugs	2014	2015	2016	2017	2018	Average
Amoxicillin 250 mg capsules	753,000	855,000	710,000	730,000	707,000	751,000
Amoxicillin 125 mg/5 ml syrup	8,610	8,400	8,900	8,410	13,660	9,843
Paracetamol 500 mg tablets	423,000	462,000	443,000	372,000	481,000	432,000
Cotrimoxazole 480 mg tablets	10,000	19,000	46,000	15,000	54,000	28,800
Albendazole 400 mg tablets	25,800	8,700	51,500	24,500	11,500	22,100
Chlorphenamine 4 mg tablets	63,000	57,000	67,000	52,000	50,000	57,800
Metformin 500 mg tablets	328,000	190,900	270,000	235,380	377,040	280,264
Metronidazole 200 mg/5 ml suspension	1,800	2,100	1,300	NR	1,060	1,252
Gentamycin 40 mg/ml injection	30,900	29,110	23,000	NR	NR	16,602
Benzyl penicillin 5/1 mega injection	22,800	21,650	25,000	10,500	10,550	18,100
Adrenaline 1 mg/ml injection	3,200	2,100	1,000	700	500	1,500
Hydrocortisone 100 mg injection	3,760	4,520	4,580	4,200	4,030	4,218
Oral rehydration salt 500 ml/sachet	17,500	15,000	14,732	13,420	8,732	13,877
1% Tetracycline eye ointment	1,150	1,600	1,300	1,120	1,030	1,240
1% Clotrimazole cream	634	764	640	770	768	715
Oxytocin injection	16,255	14,413	5,652	6,200	13,690	11,242
Insulin (mixtard) injection	4,661	4,899	4,321	5,509	6,576	5,193
Enalapril 5 mg tablets	70,700	87,000	80,000	145,900	175,400	111,800
0.9% Sodium chloride infusion	NR	NR	34,502	32,427	33,606	20,107
Suxamethonium injection	2095	1300	1020	510	2140	1,413

NR: No records.

Consumption patterns for tablets and capsules

Results in Figure 1 show an increased consumption patterns for tablets and capsules with 5 of the 7 tracer essential tablets and capsules showing an increasing trend over the study period. The consumption of metformin and enalapril was attributed to the fact they treat non-communicable diseases which are on the rise in Nyeri County, and increased awareness among patients leading to more diagnosis.

Drugs accessibility has also increased due to increased NHIF uptake. One pharmacist had this to say: *“These are NCDs drug, the cases within the county are increasing because nowadays people are being diagnosed and increase awareness, also the issue of the NHIF, people can access drugs, and people have registered with NHIF”*

Amoxicillin capsules recorded a decreasing consumption, this was attributed to availability of alternative antibiotics in the facility and prescriber bias. Chlorpheniramine showed a decrease in consumption over the study period. One pharmacist was quoted saying: *“Eehh siku hizi kila mtu anaandikiwa cetirizine, due prescriber’s bias, you know people like cetirizine because of the drowsiness and convenience of dosing frequency”*. Meaning, nowadays, prescribers highly prefer to prescribe cetirizine over chlorpheniramine due to once daily dosing frequency and

lack of drowsiness side effect. Albendazole which is an antihelmintic recorded a low and a decreasing consumption pattern as shown in Figure 1 below.

Consumption patterns for injectable and infusions

Consumption patterns for injectable and infusions showed a mixed trend with 4 of the 8 medicines declining in consumption as shown in Figure 2. Most injectables including injections benzyl penicillin, adrenaline, hydrocortisone, oxytocin, insulin, normal saline and suxamethonium had a decreasing consumption between year 2016 and 2017 which was associated to the health workers strike during the period. This was because these medicines are used in inpatients except for suxamethonium which is used in theatre. One respondent had this to say: *“So for 2016 kuna hiyo time ya strike na pia inaexplain 2017 kwa sababu tukiwa strike most inpatient haifanyi and they are the heaviest consumer wa injectables coz nakumbuka 100days zikaisha nurses wakaenda one hundrt and what days. For those days hakuna dawa ilikuwa inatoka na sasa madaktari wakastrake hakuna admission hakuna anything, probably that’s the explanation we can use”*.

Gentamycin showed no consumption data between year 2014 and 2016 and while sodium chloride showed no consumption data in 2014 and 2015, due to the fact that no

records were available for consumption data for that period. One of the respondent was quoted saying: “There is a time last year pharmacy was under renovation, siuliona? Some records stored in cartons were misplaced, even upto now we haven’t found them, again zingine kana normal saline ni watu wengine kukataa kujaza makosa ni eti the fluid’s store is outside the pharmacy and manned by

the casuals here and most pharmacists don’t follow up when they are on duty”. Translated as: Last year, pharmacy was under renovation hence some records were misplaced, also, for normal saline most pharmacists refuse to record because the stores is outside the pharmacy and is manned by casuals and they don’t follow up when they are on duty.

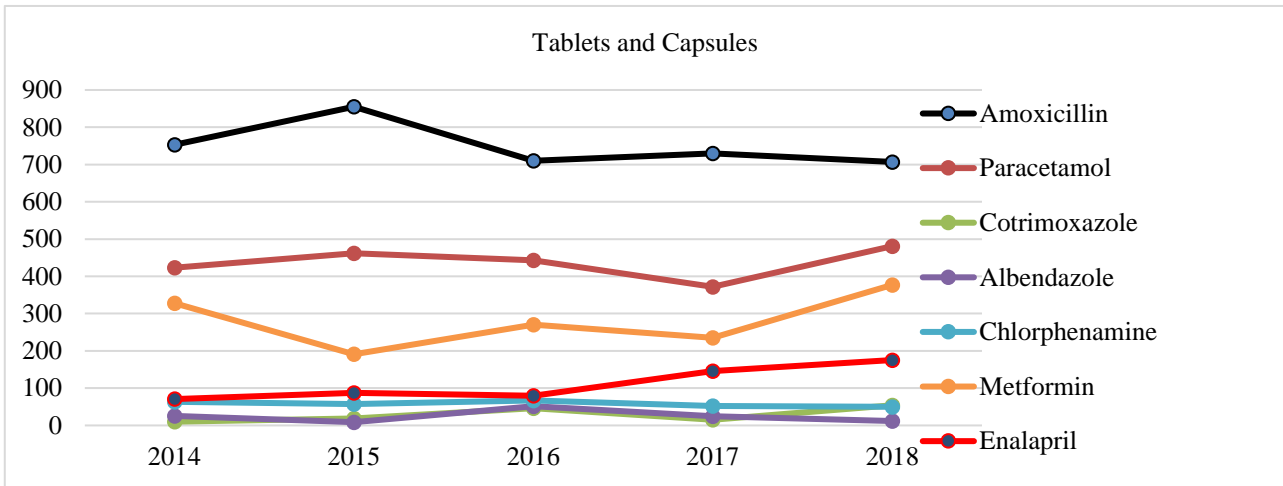


Figure 1: Consumption patterns for tablets and capsules.

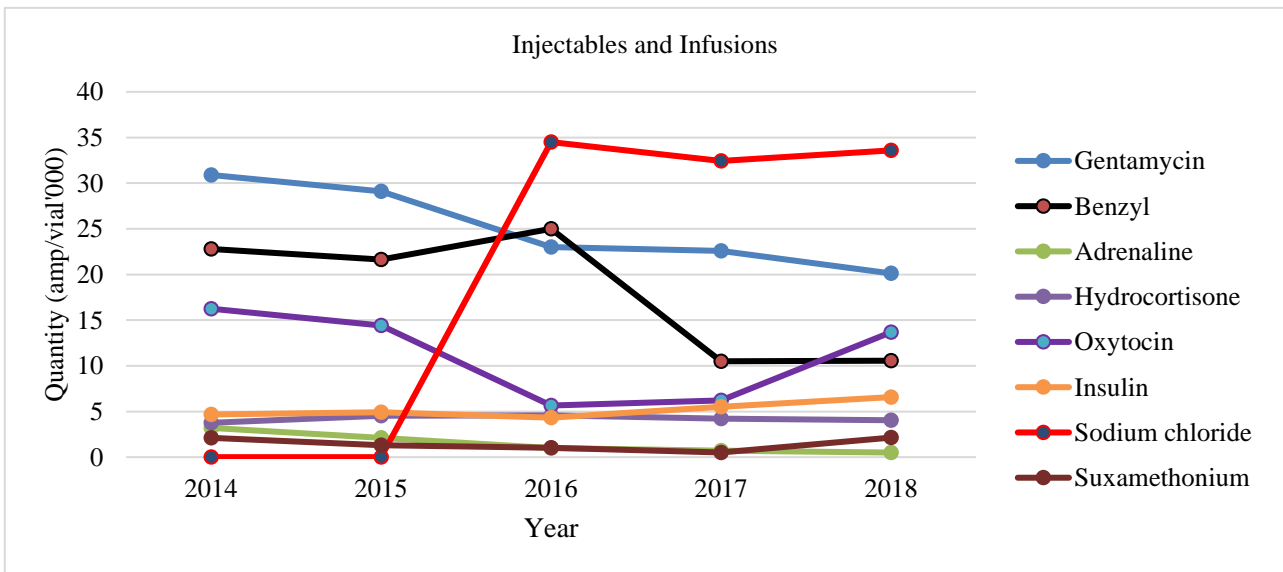


Figure 2: Consumption patterns for injectable and infusions.

Consumption patterns for syrups and suspensions

Consumption of amoxicillin syrup showed an increasing trend while metronidazole showed a declining trend as shown in Figure 3. The high consumption of amoxicillin was attributed to prescriber’s bias since most of the medicines were prescribed by clinicians and clinician interns who prefer to prescribe amoxicillin as opposed to other medication. This was quoted by a pharmacist: “Unaona pia most of this things zinaweza kuwa based on

prescribers, unaona some of these prescribers, every under 5 anakuja, hii story ya empirical treatment everyone anapewa amoxicillin for whatever reason, they are not sure because most of the prescribers are C.O. interns. So for amoxicillin maybe we can attribute to clinicians”. To mean; this depends on prescribers, most are clinical officers and clinical officers’ interns who practice empirical treatment that every child under five years is given amoxicillin. One pharmacist had this to say on decreasing consumption of metronidazole syrup: “So

kwenda chini isn't a bad things unajua hizi vitu za hand hygiene zimefanya job, watoto hawaharishi, linda mama, so ikienda chini iko poa, indicators ziko stronger. Na pia for metronidazole watu hawapati git infection sana." To mean, the decrease in consumption for metronidazole is a good thing since this means that hand hygiene is being practiced, reduction in diarrhea and GIT infections in children and also Linda Mama program is working well hence the indicators are improving.

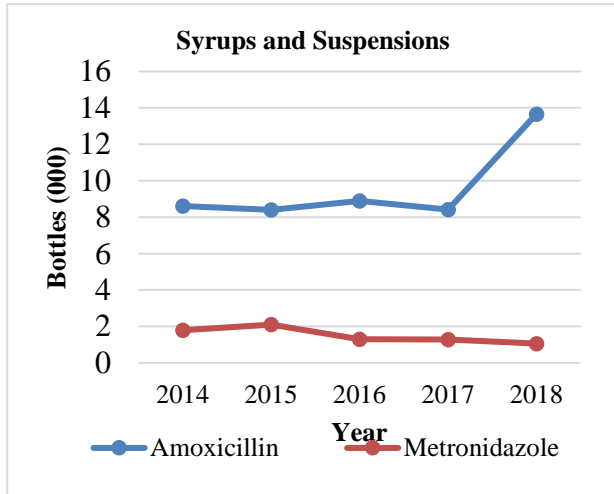


Figure 3: Consumption patterns for syrup and suspensions.

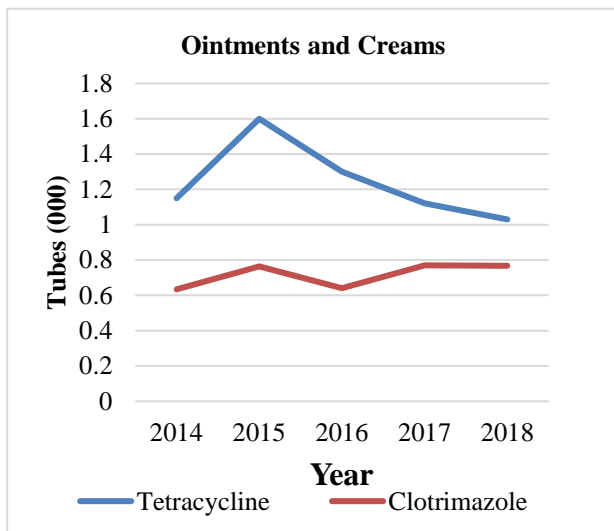


Figure 4: Consumption patterns for ointments and creams.

Consumption patterns for ointments and creams

Findings in Figure 4 show that tetracycline decreased in consumption and clotrimazole had a slight increase in consumption over the study period. The decrease in consumption between 2016 and 2017 can be explained by a lengthy health worker strike and general elections in August 2017 which led to change in operations and movement of people.

Consumption patterns for sachets

Oral rehydration salt showed a declining trend in consumption over the study period as shown in Figure 5. Most respondent felt that the reduction of ORS can be attributed to success of hand hygiene programs among children. This has reduced diarrhea cases greatly which has seen a drop in ORS prescription.

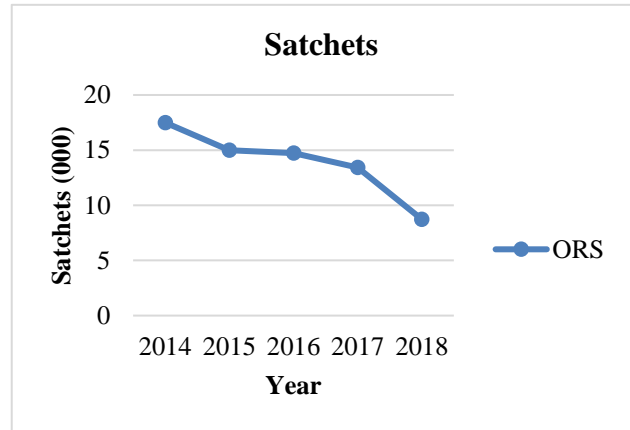


Figure 5: Consumption patterns for sachets.

DISCUSSION

Reasons underlying the availability and consumption patterns for essential medicines

Reasons that affect the availability of essential medicines

Respondents in the study were asked to indicate the reasons that affect the availability of essential medicines. The most cited reason was limited allocation of budget for essential medicines which was mentioned by the vast majority of respondents. Majority of pharmacists indicated the problem of long lead times and unavailability of medicines from the supplier and improper quantification. During a phone interview one pharmacist was quoted saying: *“We are not always supplied with what we have ordered from KEMSA. For some medicines we have never received 100% of what we order, we have to wait for county pharmacist to send us the MEDS catalogue and order any medicine which was not supplied and this will take even up to one month”*.

Another pharmacist had this to say: *“When ordering you have to be very careful during quantification, there is a time we used to order a certain drug in packs of 1000’s, the supplier reviewed the list and changed the drug to pack of 100’s, i didn’t notice the pack’s size had changed, so I ordered as usual. For that quarter we run out of stock shortly after receiving it.*

Factors influencing consumption patterns

Respondents in the study were asked to indicate factors that influence consumption patterns of essential

medicines. The major factors cited were prescribing behaviors of clinician's season's variation, seasonal disease patterns, availability of essential medicines, common illness and non-adherence in treatment guidelines and availability at KEMSA. One pharmacist was quoted saying; "for the consumption, this depends on specific medicines, if you look at ORS and metronidazole the decrease in consumption is a good thing if the reason was not stock out. This means the county is able to eliminate diarrhea diseases and the GIT infections".

Consumption patterns for essential medicines

The study analyzed consumption patterns for essential medicines at Nyeri County Referral Hospital. It was found that there was a change in consumption of essential medicines. Amoxicillin had the highest (751,000) consumption over the study period. Other essential medicines with high consumption include paracetamol (432,000), metformin (280,264) and enalapril (111,800). The high consumption of essential medicines can be attributed to the facility in question being upgraded to a referral hospital. The decrease in consumption between 2016 and 2017 can be explained by a lengthy health worker's strike and general elections in August 2017 which led to change in operations and movement of people. The consumption of drugs such as metformin and enalapril can be attributed to the fact they treat non-communicable diseases which are on the rise. Another reason is increased awareness among patients leading to more diagnosis. Drugs accessibility has also increased due to increased NHIF uptake. This finding is consistent with findings of Mikkelsen-Lopez et al that there has been a remarkable increase in the consumption of medicine in almost every nation worldwide.²⁵ It is also consistent with findings of Fredrick and Muturi in Kenya, it was found out that class A medicines were few but utilized the largest proportion of hospital medicines costs.²⁶ Kivoto et al also found that vital and essential medicines consumed the highest percentage of drug expenditure. ABC-VEN categorization showed that an average of 31% medicine types consumed an average of 85% of total drug expenditure.

CONCLUSION

WHO recommends 100% availability of tracer medicines at all times. These 20 tracer essential drugs require more strict control to avoid out of stock situation as they may lead to more expensive emergency procurement.

There was a significant relationship between stock out frequency and consumption pattern of tracer essential medicines since in the event of stock out the consumption pattern of essential tracer medicines would decrease.

The study concludes that the stock-out frequency for essential medicines at the Nyeri County Referral Hospital was high. The study also concludes that there was a change in consumption pattern for essential medicines at Nyeri

County Referral Hospital. The frequent and persistent stock-out frequency for essential medicines is a problem considering the high consumption for essential medicines. The study concludes that major reasons underlying the availability of essential medicines at Nyeri County Referral Hospital include stock outs, expiries, wrong quantification, long load times by KEMSA and MEDS, unavailability of medicines by KEMSA and MEDS, limited allocation of budget for medicines, inadequate training of staff on commodity management and patients surge. The study also concludes that major reasons underlying the change in consumption pattern of essential medicines at Nyeri County Referral Hospital include common illness, seasons, availability, change in treatment guidelines, availability of skilled medical practitioners, poor record keeping and alternative medicines.

Limitations

The hospital used both manual and electronic systems of documentation putting into question the accuracy of some of the data gathered using the manual system, furthermore some of the records and registers were missing.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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