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Original Research Article

Factors associated with antibiotic prescribing at the outpatient, Nanyuki teaching and referral hospital, Laikipia County-Kenya

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ABSTRACT

Background: There are factors that play a vital role in determining the prescribing patterns of antibiotic which include, prescriber and institution factors. Understanding this is important for tackling irrational prescribing of antibiotics. This study aimed to evaluate the factors associated with antibiotic prescribing at the outpatient department in Nanyuki Teaching and Referral Hospital, Laikipia.
Methods: Knowledge, attitude and practice tool was administered to prescribers, pharmacists and clinical microbiologist to determine the factors that influence antibiotic prescribing. Qualitative analysis was used for the while important variables had data represented in frequency tables and graphs.
Results: Most respondents reported having between 1-4 years and 5-9 years at 40.0% of practice experience. 82% participants reported receiving information on rational antibiotic use within the past year that changed their views on irrational use. 96% participants showed strong agreement that antimicrobial stewardship improves quality of care while 98% universally valued infection control. 94% showed strong concern about AMR with nearly 9 in 10 having prescribed them in the past week. Most source of information was local clinical guidelines. 52% identified organizational awareness campaigns as initiative for antimicrobial stewardship awareness. Overall, pharmacists' involvement in AMS appeared limited, with stewardship roles underutilized.
Conclusions: There is need of continuous medical education and stronger supervision to improve rational prescribing practices. Recommendation of the utilization of quality improvement project on antimicrobial stewardship adopted in various departments.

Keywords: Antibiotics, Attitude, Knowledge, Practice

INTRODUCTION

There are several factors that attribute to prevalence and patterns of antibiotic use. This includes patient factors, prescriber factors and health facility factors among others. Prescriber factors play a pivotal role where it includes a number of factors. A classical example being the prescribers training to ensure optimal utilization of antibiotics. Training is an important provider variable where by inadequate training to prescribers may lead to prescribing for infections that do not require antibiotics. On job training as well as practice training on antimicrobial very important in regulating the prescribing patterns. Providers who attend continues medical education (CMEs) on rational use of antibiotics tend to be updated on all the recent updated guidelines on prescribing of antibiotics hence positively influences on proper use of antibiotics. Lack of in practiced training includes lack of insight into local resistance patterns within the centers of practice as well.[1]

Lack of utilization of medical guidelines consequently propagate lack of adequate knowledge on use of antibiotics by health providers. Despite the presence of national guidelines on antibiotic where indications, dosages, duration are indicated, health providers are still

not consistent in utilizing them.[2] Infection diagnostic uncertainty, where by in the early stage of an infection it's hard to diagnose whether its viral or bacterial. In a survey of health provider on the management of watery diarrhea, 71% noted the use of antibiotics among the treatment.[3] Prescribers argued the administration of an antibiotic in treatment of viral infected diarrhea that didn't necessitate antibiotic use which is an indication of irrational use of antibiotics. Additionally, prescribers may warrant to give patient antibiotics with fear of things getting worse even in conditions that might not warrant an antibiotic this was noted with high a study done on the increase in antibiotic prescribing to patients with asthma.[4]

The other factor being increased length of time needed between obtaining laboratory results such as the antibiotic susceptibility test (AST) and period to obtain the laboratory samples. Prescriber avoid to use the delay prescribing technique or "the watchful waiting" by postponing antibiotic refill to 24-48 hours till when symptoms persist. Therefore, dealing with the ambiguity the health providers prescribe an antibiotic "just in case it a bacterial infection".[5]

Another pivotal reason that dictates the prescribing patterns by clinicians is succumbing to pressure by patients to have a specific antibiotic prescribed. This was clearly pointed in a study done in Kenya that 94% chemists in Kibera where willing to give an antibiotic for UTI according to the requests and demands of the patient.[2] Practice volume is another health provider factor that cannot be over looked. Where by clinicians with high volume practice are more likely to prescribe antibiotics compared to low volume practice.[6] High volume practice make prescribers overwhelmed and hence it becomes quite hard for them to explain as well as educate patients about their illness, how its management and why it does not necessitate an antibiotic.

Additionally, the health institution factors have a great role in influencing the prescription patterns of antibiotics. Therefore, cannot be overlooked because they have a hand in dictating the antibiotic to be prescribed. Drugs availability is a factor that cannot be overlooked especially in low-income countries where stock outs, availability of a few range of antibiotics as well as a problem of accessibility which is a common occurrence. This makes prescription of the antibiotics to be on the dictation of the antibiotics that are available in the facility.[7]

Availability of functional and well-equipped microbiology laboratory that offer utilization of culture and sensitivity to ensure definitive treatment for bacterial infections instead of empirical treatment that encourages irrational use of antibiotics.[8] Antibiotic prescription patterns especially in developing counties are highly influenced by lack of adequate diagnostic and quality laboratory facilities that promote definitive treatment over empiric treatment especially where etiology of the infection has not yet been established.[9] Lack of utilization of culture and sensitivity is due to the lack of the presence of both microbiology laboratories and personnel .In cases where its available, the cost is beyond reach for most patients which eventually leads to financial constrained at both facility and personnel level.[10]

It is very important for health facilities to have a multi-disciplinary antimicrobial stewardship team that regularly review and maintain proper health facility antibiotic use. The antibiotic stewardship multi-disciplinary team also work on developing and customizing the anti-biogram for their facilities hence ensuring standardization of antibiotics use across all departments in the facility. Anti-microbial stewardship committee are custodians of rational use of antibiotics through holding periodically training to health care providers on use of antibiotics.[11] Medical guidelines are also important to take into account in prescribing trends, resistance and antibiotic cost8. It has however been argued in spite the presence of guidelines and information, knowledge on the use of antibiotics among health worker is very poor. This entails that the presence of a guidelines does not necessitate use of the guideline by the practitioners within the facility.[9] Accessibility to formal health care is an important factor of consideration in ensuring good antibiotic prescribing practice. High costs in cases where there are formal health care results to patients by passing prescriber and diagnosis before getting a prescription. A study done within a duration of 12 months in Kenya informal settlement on the use of antibiotics, 54% of the surveyed individuals accessed healthcare through the community pharmacies. In addition, less than half recall getting information regarding proper use of antibiotics dispensed.[12]

METHODS

Study setting

The study was carried at Nanyuki Teaching and Referral Hospital a level 4 hospital, located in Laikipia county. The hospital outpatient department hosts several clinics. This includes the daily general consultation, pharmacy services, laboratory services, medical out-patient clinic (MOPC), diabetes out-patient clinic (DOPC), dermatological clinic, gynecological out-patient clinic (GOPC), surgical out-patient clinic (SOPC), eye clinic, dental clinic, psychiatric clinic, emergency department, oncology clinic, chest clinic, orthopedic clinic, ear nose and throat clinic (ENT), mother-child health clinic (MCH), compressive care clinic (CCC), renal unit, eye clinic.

Study design

A knowledge, attitude and practice tool was issued to a population of prescribers with different levels of training in all clinics within the outpatient department, pharmacists, and the clinical microbiologist. This was

necessary to understand the drivers of the prescribing patterns of antibiotics and identification of specific sites that require antibiotic stewardship improvement. The study was also timely with the facility having conducted an inpatient global PPS in August 2023 with a relatively high prevalence rate of 52.6%, and the outpatient prevalence in February 2025 where the antibiotic prescribing was 29.1% where they are all higher than the WHO recommendation.[13,14] The study will give assist to understand the drivers of the high prevalence in the facility. The survey tool contained demographic questions on both the facility and the healthcare worker, as well as items on personal views and general perceptions regarding antimicrobial stewardship practices within the facility. This helped in understanding the practice, attitudes, infrastructure, and governance of antimicrobial stewardship and antimicrobial resistance among healthcare providers and at the health facility level.

Time-frame for data collection

The knowledge, attitude and practice tool was issued to the participants for four consecutive weeks from 1st February to 28th February 2025.

Study population

All prescribers, pharmacists and clinical microbiologist working at the outpatient was eligible for the study. A sample was then determined for the total population. The knowledge, attitude and practice tool was administered to a sample of prescribers with different level of training which includes medical consultants, medical officers, clinical officers working in the outpatient department of the facility. Additionally, to understand the antimicrobial stewardship practices within the facility we included the pharmacists and clinical microbiologist who play pivotal role in AMS

Sampling

Purposive sampling was applied. The researcher deliberately ensured that prescribers, pharmacists, and the microbiologist were represented. Among prescribers, all cadres practicing in the outpatient department were considered, including medical consultants from different specialties, medical officers, and clinical officers. The principle of data saturation guided the process for prescribers and pharmacists, meaning respondents were recruited until no new insights emerged from the data. In addition, the hospital's clinical microbiologist and chief pharmacist were included to provide institutional perspectives on diagnostic capacity, drug availability, and stewardship practices influencing outpatient prescribing. Fifty health care workers were thus recruited.

Inclusion criteria

Data were collected from a sample of prescribers working in the outpatient department across different training levels. These included consultants in various specialties, medical officers, and clinical officers who regularly prescribed in the outpatient clinics. The hospital clinical microbiologist and the pharmacists also participated. All individuals completing the practice habit tool were requested to provide informed consent before participating in the study.

Exclusion criteria

Health care givers who refused to consent.

Data analysis

This was qualitative survey, data from the Knowledge attitude and practice tool were analyzed thematically. Emerging themes were identified to provide insights into prescriber-related and facility-related factors influencing antibiotic use.

Informed consent

Participants were fully informed about the study objectives, potential benefits, and risks prior to providing written informed consent. No names were recorded; instead, anonymized identification numbers were issued to maintain confidentiality. Participants were assured of their right to seek clarification, participate voluntarily, and withdraw at any stage of the study without providing a reason

Confidentiality

Confidentiality and privacy were strictly maintained throughout the study. Data was completely anonymized and electronic data had a password protected which was only accessible to the principal investigator.

Ethical approval

Ethical approval was obtained from the institutions ethics review board: Jomo Kenyatta University of Agriculture and Technology (JKUAT) JKU/ISERC/02316/1419, Institutional Ethics Review Committee (ISREC) and National Commission of Science, Technology and Innovation (NACOSTI)-NACOSTI/P/25/415113. The study only proceeded following the authorization from the chief executive officer Nanyuki Teaching and Referral Hospital.

RESULTS

Prescriber related characteristics associated with antibiotic prescribing among the out-patient department

Socio-demographics

As shown in Table 1 below, a total of 50 healthcare workers (HCWs) a majority being prescribers 88.0% (44), pharmacists 10.0% (5) and clinical microbiologists 2.0%

(1). Most respondents reported having between 1-4 years 40.0% (20) or 5-9 years 40.0% (20). The years of service within the current institution clustered in the 1-4 years range 60.0% (30), with smaller proportions in the 5-9 years 26.0% (13).

Table 1: Prescriber demographic characteristics.

		Count	%
Main role of HCW in hospital	Prescriber	44	88.0
	Pharmacist	5	10.0
	Clinical microbiologist	1	2.0
	Total	50	100.0
Years practicing role	5-9 years	20	40.0
	10-14 years	9	18.0
	1-4 years	20	40.0
	>20 years	1	2.0
	Total	50	100.0
Years working in institution	less than 1 year	1	2.0
	5-9 years	13	26.0
	10-14 years	6	12.0
	1-4 years	30	60.0
	Total	50	100.0

Prescribers knowledge on antimicrobial stewardship

Sources of antimicrobial stewardship information

Among the 44 prescribers surveyed, the most frequently cited source of antimicrobial stewardship (AMS) information was local clinical practice guidelines (41%, n=18). This was followed by international clinical guidelines (29%, n=13), and continuing education training courses (27%, n=12). About 23% (n=10) of prescribers reported relying on previous clinical experience. This is as shown in Figure 1.

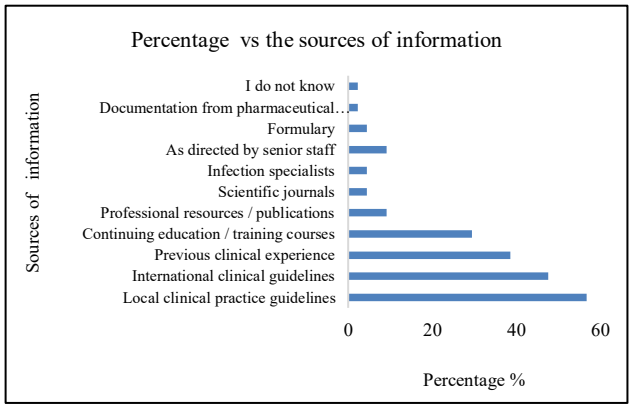

Figure 1: Sources of antimicrobial stewardship information.

In Table 2, most participants reported receiving information on rational antibiotic use within the past year. Training sessions and workplace learning emerged as the most recurrent sources, supplemented by input from colleagues and published guidelines. Additionally, exposure to this information was widely regarded as transformative, with many participants indicating that it had shifted their perspectives on irrational antibiotic use. Importantly, for most respondents this translated into tangible behavioral change, with many reporting that they had fully or mostly altered their prescribing, administering, or dispensing practices.

Table 2: AMS awareness among healthcare workers.

Knowledge	Category	N (n=50)	%
Receiving information on rational antibiotic use (last 12 months)	Yes	41	82.00
	No	5	10.00
	Unsure	4	8.00
	Total	50	100.00
Sources of information in the last one year	Training- conference/group	16	32.00
	Workplace	13	26.00
	Colleague or peer	9	18.00
	Published guidelines	7	14.00
	Scientific organization	3	6.00
	Professional body (e.g., medical/ pharmaceutical/ nursing societies)	2	4.00
	Audit and feedback	2	4.00
	Social media	1	2.00
Impact of information changed views on irrational use	Yes	41	82.00
	No answer	9	18.00
Information you received, have you changed your practice on prescribing OR administering OR dispensing of antibiotics?		9	18.0
	Yes, fully	13	26.0
	Yes, mostly	24	48.0
	Yes, sometimes	4	8.0

Table 3: Attitudes on antimicrobial stewardship (AMS).

Attitude	Disagree (%)	Neutral or D/K (%)	Agree (%)	Total (%)
AMS improves quality of care	1 (2.0)	1 (2.0)	48 (96.0)	50 (100.0)
AMS reduces antibiotic use	4 (8.0)	3 (6.0)	43 (86.0)	50 (100.0)
AMS institutional capacity to implement	1 (2.0)	6 (12.0)	43 (86.0)	50 (100.0)
AMS benefits patient care	1 (2.0)	1 (2.0)	48 (96.0)	50 (100.0)
AMS infection control important	1 (2.0)	0 (0.0)	49 (98.0)	50 (100.0)
AMS Infectious experts available	10 (20.0)	12 (24.0)	28 (56.0)	50 (100.0)
AMS only needs physicians	44 (88.0)	0 (0.0)	6 (12.0)	50 (100.0)
AMS quantify use is vital	1 (2.0)	6 (12.0)	43 (86.0)	50 (100.0)

Table 4: Prescriber AMS practices (n=44).

Practice	Agree (%)	Disagree (%)
Guidelines available	54	46
Access guidelines	72	28
Know where to get information to ensure provision of antibiotic properly	50	50
Follow up patients on AB	32	68
Antibiotic Choice based on cost	54	46
Training adequate	54	46
Access to hand hygiene facilities	66	34
Check with peers when uncertain	12	88
Patient pressure to prescribe	24	76
Fear of deterioration of the patient dictates the prescribing	64	36
Confident to advise colleagues	56	44
Knowledge sufficient to prescribe independently	72	28
Confident to follow guidelines	78	22
Confident to advise patients	76	24
Expect pharmacist to query	38	62
Lab results timely	74	26
Step-down IV → oral	46	54
Step-down broad → narrow	24	76
Restrictions impair care	18	82
Routinely very broad AB for drug -resistant organism	32	68

Table 6: Health facility initiatives on antibiotic awareness on AMS.

Level	Initiative	Frequency	%
In the organization	Awareness campaigns	26	52.0
	Antibiotic formulary	2	4.0
	CMEs (continuing medical education)	1	2.0
	Peer consults	1	2.0
	None	1	2.0

Prescribers attitude towards antimicrobial stewardship

Across themes as shown on Table 3 participants showed strong agreement that antimicrobial stewardship improves quality of care, benefits patients, reduces antibiotic use, and requires monitoring. Infection control was almost universally valued, while views on institutional capacity and the availability of infectious disease experts were more mixed. There was broad rejection of the idea that stewardship is only for physicians, reinforcing its recognition as a shared responsibility.

Prescribers practices towards antimicrobial stewardship

Most prescribers reported prescribing antibiotics frequently, with nearly 9 in 10 having prescribed them in the past week. Broad-spectrum antibiotics were used routinely by about half of prescribers, while four in ten reported only occasional use. Fear of patient deterioration and patient pressure both drove prescribing decisions, and almost six in ten acknowledged prescribing when the diagnosis was uncertain. However, only a minority reported stopping antibiotics earlier than planned. This is shown on Table 4.

Table 7: Health facility AMS practices from pharmacist's perspective.

Practice	More frequent (%)	Less frequent (%)
Supply antibiotics not recommended due to low stock	10	90
Provide less than recommended dose antibiotics	10	90
Query prescription without evidence	6	94
Doubts about antibiotic batch efficacy	10	90
Supply of antibiotic that are not in line with guidelines	10	90
Advise colleagues on antibiotic use	10	90
Pharmacist contribute to AMS strategies	10	90
Safe disposal of antibiotic	8	92
Involvement of pharmacist in collect data on antimicrobial use	8	92
Follow up patients supplied with antibiotic	10	90
Clinical activities (frequency)	10	90
Refer to STG when supplying	Rare (2)	98
Provide feedback to prescribers	2	98

As indicated on Table 5; additionally, in practice prescribers generally felt knowledgeable and confident to follow guidelines, advise patients, and prescribe independently. Access to guidelines and hand hygiene facilities was widely supported, and most valued timely laboratory results. Nonetheless, peer consultation when uncertain was uncommon, patients pressure to prescribe, step-down from broad to narrow-spectrum antibiotics was inconsistent, and reliance on pharmacists' queries was limited.

Health facility related factors associated with antibiotic prescribing among the out-patient department

Health facility utilization on knowledge on antimicrobial stewardship

When asked about initiatives on antibiotic awareness and resistance, participants most often mentioned organizational awareness campaigns, while fewer referred to formularies, continuing medical education, or peer consultations. At the national level, guidelines, toolkits, and media campaigns were the most prominent, with occasional mentions of events, professional activities, and world antibiotic awareness week.

Health facility practices on AMS

Pharmacists were best placed to give information on the practices within the facility on antimicrobial stewardship. This is represented on Table 7 whereby low frequency of stewardship practices overall. Supplying antibiotics in line with guidelines, advising colleagues, contributing to AMS strategies, or following up patients were performed by only about 1 in 10 pharmacists. Most did not routinely query prescriptions they felt had no evidence, did not dispose of antibiotics safely, nor collect antimicrobial use data. Feedback to prescribers was particularly rare.

On attitudes, very few pharmacists were confident to supply antibiotics independently or advise patients, and only a small proportion felt that protocols and systems supported them in stewardship roles. Concerns about antibiotic quality, patient pressure, and safe disposal were acknowledged but not widely acted upon. Overall, pharmacists' involvement in AMS appeared limited.

Emerging themes from general comments

Education and training

Respondents emphasized the importance of continuous education for prescribers.

Awareness and engagement

There was repeated emphasis on the need to sustain awareness and involvement of healthcare workers

Guidelines and resources

Respondents linked stewardship to the availability of resources and tools.

Laboratory support

Timely results were seen as essential for effective prescribing.

Community education

Some participants stressed the importance of informing the public to prevent misuse.

DISCUSSION

A high percentage of prescribers, 82%, indicated receiving knowledge in the rational use of antibiotics in the past year, with an equal number reporting that the

information had an impact and changed their practice. A similar study done in Kenya indicated that in the previous month, information on the rational use of antibiotics was highly shared through the internet (89%) and social media (65%).[15] A large number of prescribers 96%, agreed that antimicrobial stewardship improves patient care and reduces irrational use, while 98% cited infection prevention and control as important elements in antimicrobial stewardship. This is similar to a study in Nigeria showing that 83% noted poor infection prevention and control as a possible driver of antimicrobial resistance.[16] Additionally, prescribing was still shaped by patient pressure (84%) and an inclination toward broad-spectrum prescribing (70%), hence "playing it safe." Similar dynamics have been reported elsewhere where prescribers often "play it safe" by prescribing antibiotics in the face of uncertain diagnoses and where patient demand 67% strongly influences clinical decisions.[15,17]

It was noted that there is high prescribing of antibiotics among prescribers, with 9 in every 10 indicating that they prescribed an antibiotic within the last week. This is a similar trend in another hospital in Kenya, where 6-9 patients out of 10 were prescribed an antibiotic.[15]

From the study, most sought source of information for antimicrobial stewardship was local guidelines, used by 41% of respondents, followed by 29% relying on international guidelines and 27% relying on continuous medical education. A similar study in Kenya showed, 70% using international guidelines as a source of information, and 67% using local guidelines as a source of information.[15] Additionally, there was very low follow-up of patients on antibiotics, with only 32% of prescribers doing so, and seemingly low expectations of pharmacists' inquiries about prescriptions, with only 38% of respondents reporting such interactions. On the contrarily, only 24% of respondents reported stepdown from broad- to narrow-spectrum antibiotics, with similar findings echoed by tertiary hospitals in Vietnam.[18]

Concerning health facility-related factors, 82% of respondents noted that access to antibiotics without a prescription contributes to the irrational use of antibiotics. Additionally, a similar study done in Kenya showed that over-the-counter sales are major contributors to the irrational use of antibiotics, hence resistance.[15] The study highlighted health system weaknesses, including poor surveillance, inadequate diagnostics, and supply chain issues, with 50%, 58%, and 60% of prescribers respectively recording these as constraints to stewardship. This has also been echoed in other studies where poorly resourced surveillance systems, irregular drug supplies, and circulation of substandard medicines have been documented as major constraints in sub-Saharan Africa as well as enablers of antimicrobial resistance.[19,20]

Pharmacists showed limited involvement in antimicrobial stewardship, with minimal participation in guideline adherence, prescription review, data collection, and feedback to prescribers. Similar studies report poor utilization of treatment guidelines and formularies due to weak institutional enforcement and limited stewardship structures.[8,9,11]

Inadequate drug availability and frequent stockouts further restrict pharmacists' ability to support rational prescribing, often leading to reliance on available rather than recommended antibiotics similarly this has also been echoed in a study.[7] In terms of attitudes and responsibilities, microbiologist acknowledged issues such as antibiotic resistance to broad-spectrum antibiotics, the release of preliminary results, safe disposal practices, and potential contributions to irrational use of antimicrobial and eventually AMR. There was a similar trend in a study in Kisii, Kenya, where diagnostic stewardship was identified as a vital component of antimicrobial stewardship.[21]

CONCLUSION

Most respondents reported having between 1-4 years 40.0% or 5-9 years 40.0% of practice experience in their professional role. 82% participants reported receiving information on rational antibiotic use within the past year with all accepting it changed their views on irrational use. 96% participants showed strong agreement that antimicrobial stewardship and improves quality of care while 98% universally valued infection control. Nearly, 9 in 10 having prescribed antibiotics in the past week. Half rated surveillance adequate, but lack of diagnostics (58%), and supply interruptions (60%) were concerns. Guidelines were viewed as easy to apply (56%). Awareness campaigns were common at facility level (52%), while national initiatives emphasized guidelines (26%) and toolkits (24%). Pharmacists demonstrated low engagement in antimicrobial stewardship, with fewer than 10% routinely following guidelines, advising colleagues, or collecting antimicrobial use data. Confidence in supplying and advising on antibiotics was low, and feedback to prescribers was rare. Overall, stewardship practices were stronger in the laboratory than in pharmacy services.

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Ethical approval: The study was approved by the Jomo Kenyatta University of Agriculture and Technology (JKUAT) JKU/ISERC/02316/1419, Institutional Ethics Review Committee (ISREC) and National Commission of Science, Technology and Innovation (NACOSTI)-NACOSTI/P/25/415113

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