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'Some patients demand for a prescription of an antibiotic': an assessment of barriers and facilitators to rational antimicrobial use in a private health facility in Uganda

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Background: Antimicrobial misuse and overuse propagate antimicrobial resistance, yet data on factors influencing antibiotic prescription decisions in low-resource settings are limited. We describe factors influencing antimicrobial prescription at a large tertiary care private not-for-profit hospital in Uganda.

Methods: We conducted a descriptive phenomenology qualitative study involving face-to-face in-depth interviews of 12 purposively selected prescribers (four intern doctors, six medical officers and two Internal Medicine physicians) in a private not-for-profit hospital in Kampala, Uganda. Audio recordings and filed notes were transcribed verbatim and analysed manually by content analysis. Emerging themes and sub-themes were recorded and reported.

Results: Three broad themes emerged: experience with antimicrobial use in Uganda, barriers and facilitators to rational antimicrobial prescription and measures to address irrational antimicrobial use. Participants recognized that antibiotics are often used irrationally, prescribed even when there is uncertainty regarding clinical evidence for infection, and influenced by drug promoters, and noted high levels of antibiotic resistance. Patients' symptoms and clinical signs, previous experience using antibiotics, fear of bad outcomes, patient demand and expectations, influence from senior colleagues, the turnaround time of clinical investigations and drug marketers were the barriers and facilitators to antimicrobial prescription. Prescribers also acknowledged the need to update clinical guidelines, set up hospital antibiograms, and provide continuous medical education on rational antimicrobial use.

Conclusions: A complex interplay of intrinsic and extrinsic factors influences antibiotic prescribing decisions in this hospital. Targeted interventions through continuous education and training for prescribers, providing local prescription guidelines and antibiograms and implementing regulations on over-the-counter antibiotic sales are needed to implement robust antimicrobial stewardship programmes to curb antimicrobial resistance successfully.

Introduction

Antimicrobials are chemical substances of microbial origin that inhibit the growth or the metabolic activities of bacteria and other microorganisms, including bacteria, fungi, parasites and viruses.[1] They are indicated for prophylaxis and treatment of bacterial infections in various sites, notably the respiratory tract, urinary tract, CNS, gastrointestinal tract and focal infections.[1,2] With the advent of antimicrobials, many infectious diseases that were once considered incurable and lethal are now amenable to treatment.

Consequently, the global use of antimicrobials has exponentially increased, making them the most commonly prescribed drugs in human medicine. Worldwide, the use of antimicrobials

increased by 36% in healthcare in the first decade of the new millennium.[3] Between 2000 and 2015, global per capita consumption of 'watch antibiotics' increased by 90.9% mainly due to increased consumption in low-income and middle-income countries.[4] In Uganda, studies conducted in both public and private healthcare facilities have reported high antimicrobial prescription rates among outpatients and hospitalized patients.[5–7]

Unfortunately, there are reports of increasing resistance to these commonly prescribed drugs, and this is one of the emerging global health issues. For instance, in one review on antimicrobial resistance (AMR) covering Eastern African countries, Gram-negative and Gram-positive bacterial resistance to various antibiotics, particularly ceftriaxone, was very high.[8] In Uganda, various studies done among hospitalized patients have shown very high rates of AMR.[9–12] Multiple factors contribute to this increasing AMR such as antimicrobial misuse and overuse by providers in a variety of ways, including use in patients who are unlikely to have bacterial infections, unnecessarily prolonged periods of use and use of multiple agents or broad-spectrum agents when not needed.[13–15]

To reduce AMR, effective antimicrobial stewardship interventions should take into account factors that facilitate and hinder appropriate antimicrobial prescription. Such factors may apply to the patient, the physician, the care setting and the larger cultural and socio-economic context.[16] Decisions to prescribe antimicrobials are influenced by a multitude of factors including social norms and the healthcare provider's beliefs and emotions.[17,18] The diversity of these factors indicates that the decision to prescribe antimicrobials can be complex. Furthermore, antimicrobial use is driven by the prescribing habits of practitioners, which are dynamic and likely to change over time since they are affected by the patient, prescriber and external factors.[19] Therefore, continuously evaluating, identifying and addressing these factors are essential to achieve more sustainable improvements in antimicrobial use.[18] Mengo Hospital, located in Kampala, Uganda, is a private not-for-profit missionary hospital. It provides a wide range of healthcare services, including a fully stocked pharmacy that offers medicines at regulated prices. The hospital's operations are guided by the Ugandan Ministry of Health and the hospital's internal management structures.[20] The medicines and therapeutics committee of the hospital advises on the procurement and pricing of medicines including antimicrobial agents. There is a paucity of data on factors that influence antimicrobial prescription in private healthcare settings in Uganda. Using the theory of planned behaviour,[21] we hypothesize that healthcare providers' attitudes towards antimicrobial use, social norms on their prescribing practices and their perceived control over making informed decisions determine the antimicrobial prescription. In this study, we qualitatively investigated the barriers and facilitators to rational antimicrobial prescription among prescribers at a tertiary care hospital in Uganda.

Methods

Study design

We conducted a qualitative study utilizing a descriptive phenomenology approach among prescribers at a tertiary care private hospital between December 2019 and March 2020.

Study setting

Mengo Hospital is a tertiary care private not-for-profit faith-based hospital in Kampala, the capital city of Uganda, with a bed capacity of 300. The hospital receives about 100 000 outpatient consultations and admits about 10 000 patients every year. Generally, antimicrobials are prescribed by intern doctors (IDs), general practitioners and Internal Medicine physicians. IDs are doctors who have completed medical school but are working under supervision for 1 year before being fully licensed.

Study population

We enrolled 12 participants [two Internal Medicine physicians, six medical officers (MOs) and four IDs)] who regularly prescribe antimicrobials. The participants were regularly providing care to both outpatients and admitted patients at Mengo Hospital. These were recruited until data saturation.

Data collection

Purposive sampling was used to select study participants. Face-to-face in-depth interviews (IDIs) were conducted with prescribers to investigate their behaviour, prescribing culture and experiences regarding antimicrobial prescription in Mengo Hospital. The interviews were conducted by R.M., an adult male social scientist with training and prior experience in conducting qualitative interviews, and who had no prior contact and/or relationship with the interviewees. The duration of interviews varied from 23 to 41 min with a mean of 32 min overall (Internal Medicine physicians: 40 min, MOs: 33 min and IDs: 27 min).

We used semi-structured open-ended interview questions with flexible probes based on the interviewee's response. Questions addressed socio-demographics, experience prescribing antimicrobials and factors influencing antimicrobial prescription and were pilot-tested before research commencement. All interviews were conducted in a quiet room within Mengo Hospital during work breaks and were audio-recorded, transcribed verbatim and de-identified. Field notes were made and non-participants were not present during the interviews.

Data analysis

All transcripts were reviewed by the principal investigator for accuracy and completeness. The transcripts underwent familiarization, coding, formation of categories and themes, interpretation of themes and confirmation of the interpretation. Analysis of the data was performed thematically using deductive and inductive approaches for usefulness and flexibility.[22] The principal investigators and the research assistant initially read two different scripts independently to identify codes. The identified codes were discussed and discrepancies harmonized. At this point, codes that were identical were grouped together to form broader themes. A final coding framework was agreed upon based on the identified themes, and a coding matrix was developed in MS Excel where data were manually coded. Moving forward, the analysis team met regularly to discuss the patterns observed in the data as well as to harmonize coding discrepancies.

Results

We interviewed 12 participants (two Internal Medicine physicians, six MOs and four IDs). The majority of the participants were male (8/12). There was substantial variation in age (range 24–45) and years of professional experience (1–22) (Table 1).

Our interviews revealed three major themes related to the culture of antimicrobial prescription: (i) experience with antimicrobial use in Uganda, (ii) barriers and facilitators to rational

Table 1. Characteristics of study participants

Characteristic	Physicians ($n=2$)	MOs ($n=6$)	IDs ($n=4$)	Overall ($N=12$)
Sex				
Male	1	4	3	8
Female	1	2	1	4
Age (years)				
Mean (range)	41 (36–45)	30 (26–33)	26 (24–27)	30 (24–45)
Years of experience				
Mean (range)	16 (9–22)	4 (2–7)	1	6 (1–22)

antimicrobial prescription and (iii) measures to address the irrational use of antimicrobials.

Views on antimicrobial use in Uganda

Irrational use of antimicrobials

All study participants (12/12) believed that there is irrational use of antimicrobials in Uganda. They described a low threshold to initiate antimicrobials for patients without a definitive infection making antimicrobials the most commonly abused medicines despite the high levels of AMR. They indicated that many patients receive antibiotics when they are not necessary in cases such as viral infections as the following excerpts suggest:

> 'Ok, I believe there is an overuse of antibiotics for example when you are seated in an emergency ward, and you receive a patient who tells you that they have been on this drug. You ask him why were you given these drugs? They will always say that there was an infection that hasn't been specified'...MO-IDI-03-Female 30 years

> 'I think they are not used appropriately or rationally because... of course, we get patients who come with forms of their previous treatment, and someone comes and when you look at his form, he was given antibiotics for three days and I think three days is short'. MO-IDI-01-Male 26 years

Prescribed after thorough laboratory investigations

However, some of the participants (3/12) reported rational use of antibiotics. They revealed that antibiotics were appropriately used, and this followed a thorough investigation of the patient and thereafter prescribing these medicines in a proper way targeting the infection being investigated. This counteracts the previous narrative that antimicrobials are misused and irrationally used. The narratives of the people who thought there was proper use of antibiotics in Uganda are as follows:

> 'So, I take personal precautions to prescribe antibiotics when they are necessary. So, I usually choose an antibiotic based on what I think is the necessary or the probable cause of the infection so I choose an antibiotic in that line'. Physician-IDI-10-Female 36 years

High level of AMR

Participants reported a high prevalence of AMR, attributing this to the misuse of antibiotics. This misuse includes prescribing incorrect doses and using antibiotics for infections that do not require them, such as viral and fungal infections.

> 'IDI has been doing research on antibiotic resistance in some government facilities and they found a high level of resistance to some drugs we use in the government facilities. You will find these patients who have been attending government facilities also attend private facilities. so, you can't be so sure, you may find that it is much worse in private patients than in government patients because in private facilities, the patients are exposed to heavy-duty drugs like Meropenem'. MO-IDI-06-Male 32 years

Barriers and facilitators to rational antimicrobial prescription

The various barriers and facilitators to rational antimicrobial prescription were organized around the concepts of the Theory of Planned Behaviour, namely Attitudes, Subjective norms and Perceived behavioural control, and these were patient symptoms and clinical signs, patient demand, previous experience with antibiotics, influence from a senior colleague, results turnaround time, fear of bad outcomes and drug promoters (Figure 1).

Attitudes

Patient symptoms and clinical signs

The majority of study participants (10/12) revealed that fever was an indication that a patient required an antibiotic. Fever is a sign of infection likely bacterial in nature and thus requires treatment with antibiotics.

> 'So, usually when a patient has a fever, that tells you that your patient has an infection'. MO-IDI-07-Male 33 years

> 'First of all, for patients where I suspect or confirm an infection like someone who comes in and they have running fevers, but they don't have malaria and when I have not been able to do a complete blood count for such a patient, I would give an antibiotic'. ID-IDI-08-Female 26 years

Other signs such as crackles and bronchial breathing (which are suggestive of pneumonia) were also identified as influencers of antimicrobial prescription.

> 'If a patient comes to me as an out-patient with certain complaints and I find bronchial breathing or crepitations on physical examination which are signs of pneumonia, then I will prescribe an antibiotic'. ID-IDI-08-Female 26 years

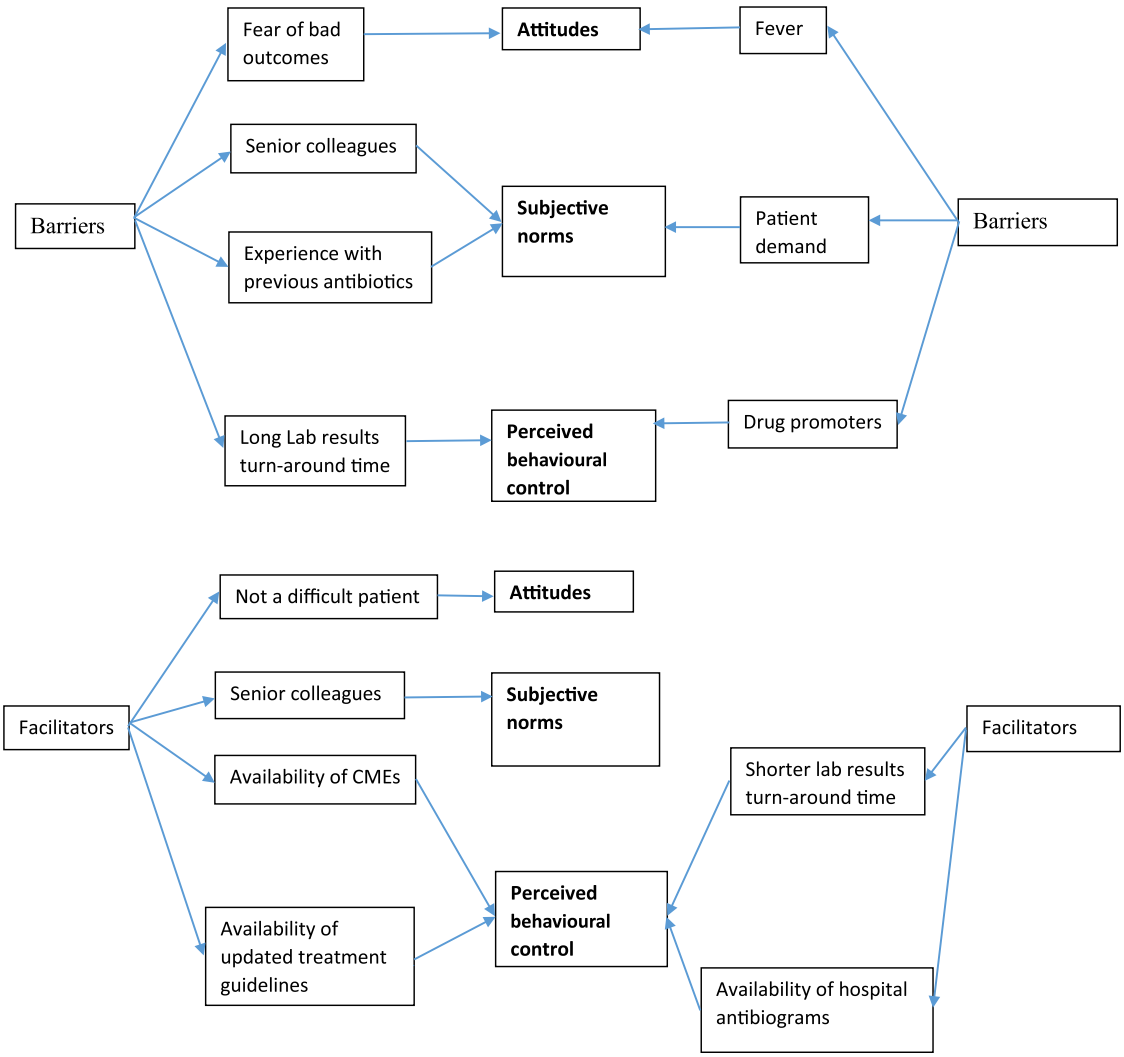

Figure 1. Barriers and facilitators of rational antimicrobial prescription.

Fear of bad outcomes

Narratives from our interviews indicated that antimicrobials may be prescribed to patients without a clear indication to avoid bad outcomes. They revealed that an antimicrobial would clear any infection that could have been missed just in case.

> 'Yes, almost all the time. When you do not find something to treat an antibiotic is always the opportunity'. MO-IDI-03-Female 30 years

> 'There's also another thing when you are in situations where you have no clue of what is happening to the patient but in your mind, you think that the patient has sepsis. Yet the patient has an underlying condition even though you are not a hundred percent sure but you are in a dilemma and say let me just throw in an antibiotic and by God's will it improves the patient's condition'. MO-IDI-06-Male 32 years

Furthermore, some healthcare professionals prescribe antimicrobials preventively to prevent other patients from acquiring infections while in the hospital.

> 'Yes, I would think so. Have also had a scenario as I told you when I was working on the ward and the people used to get very many infections from here and they say that it will be better if someone is on an antibiotic'. ID-IDI-08-Female 26 years

Previous experience using antibiotics

All study participants revealed that they tended to prescribe antibiotics that were efficacious in previous conditions even if there was no definitive evidence of infection. Therefore, if another patient presented with a similar condition, they would prescribe those antibiotics despite the lack of concrete evidence of infection.

> 'Yeah, it can mostly be when you have used a particular antibiotic and it worked perfectly, and the next time you would want to try it on a patient whose condition has failed to improve'. Physician-IDI-12-Male 45 years

> 'Of course, I have antibiotics I like to use because I think they are effective but that will still depend on the patient and the cost'. Physician-IDI-10-Female 36 years

Subjective norms

Patient demand and expectations

The study found that the majority (10/12) of the participants reported instances where patients demanded antimicrobials, particularly those who had previously used them and experienced positive outcomes or had heard favourable reviews from friends. Additionally, educated patients often specified the antimicrobials they desired, leading doctors to frequently yield to patient demands or expectations for antimicrobial prescriptions.

> 'Then also, another thing I will say is that you are driven by the patient demands, the patient comes to you with their prescription in mind telling you that at one time, they used that particular antibiotic and it worked for them and this time around, they would want you to make a prescription for them'. MO-IDI-06-Male 32 years

> 'Some patients come and they say that they want an antibiotic'. ID-IDI-11-Male 24 years

> 'The patients are quite pushy. They always tell you that if they give me these drugs, I feel better. Can't you write for me this drug? If a patient says something like that three times I just give up and say what, let me get this person off my back. Sometimes the patients push for the antibiotics, and you have to give them'. MO-IDI-05-Male 31 years

Many participants said that the patients expect them to prescribe antibiotics when they have spent money on consulting a doctor or even patients on an insurance scheme. Patients are not satisfied if they get just paracetamol which they could have taken on their own. That is why doctors prescribe antibiotics.

> 'Most of the patients we see in the private clinic are either on the insurance or they have been in the system before and if you don't give them an antibiotic they are going to demand one. They will ask, can't I have this? so sometimes you are torn between medical ethics and knowledge and the patient's demand'. MO-IDI-05-Male 31 years

Influence from senior colleagues

IDs and MOs (10/12) revealed that instructions from a senior doctor would influence them to prescribe antimicrobials even when they felt that they were not indicated in those particular conditions.

> 'It does because often a senior is a senior more so in the medical field even when you feel like you are not 100% sure but is your senior so you go with what he says'. ID-IDI-04-Male 26 years

> 'Of course, if I am getting advice from someone who has experience in the field and has used this medication, it will influence me. I can't deny if someone has given this medication to the patients, and it has worked. I don't mind. I learn because medicine is broad. So yeah, I can be influenced'. ID-IDI-08-Female 26 years

Unlike MOs who are a little more independent, we found that prescribing antimicrobials is harder for IDs. They have no choice but to always follow what the senior doctor on the ward prescribes. This seemed to suggest that even if an ID prescribes a particular antimicrobial, it is at the discretion of the senior doctor to refute it and replace it with the one of his or her choice.

> 'Yeah, pressure from senior colleagues, so sometimes, of course, the interns have to give the drugs that their supervisors prefer but for the medical officers at least we have some independence'. MO-IDI-07-Male 33 years

Perceived behavioural control

Results turnaround time

All study participants noted that some laboratory tests take several days to reveal results, e.g. blood cultures, and they could not wait to obtain the results before initiating patients on antimicrobial agents, yet these results would help determine the presence of an infection. Antimicrobials are therefore prescribed to prevent bad outcomes that may be associated with the delay.

> 'Of course, there are some tests that take long for example blood cultures so by the time blood is taken for a culture that may take 3-5 days, we would have put the patient on empirical drugs ... Like the broad-spectrum antibiotics'. MO-IDI-06-Male 32 years

Influence from drug marketers and pharmaceutical companies

Antimicrobial prescriptions that often diverge from clinical judgement were attributed to pharmaceutical influences. Narratives suggest antimicrobials may be prescribed due to marketing pressure from pharmaceutical companies. Medical representatives offer skewed studies and incentives, compelling doctors to prescribe antimicrobials without clear indications.

> '... for some of them before they bring out an antibiotic, they always talk with you then they also bring out evidence like the studies that have been carried out to back the use of a certain drug'. ID-IDI-02-Male 27 years

> 'Well, they come marketing their products with brochures, on top of that, they come with infringed benefits like pens, notebooks, and sometimes they give some commission or lunch'. ID-IDI-04-Male 26 years

Measures to address irrational antibiotic use

All participants (12/12) agreed that there is a need to address the irrational use of antimicrobial agents.

Updating guidelines

Participants revealed that they were aware of available guidelines that support antimicrobial use, for example, the Uganda Clinical Guidelines but noted the need to update them based on the current antimicrobial susceptibility patterns.

> 'We need to avail guidelines but as you avail guidelines they have to be revised or we need to frequently update them like two or three years and see what new patterns have come on board'. MO-IDI-06-Male 32 years

Hospital antibiograms

All participants noted that there is a need to develop local hospital antibiograms based on available updated antimicrobial susceptibility patterns. This is owed to the fact that susceptibility to

particular antibiotics changes from region to region as indicated in the following excerpts. Hospital antibiograms could further help to guide the development of local prescription guidelines.

> 'Institutional antibiograms are very important as I said. We use international anti-biograms but remember diseases are different, they behave differently in different populations and even antibiotic use is very different in different communities'. Physician-IDI-12-Male 45 years

> 'When prescribing an antibiotic, we should be guided by some susceptibility patterns within the localities of the area where we are living. We need to come up with guidelines on the use of antibiotics and keep updating them'. Physician-IDI-10-Female 36 years

Continuous medical education

Participants also indicated that continuous medical education (CME) sessions would be a good avenue to teach about appropriate antimicrobial use and resistance. CME provides healthcare professionals with updated knowledge and skills necessary for managing infections effectively.

> 'I think things like routine CMEs would be good avenues to keep emphasizing the point of proper antibacterial use'. MO-IDI-05-Male 31 years

Regulation

Some participants (4/12) also noted that there should be regulations that prohibit pharmacies and drug shops from selling antimicrobial agents as over-the-counter drugs.

Discussion

This study was carried out to investigate the factors that influence antimicrobial prescribing decisions among prescribers in a tertiary care private hospital in Uganda. Antimicrobial prescribing decisions were influenced by patients' symptoms and clinical signs, previous experience using antibiotics, fear of bad outcomes, patient demand and expectations, influence from senior colleagues, results turnaround time and drug marketers. In line with our findings, the results are reported from other studies done in public healthcare facilities in Uganda,[23–25] although data from private healthcare facilities are still lacking. Our findings are also similar to those reported from studies done in other low- and middle-income countries such as Tanzania[26] and Nigeria.[27]

Doctors described prescribing antimicrobials to patients who present with features such as fever and crackles, which may also present in other diseases that do not require antimicrobial agents[28] contributing to inappropriate antimicrobial prescriptions, a driver of AMR. Also, prescribers resort to antimicrobial prescription out of fear of adverse outcomes, often opting for a 'just in case' approach when faced with diagnostic uncertainty, contributing to antimicrobial misuse and overuse, thereby exacerbating AMR. Our interviews also revealed the strong influence senior staff had on prescribers' decisions to prescribe antimicrobials. Junior prescribers are likely not to follow antimicrobial prescription guidelines if they are not endorsed by their seniors. This emphasizes the importance of hierarchic influence in decision-making in medical care. Therefore, improving awareness and understanding of AMR and antibiotic prescribing should also target senior doctors. Furthermore, training in leadership skills and creating a positive working environment should be implemented to enhance decision-making processes.[29] Development of local antimicrobial stewardship programmes (ASPs) should therefore involve stakeholders at all levels for shared decision-making.[30] Prescribers described receiving financial incentives from drug promoters, impacting antimicrobial prescribing decisions as has been reported in studies done in other countries,[31–33] highlighting the pharmaceutical industry's influence on the healthcare system in low-income and middle-income countries.[34] Addressing this through prescriber education is crucial for promoting appropriate antibiotic use and stewardship interventions.[35]

The increase in antimicrobial consumption in low-income countries such as Uganda is driven in part by antimicrobial overuse and misuse,[36] which is, in turn, attributed to the factors that influence antimicrobial prescribing decisions.[13] Antimicrobial misuse and overuse lead to AMR, which is a global concern of both public health and human security.[37] Therefore, to mitigate AMR, interventions aimed at addressing the factors that influence antimicrobial prescription are needed.

The development and use of evidence-based local prescription guidelines by prescribers can help reduce the empirical prescription of unnecessary broad-spectrum antibiotics. This could also lessen the contribution of extrinsic factors such as influence from senior colleagues, drug marketers and previous experience using antibiotics on antibiotic prescription, as clinicians are likely to follow recommendations stated in the guidelines other than external influence while prescribing antibiotics. Furthermore, CME for doctors on rational antimicrobial use and dealing with difficult patients, and patient education on rational antibiotic use could help reduce patients' demand-driven antibiotic prescriptions. Patient education can be undertaken through media campaigns and health talks at the health facilities. Moreover, it has been found that frequent repetition of messages, brief written materials on rational antimicrobial use for physicians and patients and promotion in the mass media are the most effective strategies to reduce antibiotic prescribing.[38] Effective interventions such as academic detailing for doctors and guidelines supported by microbiological data on the presence of antibiotic resistance have been found to decrease inappropriate antibiotic practice.[39–41] These strategies can be easily implemented in Uganda as suggested by most doctors during our interviews. It is important to note that updating guidelines, developing local antibiograms and education alone may not address broader systemic factors such as financial incentives tied to antibiotic prescribing, lack of access to timely diagnostic tests and external pressures, e.g. patient demands. Additional interventions such as the implementation of comprehensive ASPs that include monitoring, feedback and multidisciplinary teams to guide prescribing decisions, patient-centered approaches in training healthcare providers in communication skills to manage patient expectations and to educate them on when antibiotics are not necessary and policy measures to regulate over-the-counter antibiotic sales would be more beneficial.

Findings from our study further demonstrate the influence of prescriber attitudes, behaviour and societal norms on antimicrobial prescribing decisions, which have been reported in several other studies.[17,23,27,30,42] In particular, patient demand for antibiotics has a strong influence in private healthcare due to several factors. Firstly, patients often expect antibiotics as a solution to

their ailments, and healthcare providers may feel pressured to prescribe them to meet patient expectations.[43] Secondly, patients may be more assertive about their treatment options because they meet the costs and this exacerbates the pressure on the healthcare provider. Thirdly, in some cases, not responding to the patient demand may lead to the healthcare provider being referred for disciplinary action or even job loss. Furthermore, private health facilities frequently profit from the sale of medicines, often through markups and the integration of in-house pharmacies.[44] Studies have highlighted that private for-profit healthcare providers in low- and middle-income countries tend to prioritize efficiency and responsiveness, including better drug availability than public facilities. However, this efficiency often comes with higher costs to patients due to markups on pharmaceuticals, contributing to the profitability of private providers. These practices are more prevalent in countries like Uganda where out-of-pocket payments for healthcare are common.[45] The similarity of these factors across different low-income and high-income countries suggests that a similar set of cultural factors influences antimicrobial prescription. Therefore, understanding these factors locally could help facilitate the development of effective antimicrobial stewardship interventions. Interventions designed to tackle prescriber attitudes and behaviour could be effective in reducing irrational antimicrobial use in Uganda.

This study adds valuable information on the influence of antimicrobial prescription from an area and setting of the world with limited data. It may be one of the first studies to investigate the barriers and facilitators to rational antimicrobial prescription in private tertiary care hospitals in Uganda. This could imply and depict real practice in many private tertiary care hospitals in Uganda.

Our study had some limitations. First, the prescribers' responses may not reflect their actual practice. Although all interviews were conducted by a non-medical person and kept confidential, participants may nonetheless have been inclined to give socially desirable responses. Second, this was a single-site study, and therefore, more data may need to be collected from other sites before generalizing the results.

Conclusions

A complex interplay of intrinsic and extrinsic factors influences antimicrobial prescribing decisions in this hospital. Targeted interventions through continuous education and training for prescribers to enhance diagnostic skills and promote evidence-based antimicrobial prescribing practices, providing local prescription guidelines and antibiograms and implementing regulations on over-the-counter antibiotic sales are needed for the successful implementation of robust ASPs in a bid to curb AMR.

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Transparency declarations

The authors declare no conflict of interest.

References

1 Katzung BG. *Basic and Clinical Pharmacology*. 14th edn. McGraw Hill Professional, 2017.

2 Ayele AA, Gebresillassie BM, Erku DA *et al*. Prospective evaluation of Ceftriaxone use in medical and emergency wards of Gondar university referral hospital, Ethiopia. *Pharmacol Res Perspect* 2018; **6**: e00383. https://doi.org/10.1002/prp2.383

3 Van Boeckel TP, Gandra S, Ashok A *et al*. Global antibiotic consumption 2000 to 2010: an analysis of national pharmaceutical sales data. *Lancet Infect Dis* 2014; **14**: 742–50. https://doi.org/10.1016/S1473-3099(14)70780-7

4 Klein EY, Milkowska-Shibata M, Tseng KK *et al*. Assessment of WHO antibiotic consumption and access targets in 76 countries, 2000–15: an analysis of pharmaceutical sales data. *Lancet Infect Dis* 2021; **21**: 107–15. https://doi.org/10.1016/S1473-3099(20)30332-7

5 Kizito M, Lalitha R, Kajumbula H *et al*. Antibiotic prevalence study and factors influencing prescription of WHO watch category antibiotic ceftriaxone in a tertiary care private not for profit hospital in Uganda. *Antibiotics* 2021; **10**: 1167. https://doi.org/10.3390/antibiotics10101167

6 Kiguba R, Karamagi C, Bird SM. Extensive antibiotic prescription rate among hospitalized patients in Uganda: but with frequent missed-dose days. *J Antimicrob Chemother* 2016; **71**: 1697–706. https://doi.org/10.1093/jac/dkw025

7 Mukonzo JK, Namuwenge PM, Okure G *et al*. Over-the-counter suboptimal dispensing of antibiotics in Uganda. *J multidiscip healthc* 2013; **6**: 303–10. https://doi.org/10.2147/JMDH.S49075

8 Ampaire L, Muhindo A, Orikiriza P *et al*. A review of antimicrobial resistance in East Africa. *Afri J Lab Med* 2016; **5**: 432. https://doi.org/10.4102/ajlm.v5i1.432

9 Kajumbula H, Fujita AW, Mbabazi O *et al*. Antimicrobial drug resistance in blood culture isolates at a tertiary hospital, Uganda. *Emerg Infect Dis* 2018; **24**: 174. https://doi.org/10.3201/eid2401.171112

10 Lubwama M, Phipps W, Najjuka CF *et al*. Bacteremia in febrile cancer patients in Uganda. *BMC Res Notes* 2019; **12**: 464. https://doi.org/10.1186/s13104-019-4520-9

11 Jung L, Kiwanuka J, Mbabazi L *et al*. A case for routine microbial diagnostics: results from antimicrobial susceptibility testing in post-traumatic wound infections at a Ugandan tertiary care hospital. *PLOS Glob Public Health* 2023; **3**: e0001880. https://doi.org/10.1371/journal.pgph.0001880

12 Nanyunja D, Chothia M-Y, Opio KC *et al*. Incidence, microbiological aspects and associated risk factors of catheter-related bloodstream infections in adults on chronic haemodialysis at a tertiary hospital in Uganda. *IJID Reg* 2022; **5**: 72–8. https://doi.org/10.1016/j.ijregi.2022.09.002

13 Holmes AH, Moore LS, Sundsfjord A *et al*. Understanding the mechanisms and drivers of antimicrobial resistance. *Lancet* 2016; **387**: 176–87. https://doi.org/10.1016/S0140-6736(15)00473-0

14 Pearson M, Chandler C. Knowing antimicrobial resistance in practice: a multi-country qualitative study with human and animal healthcare professionals. *Glob Health Action* 2019; **12**: 1599560. https://doi.org/10.1080/16549716.2019.1599560

15 Fletcher S. Understanding the contribution of environmental factors in the spread of antimicrobial resistance. *Environ Health Prev Med* 2015; **20**: 243–52. https://doi.org/10.1007/s12199-015-0468-0

16 Hulscher ME, van der Meer JW, Grol RP. Antibiotic use: how to improve it? *Int J Med Microbiol* 2010; **300**: 351–6. https://doi.org/10.1016/j.ijmm.2010.04.003

17 Charani E, Castro-Sánchez E, Sevdalis N *et al*. Understanding the determinants of antimicrobial prescribing within hospitals: the role of "prescribing etiquette". *Clin Infect Dis* 2013; **57**: 188–96. https://doi.org/10.1093/cid/cit212

18 Charani E, Edwards R, Sevdalis N *et al*. Behavior change strategies to influence antimicrobial prescribing in acute care: a systematic review. *Clin Infect Dis* 2011; **53**: 651–62. https://doi.org/10.1093/cid/cir445

19 Abubakar U. Antibiotic use among hospitalized patients in northern Nigeria: a multicenter point-prevalence survey. *BMC Infect Dis* 2020; **20**: 86. https://doi.org/10.1186/s12879-020-4815-4

20 Ministry of Health Uganda. Mengo Hospital [Internet], 2024. https://www.mengohospital.org/

21 Ajzen I. The theory of planned behavior. *Organ Behav Hum* 1991; **50**: 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

22 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006; **3**: 77–101. https://doi.org/10.1191/1478088706qp063oa

23 Kagoya EK, Van Royen K, Waako P *et al*. Experiences and views of healthcare professionals on the prescription of antibiotics in Eastern Uganda: a qualitative study. *J Glob Antimicrob Resist* 2021; **25**: 66–71. https://doi.org/10.1016/j.jgar.2021.02.019

24 Mambula G, Nanjebe D, Munene A *et al*. Practices and challenges related to antibiotic use in paediatric treatment in hospitals and health centres in Niger and Uganda: a mixed methods study. *Antimicrob Resist Infect Control* 2023; **12**: 67. https://doi.org/10.1186/s13756-023-01271-7

25 Yantzi R, van de Walle G, Lin J. The disease isn't listening to the drug': the socio-cultural context of antibiotic use for viral respiratory infections in rural Uganda. *Glob Public Health* 2019; **14**: 750–63. https://doi.org/10.1080/17441692.2018.1542017

26 Khalfan MA, Sasi P, Mugusi S. Factors influencing receipt of an antibiotic prescription among insured patients in Tanzania: a cross-sectional study. *BMJ Open* 2022; **12**: e062147. https://doi.org/10.1136/bmjopen-2022-062147

27 Ogoina D, Iliyasu G, Kwaghe V *et al*. Predictors of antibiotic prescriptions: a knowledge, attitude and practice survey among physicians in tertiary hospitals in Nigeria. *Antimicrob Resist Infect Control* 2021; **10**: 73. https://doi.org/10.1186/s13756-021-00940-9

28 Kasper D, Fauci A, Hauser S *et al*. *Harrison's Principles of Internal Medicine*. 19th edn. McGraw-Hill, 2015.

29 Warreman EB, Lambregts MM, Wouters RH *et al*. Determinants of in-hospital antibiotic prescription behaviour: a systematic review and formation of a comprehensive framework. *Clin Microbiol Infect* 2019; **25**: 538–45. https://doi.org/10.1016/j.cmi.2018.09.006

30 Weier N, Nathwani D, Thursky K *et al*. An international inventory of antimicrobial stewardship (AMS) training programmes for AMS teams. *J Antimicrob Chemother* 2021; **76**: 1633–40. https://doi.org/10.1093/jac/dkab053

31 Livorsi D, Comer A, Matthias MS *et al*. Factors influencing antibiotic-prescribing decisions among inpatient physicians: a qualitative investigation. *Infect Control Hosp Epidemiol* 2015; **36**: 1065–72. https://doi.org/10.1017/ice.2015.136

32 Machowska A, Stålsby Lundborg C. Drivers of irrational use of antibiotics in Europe. *J Environ Public Health* 2018; **16**: 27. https://doi.org/10.3390/ijerph16010027

33 Md Rezal RS, Hassali MA, Alrasheedy AA *et al*. Physicians' knowledge, perceptions and behaviour towards antibiotic prescribing: a systematic review of the literature. *Expert Rev Anti infect Ther* 2015; **13**: 665–80. https://doi.org/10.1586/14787210.2015.1025057

34 Brax H, Fadlallah R, Al-Khaled L *et al*. Association between physicians' interaction with pharmaceutical companies and their clinical practices: a systematic review and meta-analysis. *PloS One* 2017; **12**: e0175493. https://doi.org/10.1371/journal.pone.0175493

35 Lee C-R, Cho IH, Jeong BC *et al*. Strategies to minimize antibiotic resistance. *Int J Environ Res Public Health* 2013; **10**: 4274–305. https://doi.org/10.3390/ijerph10094274

36 Browne AJ, Chipeta MG, Haines-Woodhouse G *et al*. Global antibiotic consumption and usage in humans, 2000–18: a spatial modelling study. *Lancet Planet Health* 2021; **5**: e893–e904. https://doi.org/10.1016/S2542-5196(21)00280-1

37 Jenner A, Bhagwandin N, Kowalski SP. *Antimicrobial Resistance (AMR) and Multidrug Resistance (MDR): Overview of Current Approaches, Consortia and Intellectual Property Issues*. WIPO Global Challenges Report series, 2017.

38 Stille CJ, Rifas-Shiman SL, Kleinman K *et al*. Physician responses to a community-level trial promoting judicious antibiotic use. *Ann Fam Med* 2008; **6**: 206–12. https://doi.org/10.1370/afm.839

39 Persell SD, Doctor JN, Friedberg MW *et al*. Behavioral interventions to reduce inappropriate antibiotic prescribing: a randomized pilot trial. *BMC Infect Dis* 2016; **16**: 373. https://doi.org/10.1186/s12879-016-1715-8

40 Ranji SR, Steinman MA, Shojania KG *et al*. Interventions to reduce unnecessary antibiotic prescribing: a systematic review and quantitative analysis. *Med Care* 2008; **46**: 847–62. https://doi.org/10.1097/MLR.0b013e318178eabd

41 Meeker D, Linder JA, Fox CR *et al*. Effect of behavioral interventions on inappropriate antibiotic prescribing among primary care practices: a randomized clinical trial. *JAMA* 2016; **315**: 562–70. https://doi.org/10.1001/jama.2016.0275

42 Souza D, MacFarlane V, Murphy A *et al*. A qualitative study of factors influencing antimicrobial prescribing by non-consultant hospital doctors. *J Antimicrob Chemother* 2006; **58**: 840–3. https://doi.org/10.1093/jac/dkl323

43 Adorka M, Dikokole M, Mitonga KH *et al*. Healthcare providers' attitudes and perceptions in infection diagnosis and antibiotic prescribing in public health institutions in Lesotho: a cross-sectional survey. *Afri Health Sci* 2013; **13**: 344–50. https://doi.org/10.4314/ahs.v13i2.21

44 Basu S, Andrews J, Kishore S *et al*. Comparative performance of private and public healthcare systems in low-and middle-income countries: a systematic review. *PLoS Med* 2012; **9**: e1001244. https://doi.org/10.1371/journal.pmed.1001244

45 Morgan SG, Bathula HS, Moon S. Pricing of pharmaceuticals is becoming a major challenge for health systems. *BMJ* 2020; **l4627**: 368. https://doi.org/10.1136/bmj.l4627