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Prescribing behaviour and challenges in rational antibiotic use at a medical college teaching hospital, Kathmandu, Nepal

Binod Raut[1], Subash Pant[2], Mazum Pradhan[3], Anjan Khadka[4]

[1]Associate Professor, Department of Pharmacology;[2]Department of Medicine, Kathmandu Medical College and Teaching Hospital, Nepal
[3]Lecturer, Department of Pharmacology, Devdaha Medical College and Teaching Hospital, Nepal
[4]Associate Professor, Department of Pharmacology, Nepalese Army Institute of Health Sciences, Nepal

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Abstract

Introduction: In context of lower-middle income country like Nepal, a considerable proportion of antibiotics are prescribed irrationally, based on availability without proper diagnosis and culture sensitivity test. Thus this study aimed to assess the perception and prescribing practices of medical practitioners regarding antibiotic use.

Method: A descriptive cross-sectional study was conducted among 150 medical practitioners, including general physicians, specialists, and residents of a tertiary care teaching hospital from Aug 2024 to Jan 2025. Convenience sampling was applied to selected sample after obtaining the ethical clearance. Data were collected through self-administered questionnaire assessing demographic details, perception of antibiotic stewardship, prescribing patterns, and attitudes toward antimicrobial resistance. Descriptive statistics were used for analysis.

Result: Of the 150 respondents, 87(58%) were above 30 years, and 95(63.4%) were male. Most practitioners 98(65.4%) had less than 10 years of experience. While 124(82.66%) were aware of antibiotic prescribing guidelines. Only 62(41.33%) always prescribed antibiotics after culture and sensitivity tests, and 92(61.33%) preferred prescribing brand-name antibiotics over generic ones. The most commonly prescribed antibiotics were beta-lactams and fluoroquinolones and the most common indication was for respiratory infections. The primary reasons cited for irrational antibiotic prescription included lack of Antimicrobial Stewardship 35(23.33%), limited consultation time 32(21.33%), and inappropriate indication 31(20.67%). Most respondents 37(24.67%) emphasized the importance of regular trainings; continue medical education and workshops for improving prescribing behaviours.

Conclusion: The findings highlight improvements in antibiotic prescribing practices and the need for enhanced training programs, stricter adherence to prescribing guidelines, and increased diagnostic accuracy.

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Correspondence

Binod Raut, Department of Pharmacology, Kathmandu Medical College and Teaching Hospital Nepal. Email: binod14raut@gmail.com, Telephone: +977 9840050194

Introduction

Inappropriate use or overuse of antibiotics has led to bacterial resistance. The major factors for antibiotic resistance are excessive use of the antibiotics, over-the–counter availability and poor policies for infection control.[1-3] The prevalence of the use of antimicrobial agents varies from 24 to 67% in Nepal, and about 64% of the total antibiotics which are prescribed are either not indicated or are prescribed in incorrect dosages or are inappropriately prescribed.[4, 5]

Healthcare professionals struggle to respond to patients demanding antibiotics, even for viral infections, while also adhering to clinical guidelines to successfully manage Nepal's developing antibiotic resistance problem. To encourage sensible antibiotic usage while addressing regional healthcare problems, prescribers face limited diagnostic resources and a lack of AMS in their workplace. Various strategies have been proposed for the use of antibiotics to control the development of antibiotic resistance, like health care provider education, feedback activities, formulary replacement and rational use of antimicrobial agents all over the world.[6-8]

Improved awareness among the prescribers can promote the rational use of antibiotics. Hence, we considered it worthwhile to evaluate the insight of medical practitioners on prescribing behaviour and challenges in rational antibiotic use.

Method

A descriptive cross-sectional study design was carried out from Aug 2024 to Jan 2025 for six months at Kathmandu Medical College (KMC) Public Limited, which is a 500-bedded tertiary-level hospital of Kathmandu, Nepal, after obtaining ethical approval from the Institutional Review Committee (IRC) of KMC (Ref:05082024/05). Healthcare professionals who were directly involved in prescribing antibiotics and available at the time of data collection in outpatient departments of various specialities were included in the study. Intern doctors were excluded from the study.

A convenience sampling method was used. Questionnaires were distributed to the prescribers after obtaining written informed consent. A total of 170 practitioners available in various outpatient departments (OPDs), intensive care units and wards during the time of data collection were included. They were requested to fill out the questionnaire in their leisure time and were provided with the contact details of the researchers if they found any difficulties in understanding the statements. The questionnaires were collected from respective work settings, and those 150 who submitted the questionnaire on that stipulated time were only included in the study.

Data were collected using a self-administered questionnaire comprising three parts. Part one contained socio-demographic characteristics such as age, sex, medical qualification, number of practice years, number of patients seen per day, along with work settings and number of antibiotic prescriptions per day. Part two included ten closed-ended questions with options like yes/no/don't know; always, sometimes and never; weekly, monthly, occasionally and never.

Six questions were based on attitude, and eight questions (both open and closed-ended) were based on the practice of rational prescription of antibiotics, including the indication for using antibiotics, the name of antibiotics commonly prescribed, reasons behind the overuse of antibiotics and need for rationalising antibiotic use.

The content and construct validity of questionnaire was done by a pharmacologist, a microbiologist and physician. The face validity was performed with ten residents and five clinicians in their work settings. A questionnaire was modified as per the suggestions, and the Cronbach's alpha for internal consistency reliability was 0.78. The modification was mainly on framing the statements in a positive note concerning practice and inclusion of 'don't know', 'sometimes', and 'occasionally' in the options.

Data analysis was done with descriptive statistics to summarise socio-demographic data, prescribing patterns (diseases and drugs) and perceptions. It was conducted using SPSS version 22. The reasons for overuse of antibiotics and the perceptions on rationalising antibiotics use were listed and expressed in tabular form and a bar diagram.

Result

A total of 150 medical practitioners submitted the filled questionnaire. The number of male and female medical practitioners was 95(63.4%) and 55(36.6%), respectively. There were 87(58%) practitioners from the age group of more than 30 years, and 80(53.4%) were consultants with a postgraduate degree. Based on practice, 98(65.4%) were practising for less than 10 years and regarding the consultation, 78(52%) of them consult less than 25 patients per day. Based on work setting, 61.4% of medical practitioners were working at an outpatient department, Table 1.

Based on antibiotics prescribed, more than 10 antibiotics per day were prescribed by 16(10.4%) of medical practitioners and 52(34.7%) prescribed 5 to 10 antibiotics per day, whereas 82(54.6%) of them prescribed less than 5 antimicrobials per day. Regarding the frequency of antibiotics prescription, 56 (37.34%) of medical practitioners prescribed antibiotics weekly, 42(28%) prescribed daily, and 38(25.33%) prescribed monthly, Figure 1.

Among 150 medical practitioners, 124(82.66%) of prescribers were aware of current guidelines and World Health Organisation's (WHO) Access, Watch, and Reserve (AWaRe) classification of antibiotics, whereas 26(17.4%) were unaware of the guidelines and classification. Similarly, 84(56%) of them had attended a recent workshop or training on rational use of antibiotics, whereas 44(29.33%) hadn't attended any and 22(14.67%) were not aware of such trainings.

Regarding antibiotic resistance, 84(56%) of medical practitioners believed that skipping one or two doses may lead to antibiotic resistance, and 44(29.33%) did not believe in the development of resistance with skipping one or two doses, whereas 22(14.67%) did not know about it. The 67(44.67%) of medical practitioners believed that adverse effects of antibiotics did not reduce by using more than one antibiotic at a time but 56(37.33%) of them believed that adverse effects can be reduced by using more than one antibiotic at a time whereas 27(18%) of them were unaware about it. Of the 112(74.66%) prescribers perceived that injudicious use of antimicrobials doesn't shorten the duration of illness, but 22(14.67%) believed that it shortens the duration of illness, and 16(10.67%) were not aware of it. On inquiring how often they prescribe or modify antibiotics after culture sensitivity test, 62(41.33%) of the prescribers always prescribed after culture and sensitivity test, whereas 84(56%) did so only sometimes, and 4(2.67%) never used to do that. The follow-up advice was always given and strictly followed by 72(48%) of the prescribers, whereas 58(38.67%) advised for follow-up sometimes, and 20(13.33%) never asked their patients to strictly follow up. On updating the information on antibiotic use, 61(40.67%) read medical journals monthly, 57(38%) read occasionally, 14(9.33%) read weekly, but 18(12%) had never read a medical journal to update on antibiotic use.

The total variety of antibiotics which are usually prescribed by medical practitioners was 18 (mutually inclusive). The most commonly prescribed antibiotic group was beta-lactams (penicillins, cephalosporins, monobactams and carbapenems), followed by fluoroquinolones and macrolides, Table 2. The five antibiotics which were most widely prescribed were amoxicillin (alone and with clavulanic acid), ceftriaxone, azithromycin, ofloxacin and flucloxacillin. Most of the practitioners used to prescribe antibiotics in their brand name, 92(61.33%) and 58(38.67%) were prescribed in generic name.

The commonest conditions for the prescription of antibiotics were respiratory infections, followed by skin infections (cellulitis, wound infection, abscess and acne), fever (typhoid, dengue and pyrexia of unknown origin), urinary tract infections and gastrointestinal tract infections (infectious diarrhoea, dysentery and Helicobacter pylori-induced ulcer), Table 3.

Table 1. Sociodemographic of medical practitioners surveyed for prescribing behaviour and challenges in rational antibiotic use, n=150

Variables		n(%)
Age	Less than 30 years	87(58)
	More than 30 years	63(42)
Sex	Male	95(63.4)
	Female	55(36.6)
Medical qualification	MBBS	42(28)
	MD/MS	63(42)
	BDS	28(18.6)
	MDS	17(11.4)
Number of practices in years	Less than 10 years	98(65.4)
	More than 10 years	52(34.6)
Number of patients seen per day	Less than 25	78(52)
	26-50	58(38.6)
	More than 50	14(9.4)
Work setting	Out Patient Department (OPD)	92(61.4)
	Admitted patient (Ward)	36(24)
	Intensive care unit (ICU)	22(14.6)

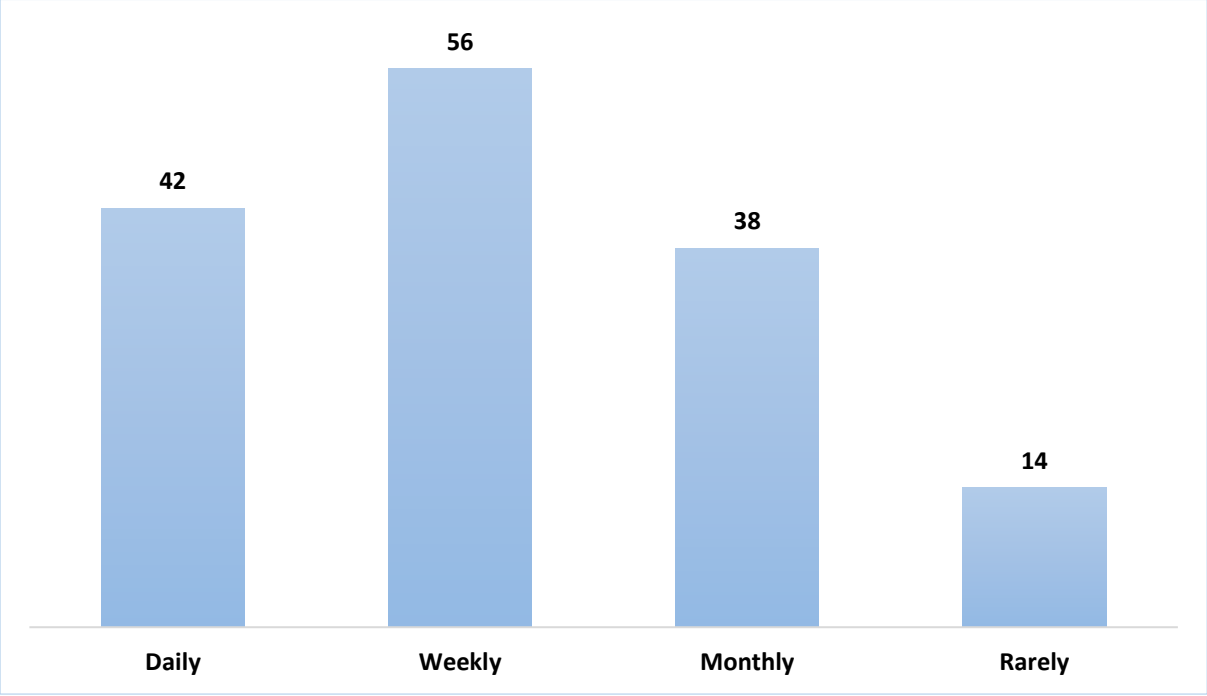

Figure 1. Frequency of antibiotic prescription by medical practitioners surveyed for prescribing behaviour and challenges in rational antibiotic use, n=150

Table 2. Commonly prescribed antibiotics by medical practitioners surveyed for prescribing behaviour and challenges in rational antibiotic use, n=150

Antibiotic group	Number of medical practitioners prescribing antibiotics	Commonly prescribed antibiotics
Penicillins	94	Amoxicillin and clavulanic acid (29), Amoxicillin (20), Flucloxacillin (18), Ampicillin (11), Cloxacillin (9), Piperacillin and tazobactam (7)
Cephalosporins	63	Ceftriaxone (33), Cefixime (15), Cefepime (9), Cefpodoxime (6)
Fluoroquinolones	45	Ofloxacin (21), Levofloxacin (18), Moxifloxacin (6)
Macrolides	34	Azithromycin (22), Clarithromycin (10), Roxithromycin (2)
Tetracyclines	17	Doxycycline (15), Minocycline (2)
Lincosamides	13	Clindamycin (12), Lincomycin (1)
Aminoglycosides	7	Amikacin (5), Gentamycin (1). Tobramycin (1)
Oxazolidinediones	7	Linezolid
Monobactams	5	Aztreonam
Sulfonamides	5	Silver sulfadiazine (4), Cotrimoxazole (1)
Carbapenems	5	Meropenem (3), Imipenem and Cilastatin (2)
Others	15	Metronidazole (3), Mupirocin (3), Neomycin (2), Albendazole (2), Primaquine (1), Artesunate (1), Polymyxin (1), Fluconazole (1)

Table 3. Common diseases and symptoms for which antibiotics were prescribed by medical practitioners, n=150

Disease's/conditions	n(%)
Respiratory tract infections (pneumonia, pharyngitis, acute exacerbation of chronic obstructive pulmonary diseases)	78(52)
Skin infections (cellulitis, abscess, abscess, acne)	54(36)
Fever (typhoid, dengue, malaria, pyrexia of unknown origin)	51(34)
Urinary tract infections	45(30)
Gastrointestinal infections (Infectious diarrhea and/or dysentery, Helicobacter pylori induced ulcer)	33(22)
Falls/injury/road traffic accident/Cut injuries	26(17.33)
Sepsis	17(11.33)
Rheumatic heart disease and endocarditis	6(4)
Oral infection/dental pain	5(3.33)
Others (sinusitis, scrub typhus, brucellosis, ascariasis, pelvic inflammatory diseases)	11(7.33)

About 35(23.33%) of medical practitioners felt that lack of AMS is the key reason for irrational use of antibiotics followed by limited consultation time 32(21.33%), inappropriate indications 31(20.67%), poor regulation and lack of strict policies 25(16.67%) and lack of standard laboratory 23(15.33%) and fear of treatment failure 22(14.67%), Figure 2. The other reasons included inadequate training, cultural beliefs, inconsistent laboratory reports, peer influence, hospital protocols.

Medical practitioners recommend strategies for reducing antibiotic resistance which included

training, workshops, and seminars 37(24.67%) on rational antibiotic usage, dissemination of local antimicrobial susceptibility patterns 30(20%), AMS programs 29(19.33%), formulary-based prescriptions 28(18.67%), regular antibiotic prescription audits and feedback 26(17.33%) and patient education and awareness for medication adherence 25(16.67%), Figure 3.

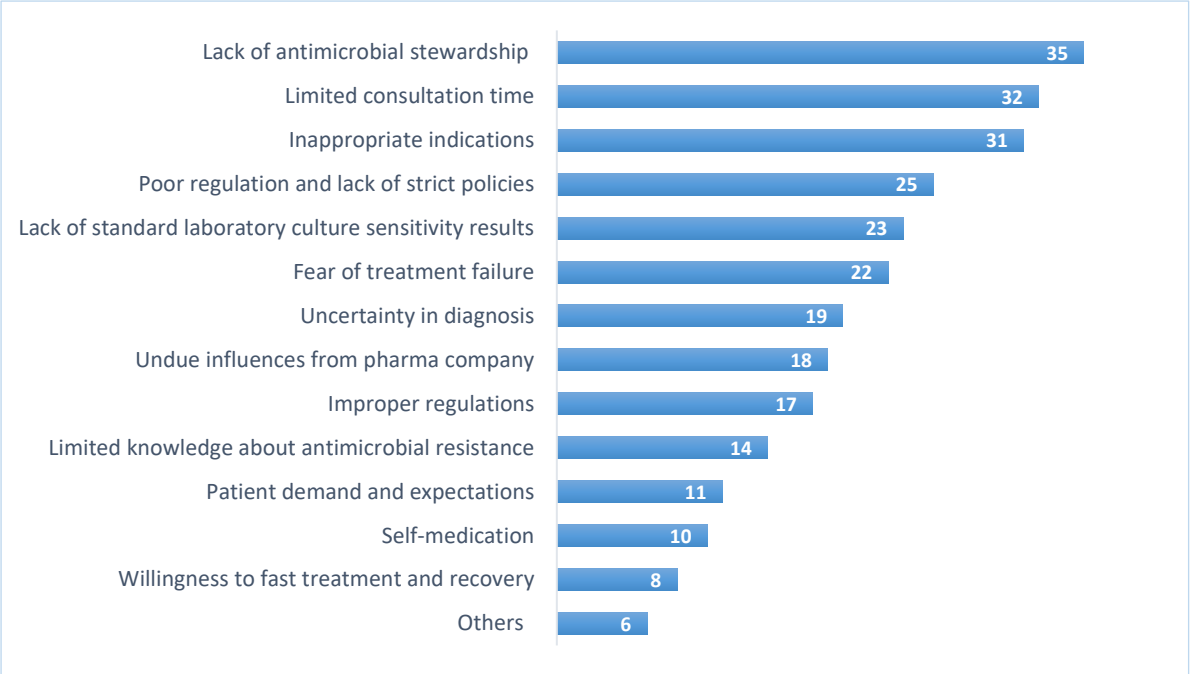

Figure 2. Medical practitioner's perceived reasons behind irrational use of antibiotics, n=150

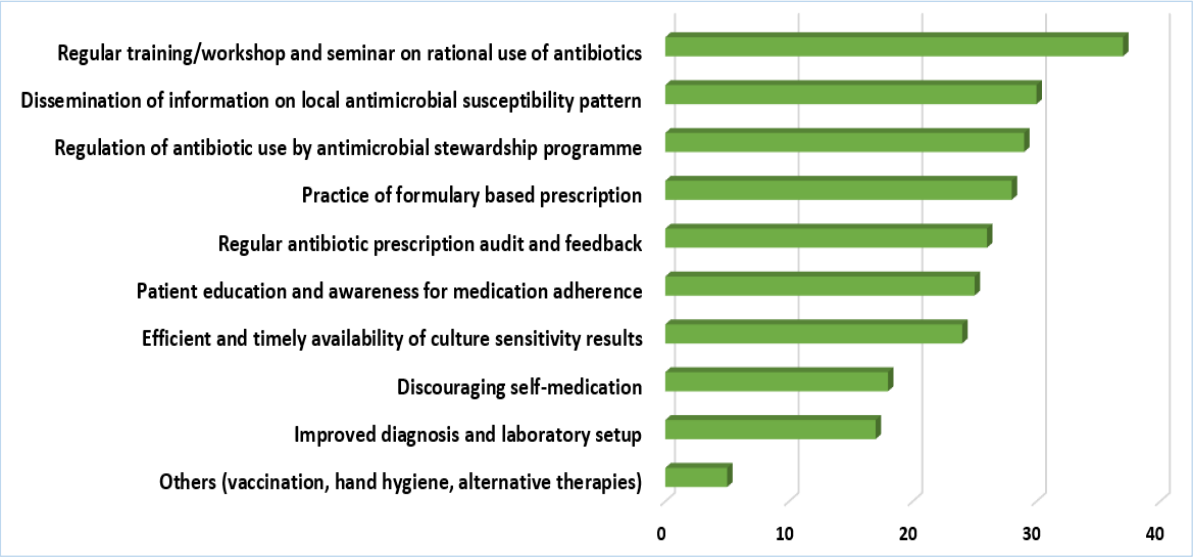

Figure 3. Medical practitioner's perception on implementation steps to rationalize antimicrobial use, n=150

Discussion

The present study provides valuable insights into the prescribing behaviour and challenges in rational antibiotic use. The findings highlight major aspects of demographics, consultation practices and antibiotic stewardship, which are crucial in defining antibiotic resistance and implementing rational prescribing. The majority were male and under 30 years old, which is similar to the previous studies suggesting that male physicians tend to be more actively involved in prescribing decisions.[9] The majority of prescribers were consultants and had fewer

than ten years of experience, which could impact on prescribing behaviours, experiences on patient counselling and adherence to guidelines, which is indicated in various studies where the respondents were consultants too.[10-13] The study emphasised variances in antibiotic prescribing practices, with the majority of practitioners prescribing fewer than five medicines each day. Notably, 82.66% were aware of the current rules and WHO's AWaRe categorisation. Furthermore, half of the practitioners had recently attended training on rational antibiotic use. These findings are in similarity with studies conducted in Nepal.[14-16]

The study demonstrated that medical practitioners had diverse opinions about antibiotic resistance and prescribing behaviours. While more than half thought skipping doses would lead to resistance. The opinions on combining antibiotics to reduce side effects were mixed. This indicates a potential misunderstanding in the resistance mechanism. Studies had emphasised that continuous use of medicine without skipping doses is more effective in the treatment as well as in preventing the development of resistance.[16,17] The majority agreed that injudicious antibiotic use does not reduce disease duration.

Around 40% of prescribers followed culture sensitivity tests at all times, while 56% did so on occasion which indicates that higher rate of prescription was done without culture and sensitivity test which justified over reliance on empirical treatment without diagnostic confirmation leads to use of inappropriate antibiotics and resistance and this finding is in lieu with findings from Nepal (67.50%).[14] About 48% rigorously gave follow-up counsel, while 38.67% did so infrequently. Counselling is essential for promoting sensible antibiotic use and reducing antimicrobial resistance. International study on a similar topic mentioned that effective patient counselling raises awareness of appropriate antibiotic use, adherence to prescribed regimens, and the risks of self-medication.[16]

According to studies, patient education about finishing antibiotic regimens lowers the chance of resistance and treatment failure.[16-20] Furthermore, counselling helps to dispel fallacies, such as the notion that drugs are useful against viral illnesses, and promotes appropriate sanitation and vaccination as preventive measures.[21] Healthcare practitioners should incorporate counselling into their daily practices to improve patient outcomes and combat antibiotic abuse.

In this study, most of the practitioners read medical journals monthly, while 12% never did, highlighting the importance of ongoing medical education. Similar findings revealed that 42% of physicians depended on journals for antibiotic updates, while a larger number (18%) never used them.[12,22] These comparisons demonstrate that while many practitioners realize the significance of staying current, gaps still persist, emphasizing the necessity for structured continuing education programs and workshops to encourage evidence-based antibiotic prescribing.[15, 22]

According to the survey, medical practitioners prescribed 18 different types of antibiotics, with beta-lactams (including penicillins, cephalosporins, monobactams, and carbapenems) being the most common, followed by fluoroquinolones and macrolides. The five most commonly prescribed antibiotics were amoxicillin, ceftriaxone, azithromycin, ofloxacin, and flucloxacillin. This tendency is similar to National trends and global trends, which reported that amoxicillin and ceftriaxone were among the most commonly prescribed antibiotics in their respective regions.[13,16,22]

A study on antimicrobial consumption and resistance in adult patients in 53 countries also reported beta-lactams, third-generation cephalosporins and fluoroquinolones as the top three antibiotics prescribed worldwide.[18] Furthermore, the study discovered that 61.33% of practitioners administered antibiotics by brand name, while 38.67% used generic names, which is greater than in previous studies by (only 50% prescribed generics), demonstrating a global heterogeneity in prescribing practices.[23]

Patient familiarity and marketing pressures may impact brand name selection. These findings highlight the need of promoting generic prescriptions to lower costs and enhance accessibility, in accordance with guidelines that advocate for the use of generic medications whenever possible.[23, 24]

The study discovered that respiratory illnesses were the most common reason for antibiotic prescriptions, followed by skin infections, fever, urinary tract infections, and gastrointestinal infections. This is consistent with findings from other study by and, who found that respiratory infections were the top cause of antibiotic prescriptions, particularly in primary care settings.[13,16] Similarly, pneumonia (19.2%), skin infections (9.8%) and intra-abdominal infections (7%) were reported by as most common reason for prescription of antibiotics.[25] Another study found that skin infections and UTIs were among the most common reasons for antibiotic use in Pakistan and reported respiratory system (40.70%) as commonest body system followed by gastrointestinal system (14.30%) for which antibiotics were prescribed in Nepal.[14,26] A study reported that the top five indications for antibiotic prescription—pneumonia or lower respiratory tract infections, skin and soft tissue infections, intra-abdominal infections, lower urinary tract infections, and upper urinary tract infections—accounted for 45.9%. and pneumonia as the most common indication, accounting 19·2% of the treated patients worldwide.[18] This global consistency in prescribing practices reflects how frequently these common conditions appear in clinical practice, as well as the established tendency to treat them with antibiotics, even when they are viral or self-limiting, emphasizing the need for increased awareness and stewardship.

According to the study, 23% of medical practitioners cited a lack of AMS as the primary reason for irrational antibiotic use, followed by limited consultation time (21.33%), inappropriate indications (20.67%), poor regulation and lack of strict policies (16.67%), a lack of standard laboratory facilities (15.33%), and fear of treatment failure (14.67%). These findings are consistent with global research highlighting the relevance of AMS in reducing unnecessary antibiotic prescribing. For example, a study discovered that a lack of effective stewardship programs was a major driver of illogical antibiotic usage in primary care settings.[16,27] Other contributing factors, such as insufficient training, cultural attitudes, and peer influence, were mentioned by a lower proportion (4%) of practitioners. These factors are also noted in several studies which indicated that peer influence and cultural factors play a role in antibiotic prescribing decisions, particularly in areas with limited access to ongoing education and training.[28-30] These findings highlight the importance of holistic interventions, such as increasing AMS programs, improving diagnostic capability, addressing time constraints, and raising healthcare provider education and awareness levels.

The study discovered that 24.67% of medical practitioners suggested training, workshops, and seminars to encourage rational antibiotic use, followed by the distribution of local antimicrobial susceptibility patterns (20%) and the creation of AMS programs (19.33%). Formulary-based prescriptions (18.67%), regular antibiotic prescription audits and feedback (17.33%), and patient education and medication adherence awareness (16.67%) were all stressed as antibiotic resistance prevention techniques. These findings are consistent with global recommendations and mirror similar techniques reported in other studies which underline the need of training and seminars in keeping medical practitioners up to date on the most recent data and antibiotic guidelines.[16,28,31]

Furthermore, AMS programs have been generally recognized as effective in decreasing antibiotic overuse, as stated in research with findings that stewardship improved prescribing behaviour by monitoring and providing feedback to doctors.[28,32] The strategies recommended by medical practitioners in this study are evidence-based practices aimed at promoting rational antibiotic use and combating antimicrobial resistance, which align with global recommendations from organizations such as the World Health Organization (WHO) and the

Centres for Disease Control and Prevention (CDC).[5,21,25,32]

This study sheds the factors that influence antibiotic prescribing behaviour, as well as the difficulty of promoting rational antibiotic use. The findings underline the importance of ongoing education, strong AMS programs, and improved diagnostic methods in reducing unnecessary antibiotic usage and combating antibiotic resistance. The study emphasizes the importance of addressing barriers such as limited consultation time, insufficient training, and ineffective policies, as well as promoting strategies such as training workshops, evidence-based prescribing, and patient education, to ensure long-term improvements in prescribing practices. These measures are critical for integrating local practices with global recommendations and improving patient outcomes worldwide.

Conclusion

This study found that more than three quarters of doctor prescribers surveyed were aware of current guidelines for rational antibiotic use. The findings suggested the need for address barriers like limited consultation time, continued training updates, and effective policies, guidelines in place together with patient awareness campaigns to improve rational use of antibiotic.

Author contribution

Concept design: BR, SP, MP, AK; Literature search: BR, SP, MP, AK; Data collection: BR, SP Data analysis: BR, AK, SP, MP; Draft manuscript: BR, SP, MP, AK; Final manuscript and accountability: BR, SP, MP, AK

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Conflict of interest

None

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None

Supplementary material

The data and supplementary material that support the findings of this study are available from the corresponding author upon reasonable request.

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