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Research Article

Antibiotic Prescription Patterns in Pediatric Care and Impact of Parent Counseling by Pharmacist in Outcome of Pediatric Treatment

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ABSTRACT

Inappropriate antibiotic prescribing and usage in pediatric healthcare remain prevalent in Nepal, contributing to antimicrobial resistance. This cross-sectional observational study investigated antibiotic prescription patterns in government and private hospitals in the Chitwan District and evaluated the efficacy of pharmacist-led parent counseling interventions. The study encompassed prescription pattern analysis and assessment of post-counseling outcomes, measuring changes in parental knowledge, attitudes, and practices (KAP) regarding antibiotic use. Results demonstrated distinct prescribing patterns between hospital types, with parental literacy correlating with private hospital preference. Post-intervention analysis revealed significant improvements in KAP scores ($p < 0.05$), particularly in private hospital settings, manifesting as enhanced antibiotic adherence and reduced inappropriate use. These findings suggest that pharmacist-led interventions effectively improve antibiotic stewardship and indicate the need for standardized prescribing protocols across healthcare sectors.

Introduction

Antibiotics play a critical role in pediatric care, particularly in treating bacterial infections such as pneumonia, otitis media, and urinary tract infections. In children whose immune systems are still developing, bacterial infections can escalate quickly, making timely antibiotic intervention crucial for preventing complications, reducing mortality, and promoting faster recovery. The use of antibiotics is often necessary to treat life-threatening conditions and prevent the spread of infections within communities.[1] In developing countries like Nepal, where healthcare access is limited, antibiotics are crucial for managing bacterial infections, particularly in rural areas. They are essential in pediatric care and frequently prescribed to treat various infections.[2]

Antibiotic misuse in pediatric care is a significant concern in developing countries like Nepal, where healthcare systems face challenges such as limited diagnostic tools, weak regulations, and restricted access to professionals.[3] Overprescription and improper use contribute to antibiotic resistance, with children at risk of developing resistant strains early in life, limiting future treatment options.[4] Antibiotics are often overused for viral infections like colds, driven by diagnostic uncertainty or parental pressure, which fuels resistance and exposes children to unnecessary side effects.[5] Misuse also increases the likelihood of adverse drug reactions, such as diarrhea, allergies, and severe conditions like Stevens-Johnson syndrome.[6]

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Inconsistent adherence to prescribed regimens due to economic constraints or lack of awareness fosters resistance and infection recurrence.[7] Frequent antibiotic use disrupts the developing gut microbiota in children, potentially causing long-term health issues like infections, allergies, and autoimmune disorders.[8] Nepal's lack of rapid diagnostics, public awareness, and resources in government hospitals, along with economic incentives in private settings, further drive empiric and unnecessary antibiotic use.[9]

Antibiotic resistance is a critical global health threat with severe implications for pediatric care. The World Health Organization (WHO) identifies antimicrobial resistance (AMR) as a top global concern, warning that by 2050, antibiotic-resistant infections could cause 10 million deaths annually if current trends persist. Overuse and misuse of antibiotics, including over-prescription, poor adherence, and agricultural non-medical use, are major drivers of resistant "superbugs."[10]

In pediatrics, antibiotic resistance poses unique challenges. Children, being more vulnerable to infections, have fewer approved antibiotic options than adults. Resistance limits treatment choices, often requiring the use of stronger, costlier, or more toxic drugs with severe side effects.[11] It also increases morbidity and mortality, as previously manageable pediatric infections may lead to extended treatment, hospitalization, or death in severe cases.[12] Moreover, resistant infections often prolong hospital stays, elevating the risk of hospital-acquired infections, which are also challenging to treat.[13]

Nepal's healthcare system is a mix of government-funded public services and private sector facilities. The system faces numerous challenges, including limited resources, inadequate infrastructure, and a shortage of healthcare professionals, particularly in rural areas. While healthcare is theoretically accessible to all citizens through public health services, many people rely on private healthcare for quicker, more specialized treatment.[14]

In the Chitwan district, which is located in the southern part of Nepal, healthcare services reflect this national structure, with both government and private hospitals playing key roles in providing medical care to the population. Chitwan has seen significant growth in its healthcare infrastructure over the years, partly due to its strategic location and the increasing demand for medical services from both local residents and people from neighboring districts.[15]

Government hospitals in Chitwan provide free or subsidized healthcare but face challenges in antibiotic prescription compared to private hospitals. Limited diagnostics in government facilities often lead to empirical prescriptions, while private hospitals, with more resources, prescribe broader-spectrum antibiotics, sometimes influenced by parental demands.[16,17] High patient loads in government hospitals restrict parent counseling, increasing misuse risks, whereas private hospitals offer more education but may still overprescribe under pressure.[18,19] Antibiotic stewardship is more common in well-funded private hospitals, while resource constraints hinder its implementation in government facilities.[20-22]

Pharmacists are key to antibiotic stewardship in pediatrics, educating parents on proper use, dosage, and side effects to ensure safe, effective treatment and reduce resistance.[23-25]

Pharmacists play a crucial role in antibiotic stewardship by educating parents, ensuring proper dosage and adherence, counseling on side effects, preventing misuse, collaborating with healthcare providers, and offering follow-up support.[26]

Pharmacists in Nepal face challenges such as low public awareness, over-the-counter antibiotic sales, resource limitations, and inadequate training.[27] Despite these hurdles, pharmacist-parent counseling significantly improves pediatric outcomes by reducing misuse, enhancing adherence, and achieving better health results.[28]

Pharmaceutical Advantage of the Study in the Present Scenario

This study addresses a critical gap in pediatric antibiotic use by focusing on the prescription practices of pediatricians and the potential benefits of pharmacist-led counseling. In the present scenario, where antimicrobial resistance (AMR) is a growing global health threat, understanding the dynamics of antibiotic prescriptions in government versus private hospitals can help identify areas for intervention and standardization. Moreover, involving pharmacists as key educators in pediatric care not only promotes rational antibiotic use but also enhances adherence and outcomes through targeted parent counseling. These findings will provide actionable insights for implementing antibiotic stewardship programs, optimizing pediatric treatment protocols, and reducing the burden of AMR, particularly in resource-limited settings like Chitwan, Nepal. This aligns with global efforts to preserve antibiotic efficacy and improve pediatric healthcare delivery through multidisciplinary collaboration.

Research on antibiotic prescription habits is crucial to address AMR, especially in pediatric populations. While studies like Shankar *et al.* (2006) and Basnet *et al.* (2019) highlight prescribing patterns and differences between public and private hospitals in Nepal, there remains a lack of region-specific data for Chitwan.[29, 30] Moreover, few studies have directly compared antibiotic practices across healthcare settings, and the role of pharmacist-led counseling in improving adherence and knowledge in Nepalese pediatric care is still underexplored.[31] The primary objective of this study is to evaluate antibiotic prescription habits of pediatricians in government

versus private hospitals in Chitwan, identifying patterns, variations, and drivers of inappropriate use. The secondary objective is to assess the impact of pharmacist-led parent counseling on pediatric treatment outcomes, focusing on improving adherence to antibiotic courses and enhancing parental understanding to reduce self-medication and overuse.

Materials And Methods

Study Design

A cross-sectional observational study is conducted to compare the antibiotic prescription patterns of pediatricians in government and private hospitals in Chitwan with a component of prospective pharmacist intervention.

Study Setting

Hospitals in Chitwan district (both government and private).

Study Population

The children (ages 0–12) admitted in the in-patient department, treated for common infection sand parents of these patients.

Sampling Method

Random sampling of the in-patients cardex is used to select prescriptions from both government and private hospitals over a 6-month period.

Study Criteria

Inclusion criteria

- Patients who were willing to participate in the study.
- Both male and female paediatric patients who were prescribed with antibiotic drugs.
- Patient admitted in hospital with infective disease.
- Use of antibiotics.

Exclusion criteria

- Patients who were not willing to participate in the study.
- Patients with non-infective disease.
- Patients with co-morbidities or critically ill.
- Patients using antibiotic for prophylaxis purpose.

Data Collection Tools and Procedure

- Review of in-patient cardex for antibiotic prescription patterns.
- Intervention: Pharmacist-led counseling sessions with parents on antibiotic use.
- Follow-up data on treatment adherence and outcomes.

The question was initially written in English and later translated into Nepali. The questionnaire was evaluated and reviewed. All data was initially recorded manually on paper and then entered into Microsoft Excel for storage. The data were analyzed using the Statistical Package for the Social Sciences version (IBM SPSS Statistics).

Tool validity and reliability

To ensure the validity and reliability of the tool for this study, it was undergo expert review to confirm content validity, and a pilot test was conducted to assess construct validity and identify any issues. The tool's reliability was evaluated through test-retest and inter-rater consistency, and internal consistency was measured using statistical methods like Cronbach's alpha to ensure accurate and consistent data collection.

Results

Evaluation of antibiotic prescription habits of pediatricians in government *vs.* private hospitals in Chitwan

Details of Patient Distribution based on Gender

This indicates a fairly balanced gender representation in both sectors, although males are slightly more likely to visit private hospitals (Table 1).

Patient Distribution based on Different Age Groups

This suggests that younger children (especially infants) are more frequently brought in for treatment, particularly in private hospitals (Table 2).

Patient Distribution based on Literacy Rates of Parents

This may suggest that literate parents tend to prefer private hospitals for their children's treatment (Table 3).

Patient Distribution based on Diseases Diagnosed in the Government Hospital

The most common diagnosed conditions in both hospital types are colds and fever. Other conditions such as nose drainage, sore throat, and cough also show comparable distribution across both hospital types (Table 4).

Current Treatment Practice with Antibiotics in Hospitals

In both hospitals, the most frequently prescribed antibiotic is amoxicillin + clavulanic acid, prescribed to 69% of government hospital patients and 61% of private hospital patients. Cephalosporins like cefixime are the second most common, accounting for 19 and 25% of prescriptions, respectively. This suggests a heavy reliance on broad-spectrum antibiotics, particularly for upper respiratory tract infections (Table 5).

Current Treatment Practice with Antibiotic Combinations in Hospitals

The most common fixed-dose antibiotic combination in both hospital types is amoxicillin and clavulanic acid, prescribed to 69% of government hospital patients and 75% of private hospital patients. Single-dose

Table 1: Details of patient distribution based on gender

S. No.	Gender	Government hospital		Private hospital	
		No. of patients (N = 155)	%	No. of patients (N = 106)	%
1	Male	81	52	63	59
2	Female	74	48	43	41
Total		155	100	106	100

Table 2: Patient distribution based on different age groups

S. No.	Age group (years)	Government hospital		Private hospital	
		No. of patients (N = 155)	%	No. of patients (N = 106)	%
1	0–2	45	29	33	31
2	3–4	28	18	20	19
3	5–6	19	12	19	18
4	7–8	20	13	16	15
5	9–10	24	15	12	11
6	11–12	19	12%	6	6
Total		155	100%	106	100

Table 3: Patient distribution based on literacy rates of parents

S. No.	Category	Government hospital		Private hospital	
		No. of patients (N = 155)	%	No. of patients (N = 106)	%
1	Literacy	28	18	41	39
2	Illiteracy	127	82	65	61
Total		155	100	106	100

Table 4: Patient distribution based on diseases diagnosed in government hospital

Diseases	Government hospital		Private hospital	
	No. of patients (N = 155)	%	No. of patients(N = 106)	%
Cold	42	27	31	29
Nose Drainage	24	15	18	17
Sore Throat	19	12	12	11
Cough	16	10	11	10
Vomit	8	5	6	6
Fever	35	23	22	21
Ear Pain	11	7	6	6
Total	155	100	106	100

treatments are less common, particularly in private hospitals, where only 22% of patients receive a single dose, compared to 28% in government hospitals. This reflects a preference for combination therapy in treating infections (Table 6).

Assessment of the impact of pharmacist-led parent counseling on pediatric treatment outcomes, focusing on adherence to antibiotic courses and understanding of antibiotic use.

Distribution of Participants by Socio-demographic characteristics for Both Hospital

Both hospitals have a higher proportion of female parents, with 58% in government and 60% in private hospitals. Male parents account for 42 and 40%, respectively. The majority of parents are in the 21 to 30 and 31 to 40 age groups. Government hospitals see more parents aged 21 to 30 (60%), while private hospitals have more parents aged 31 to 40 (53%). Hinduism is the dominant

Table 5: Current treatment practice with antibiotics in hospitals

Prescribed antibiotic	*Classification of antibiotic*	*Indication for use*	*Duration therapy days*	*No. of patients (n=155)*	*%*	*No. of patients (n=106)*	*%*
Amoxicillin + clavulanic acid (generic name)	Penicillin	Upper respiratory tract infection, acute tonsilitis pharyngitis, acute sinusitis	7	107	69	65	61
Amoxyclav, Indiclav DS (brand name)							
Ceftriaxone							
Meropenam							
Cefixime (generic name)	Cephalosporin	Upper and lower respiratory tract infections	5	29	19	27	25
Cefolac, Taxone P (brand name)							
Azithromycin (generic name)	Macrolides	Bronchiolitis	10	4	3	6	6
Azithro (brand name)							
Amoxicillin (generic name)	Penicillin	Acute otitis media, community acquired pneumonia	7	7	5	4	4
Cefpodoxime + clavulanic acid (generic name)	Cephalosporin	Urinary tract infection	7	5	3	3	3
Ciprofloxacin	Fluroquinolone	Typhoid fever	7	3	2	1	1
Total				155	100	106	100

Table 6: Current treatment practice with antibiotic combinations in hospitals

Fixed dose combination	*No. of patients*	*Percentage (%)*	*No. of patients*	*Percentage (%)*
Amoxicillin and clavulanic acid	107	69	79	75
Cefpodoxime and clavulanic acid	5	3	3	3
Single dose	43	28	23	22
Total	155	100	105	100

religion in both hospital types, with 97% in government hospitals and 89% in private hospitals. Private hospitals show slightly more religious diversity. Upper caste groups form the largest proportion in both settings (43%). Dalits are also well-represented, making up 30% in government and 29% in private hospitals. Private hospitals have a more educated parent base, with 36% having basic literacy and 17% holding university degrees, compared to 15 and 5%, respectively, in government hospitals (Table 7).

KAP Scores

Knowledge levels before and after pharmacist mediated parents counseling for government & private hospitals (Fig. 1).

Overall knowledge improvement

There is a noticeable increase in knowledge levels in both private and government hospital groups after the counseling. In particular, private hospitals show a higher percentage increase in the "Yes" responses across most categories, indicating that the intervention was more effective in these settings.

Identification of antibiotics

The recognition of antibiotics, including commonly used drugs like amoxicillin, improved in both groups, with private hospital parents showing a significant increase in correct identification. This suggests that counseling was effective in clarifying basic antibiotic information.

Knowledge of antibiotics' role

Knowledge about the role of antibiotics in treating infections, particularly distinguishing between bacterial and viral infections, also improved notably. The misconception that antibiotics are necessary for conditions like colds and flu saw a marked decrease post-counseling in both hospital settings.

Table 7: Distribution of participants by socio-demographic characteristics for hospital

Variables	*Government hospital*		*Private hospital*	
	Frequency (n = 100)	*(%)*	*Frequency (n = 96)*	*(%)*
Gender				
Male	42	42	38	40
Female	58	58	58	60
Total	100	100	96	100
Age of participants				
≤ 20 Years	4	4	2	2
21 – 30 Years	60	60	43	45
31 – 40 Years	36	36	51	53
Total	100	100	96	100
Religion				
Hindu	97	97	85	89
Christian	1	1	5	5
Buddhist	1	1	2	2
Muslim	1	1	4	4
Total	100	100	96	100
Ethnicity/Caste Group				
Upper cast group	43	43	41	43
Dalit	30	30	28	29
Disadvantage janajati	18	18	14	15
Relatively advantage janajati	8	8	9	9
Religious minorities	1	1	4	4
Total	100	100	96	100
Educational level of Participants				
Illiterate	4	4	3	3
Literate	15	15	35	36
Basic	40	40	22	23
Secondary	33	33	8	8
College	3	3	12	13
University degree	5	5	16	17
Total	100	100	96	100

Side effects of antibiotics

Awareness of the potential side effects, such as elimination of good bacteria and secondary infections, improved substantially, especially in private hospitals. This highlights the effectiveness of the counseling in educating parents on the risks associated with antibiotic misuse.

Misuse and antibiotic resistance

The understanding of antibiotic resistance and the consequences of misuse improved in both groups, with a more significant improvement in private hospital participants. This indicates that parents became more aware of the long-term risks of antibiotic misuse following counseling.

Antibiotic usage practices

There was a substantial decrease in the belief that leftover antibiotics could be reused or that they should be kept for future illnesses. Both groups showed increased understanding that antibiotics should not be discontinued

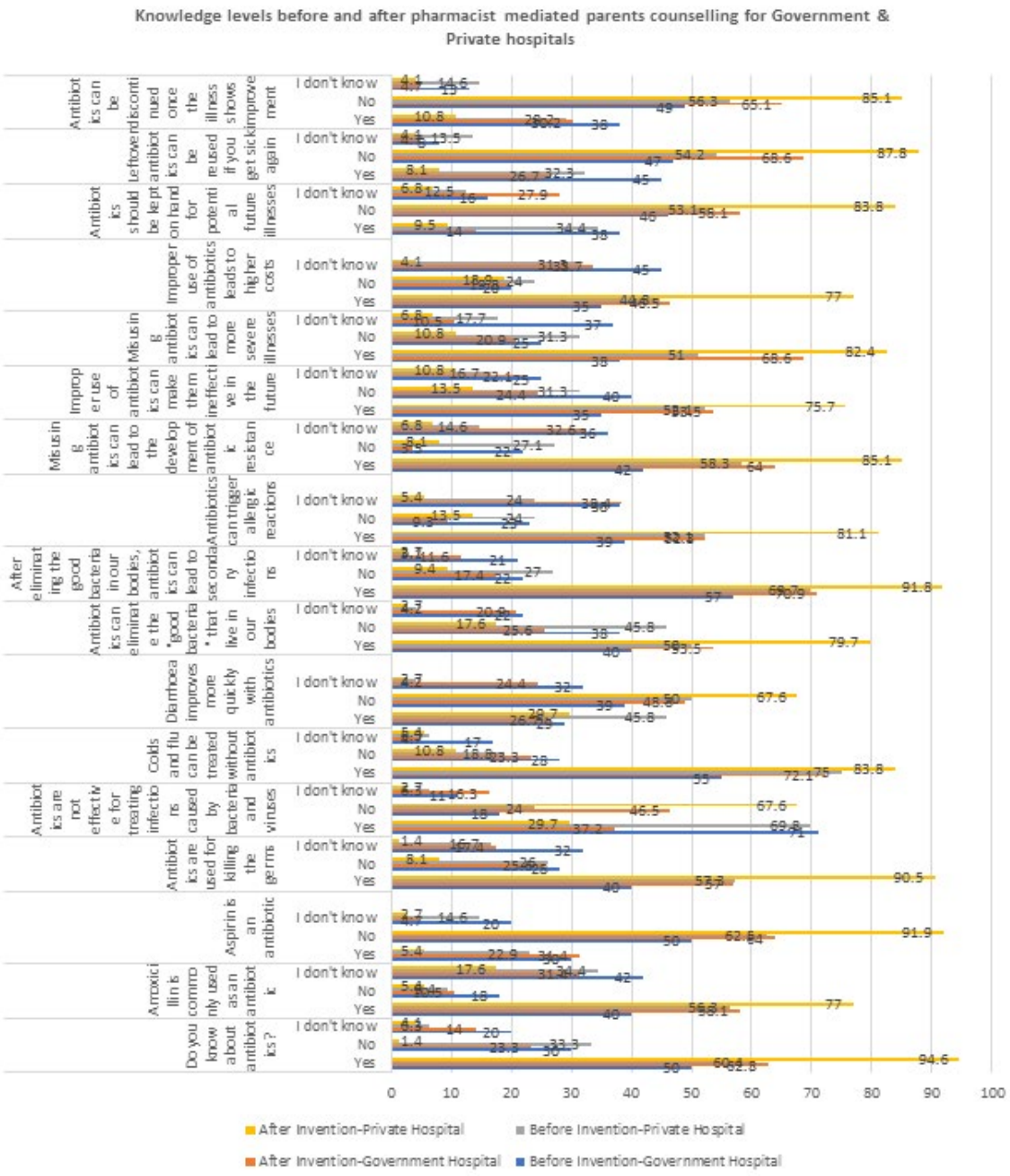

Fig. 1: Knowledge levels before and after pharmacist mediated parents counseling for government & private hospitals

prematurely, although private hospital participants exhibited a more pronounced improvement.

Attitude levels before and after pharmacist mediated parents counseling for government & private hospitals (Fig. 2)

Positive shift in trust towards doctors

After counseling, a greater percentage of parents trusted doctors' decisions on antibiotic prescriptions. In private hospitals, there was a significant increase in the "Yes" responses, reaching 83.8%. This indicates that the counseling successfully increased trust in professional medical advice.

Increased awareness of antibiotic resistance

More parents became aware of the risks of antibiotic misuse, with a notable improvement in the private hospital group. There was a considerable increase in the understanding of how misuse contributes to antibiotic resistance, as seen by higher "Yes" responses in both

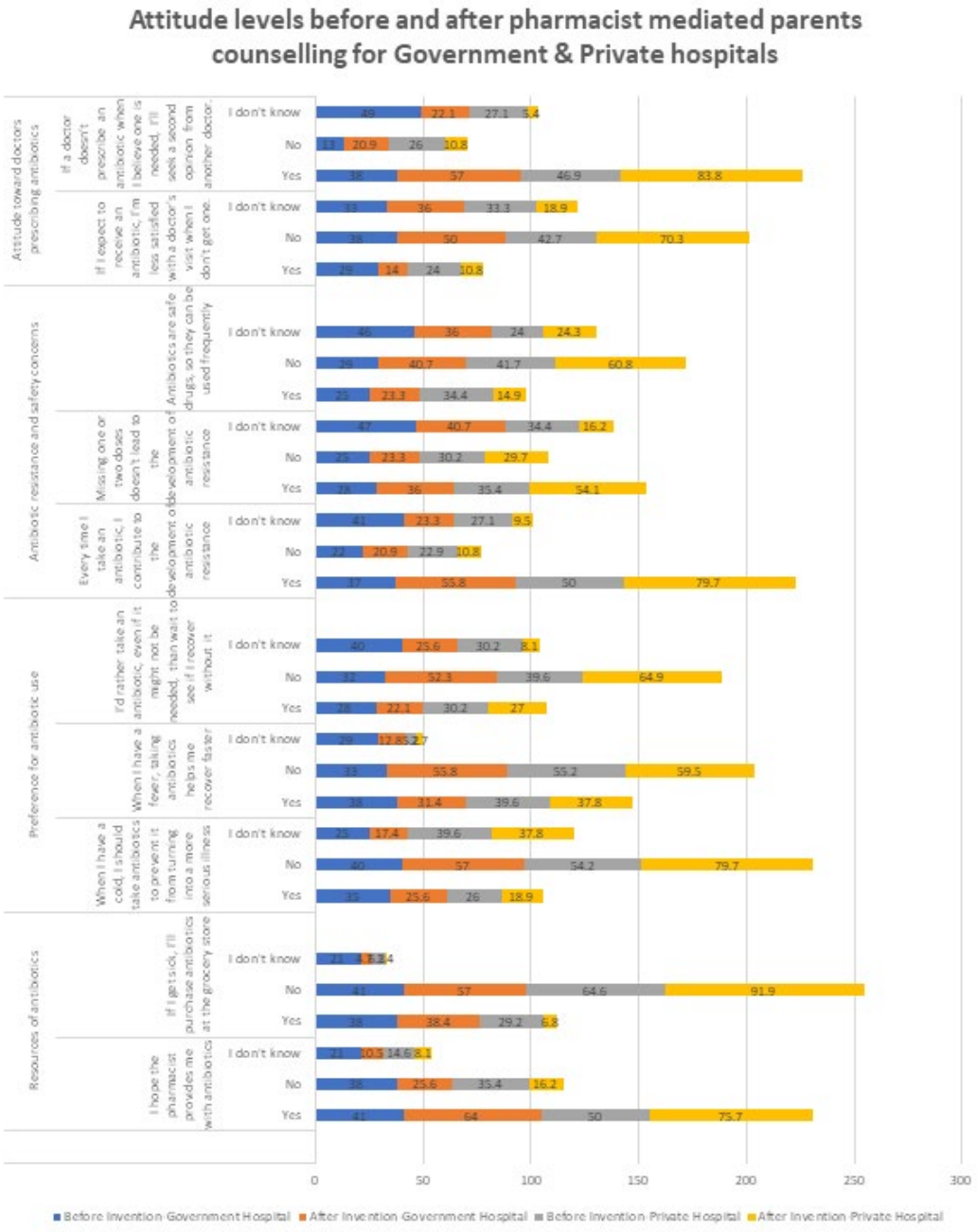

Fig. 2: Attitude levels before and after pharmacist mediated parents counseling for government & private hospitals

groups after the intervention.

Reduced preference for antibiotic overuse

Counseling effectively reduced the inclination to use antibiotics for minor health issues. Parents, particularly in the private hospital group, demonstrated a stronger reduction in preference for antibiotics unless necessary.

Better understanding of antibiotic use

Parents showed improved awareness that antibiotics should be reserved for severe illnesses. The post-counseling "Yes" responses indicate that more parents understood antibiotics should not be used indiscriminately, with the private hospital group showing 91.9% of parents agreeing that antibiotics are a last resort.

Improved awareness of alternatives

The intervention also led to more parents understanding the availability of alternatives to antibiotics, reflected in improved responses regarding the cautious use of antibiotics.

Practice levels before and after pharmacist mediated parents counseling for government & private hospitals (Fig. 3)

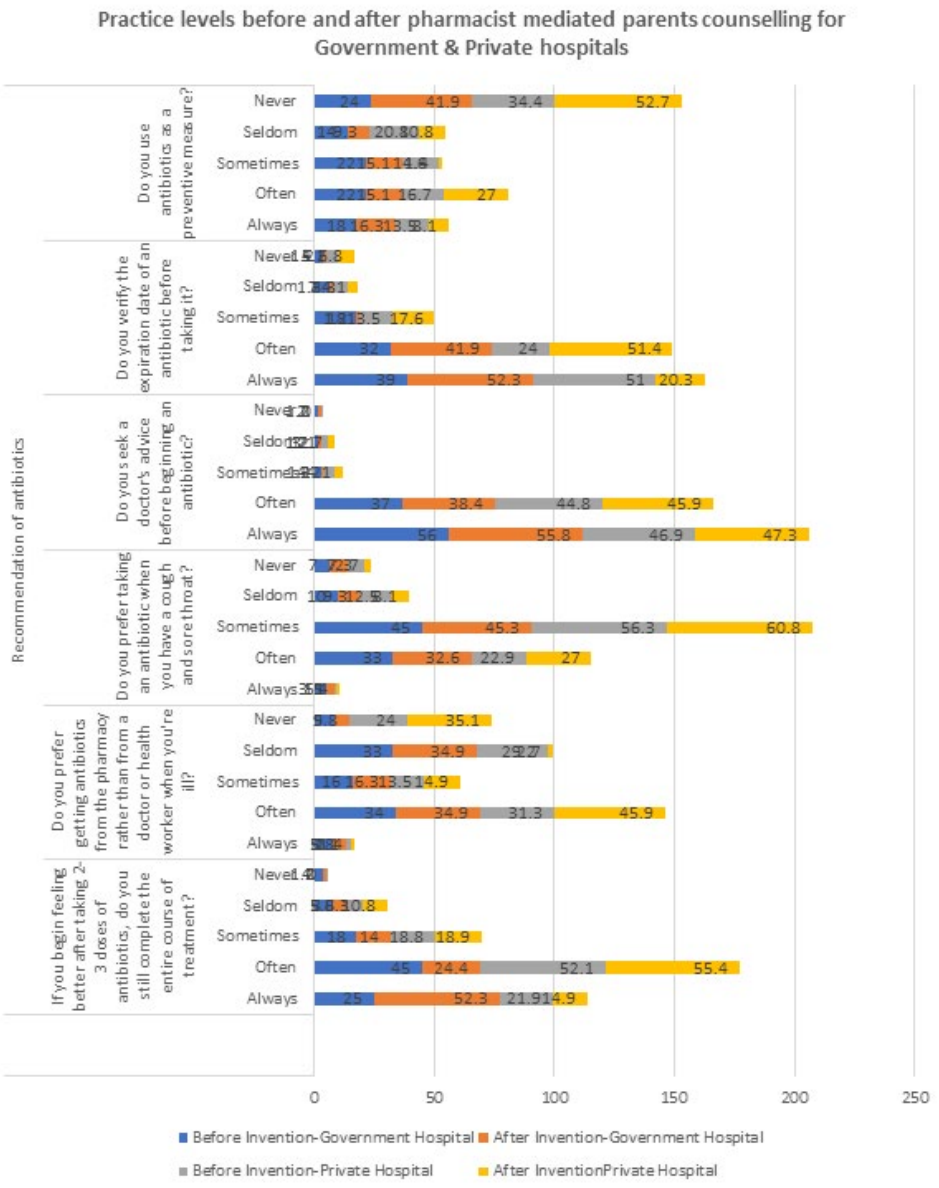

Fig. 3: Practice levels before and after pharmacist mediated parents counseling for Government & Private hospitals

Recommendation of antibiotics

After the intervention, there was an increase in parents who always completed the entire course of antibiotics of their child, with a noticeable rise in both government (25–52.3%) and private hospitals (21.9–55.4%). This suggests that counseling significantly improved adherence to antibiotic regimens.

Preference for antibiotics

There was a reduction in the number of parents who always preferred taking antibiotics when their child had a cough or sore throat, particularly in private hospitals (1–1.4%) and government hospitals (5–3.5%). This shift indicates a better understanding of when antibiotics are necessary.

Seeking doctor's advice

The number of parents who always sought a doctor's advice before beginning antibiotics remained high, with minimal change post-intervention in both hospital types. This consistency (55.8% in government and 47.3% in private) suggests that most parents already understood the importance of professional guidance before taking antibiotics.

Verification of expiration date

Post-intervention, more parents in government hospitals always checked the expiration date of antibiotics (39–52.3%). However, there was a slight decline in private hospitals (51–20.3%), possibly indicating a need for more focused counseling on this specific practice in private settings.

Antibiotic use as a preventive measure

The intervention led to a significant decrease in parents who used antibiotics preventively, especially in private hospitals (13.5%–8.1%). This improvement is crucial in reducing unnecessary antibiotic use and combating resistance.

Comparison of adequacy of knowledge, attitude and practices of patients before and after counseling for government & private hospital (Fig. 4).

Knowledge

In government hospitals, the proportion of parents with good knowledge increased from 20% before counseling to 40% after counseling. A similar trend was observed in private hospitals, where the percentage of parents with good knowledge rise dramatically from 23.4 to 84.5%. Both settings experienced a decline in parents with poor knowledge post-intervention, with government hospitals reducing from 50 to 42.7% and private hospitals from 10.2 to 5.3%.

Attitude

A notable improvement in *positive attitude* was seen after counseling, particularly in private hospitals, where it increased from 67 to 96.3%. Government hospitals also saw a rise from 40 to 60%. The proportion of parents with a negative attitude sharply decreased, with government hospitals improving from 60 to 40% and private hospitals from 55.7 to 3.7%.

Practice

There was a significant improvement in the proportion of parents exhibiting good practices post-counseling. Government hospitals saw an increase from 56 to 72%, while private hospitals rose substantially from 80 to 97.2%. The proportion of parents exhibiting poor practices decreased in both settings, with government hospitals reducing from 28 to 20% and private hospitals from 22.8% to nearly negligible levels (0%).

Comparison of mean KAP before and after patient counseling for government & private hospital (Fig. 5)

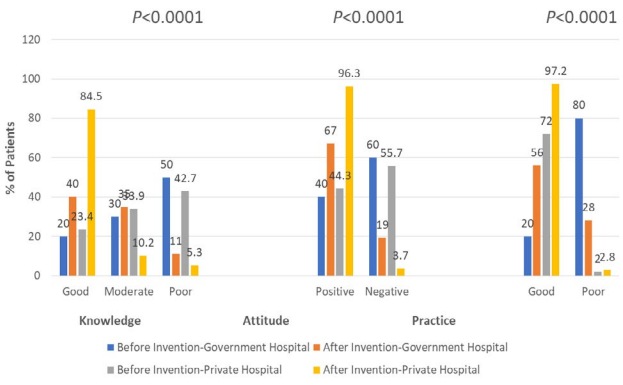

Fig. 4: Comparison of the adequacy of KAP of patients before and after counseling for government & private hospital

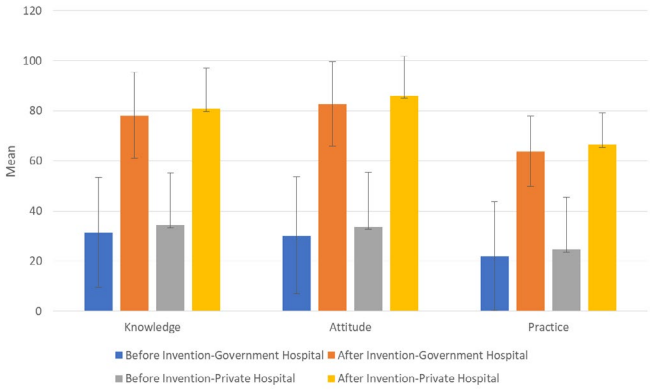

Fig. 5: Comparison of mean KAP between before and after patient's parent counseling for government & private hospital

The figure illustrates the mean scores for knowledge, attitude, and practice (KAP) of parents in both government and private hospitals before and after intervention. Significant improvements are evident post-intervention in all three domains across both hospital types, with private hospitals showing greater gains in knowledge and practice compared to government hospitals. The intervention effectively enhanced the overall KAP of parents, particularly in private hospitals, indicating the value of targeted counseling and educational efforts in improving parents engagement and adherence to treatment practices.

Discussion

This study aimed to explore the antibiotic prescription patterns and the impact of pharmacist-mediated parental counseling on the knowledge, attitude, and practice (KAP) of parents regarding antibiotic use in both government and private hospitals in Chitwan, Nepal. The findings from this study offer significant insights into the antibiotic treatment practices in these healthcare settings and underscore the role of pharmacist-led counseling in improving parental KAP. The patient distribution in both government and private hospitals revealed distinct demographic patterns. In government hospitals, the gender distribution was almost equal, with 52% male and 48% female patients, while in private hospitals, males constituted 59% of the total patients, compared to 41% females (Table 1). The higher proportion of male patients in private hospitals may be influenced by social, economic, or cultural factors that warrant further investigation.

Regarding age distribution, the majority of patients in both settings were under the age of 10 years, with a higher proportion of younger children (0–2 years) in government hospitals (29%) compared to private hospitals (31%) (Table 2). This suggests a potential difference in the patient profiles of both hospitals, with government hospitals possibly handling more cases of early childhood illnesses,

while private hospitals may see a slightly older paediatric population.

The literacy rate of parents was another important socio-demographic variable that differed across hospitals. In government hospitals, a significant 82% of parents were illiterate, while 39% of parents in private hospitals had some level of literacy (Table 3). This finding reflects the socioeconomic disparity between the two hospital settings, with private hospitals catering to a relatively more educated population, which may influence parental understanding of medical treatments and adherence to prescribed therapies. The most common diagnoses in both government and private hospitals were upper respiratory infections, with conditions like cold, fever, and sore throat dominating the patient distribution (Table 4). The prevalence of these conditions is consistent with common paediatric illnesses in Nepal. However, the treatment approach, especially regarding antibiotic use, revealed areas for improvement. The study found that amoxicillin + clavulanic acid, a broad-spectrum antibiotic, was the most commonly prescribed treatment, accounting for 69% of cases in government hospitals and 61% in private hospitals (Table 5). This aligns with findings from previous studies, which have shown a heavy reliance on amoxicillin and similar antibiotics for the treatment of respiratory infections.[32] While these antibiotics are effective for certain bacterial infections, their overuse can contribute to the growing problem of AMR.

The use of fixed-dose combinations, such as amoxicillin and clavulanic acid, was widespread in both hospital settings, with 69% of patients in government hospitals and 75% in private hospitals receiving these combinations (Table 6). The over-prescription of broad-spectrum antibiotics, especially for conditions like viral infections where antibiotics are ineffective, highlights the need for better diagnostic accuracy and stricter adherence to clinical guidelines. One of the most significant findings from this study was the impact of pharmacist-mediated parental counseling on improving the KAP of parents regarding antibiotic use. Pre-counse lling data indicated a general lack of knowledge and inappropriate practices among parents, with many either discontinuing antibiotics prematurely or self-medicating their children (Figs 1-3). However, after receiving counseling from pharmacists, there was a notable improvement in parental knowledge, attitude, and practices, with a significant increase in the percentage of parents demonstrating adequate KAP regarding antibiotic usage (Figs 4-5).

These findings are consistent with previous research that has demonstrated the positive effect of pharmacist interventions in improving parents and caregiver education, particularly in areas of medication adherence and appropriate antibiotic use.(33) The improvements in KAP observed in both hospital settings suggest that pharmacist-led counseling can play a crucial role in enhancing parental understanding of antibiotic therapy, which can lead to better treatment adherence and reduced misuse of antibiotics. The results of this study underscore the need for effective antibiotic stewardship programs in both government and private hospitals. Despite the improvements in KAP following pharmacist-mediated counseling, the widespread use of broad-spectrum antibiotics, particularly amoxicillin + clavulanic acid, suggests that there is still significant room for improvement in prescribing practices. Implementing stricter antibiotic stewardship guidelines and ensuring that both healthcare providers and patients adhere to these guidelines could help reduce unnecessary antibiotic prescriptions and mitigate the risk of AMR. Identical findings observed from the study conducted in Iran. [34]

Further, the socio-demographic disparities observed in the patient and parent education levels highlight the importance of targeted interventions. In government hospitals, where a larger proportion of parents are illiterate, it may be beneficial to incorporate more visual aids and community health workers to support parental education, alongside the efforts of pharmacists which is evident in other study too.[35]

This investigation comprehensively examined antibiotic prescription habits among paediatricians in government and private hospitals in Chitwan District, Nepal, while assessing the impact of pharmacist-mediated parental counseling on paediatric treatment outcomes. The study provides critical insights into the prescribing patterns, rationale for antibiotic use, and prevalence of antibiotic misuse in paediatric care. Furthermore, it highlights the potential of pharmacist-led interventions to bridge gaps in parental KAP and improve treatment adherence and outcomes.

The study identified significant differences in antibiotic prescribing habits between government and private hospitals. Government hospitals tended to prescribe antibiotics more conservatively, often constrained by adherence to national or WHO guidelines and limited availability of broad-spectrum antibiotics. In contrast, private hospitals exhibited a higher rate of antibiotic prescriptions, including for viral infections where antibiotics are inappropriate. Economic incentives, diagnostic uncertainty, or parental demand for immediate interventions may drive this. These findings are consistent with regional studies indicating that private hospitals are often more lenient in their prescribing practices, potentially contributing to the overuse and misuse of antibiotics. Pediatricians in both sectors showed varying levels of adherence to clinical guidelines for antibiotic use. While government hospital practices were more aligned with guidelines, resource constraints and reliance on empirical treatment in the absence of diagnostic tools often led to unnecessary antibiotic prescriptions. In private settings, guideline adherence was sometimes

overshadowed by the pressure to meet parental expectations, resulting in overprescription and misuse. This underscores the need for targeted training and enforcement of antibiotic stewardship programs to ensure rational prescribing across all healthcare settings. The frequent prescription of antibiotics for viral infections reflects a persistent issue of diagnostic uncertainty and insufficient rapid diagnostic tools. This misuse contributes significantly to AMR, a problem particularly concerning in pediatrics where treatment options for resistant infections are limited. Addressing this requires investments in diagnostic infrastructure, education for healthcare providers, and public awareness campaigns about the limited role of antibiotics in treating viral illnesses. The pharmacist-mediated counseling intervention demonstrated substantial improvements in parental KAP. Prior to counseling, a lack of understanding about antibiotics was prevalent, with common practices including premature discontinuation of antibiotics, saving leftovers for future use, or self-medicating without proper consultation. Post-counseling, parents displayed significantly enhanced awareness about the risks of antibiotic misuse, the importance of completing prescribed courses, and recognizing when antibiotics are unnecessary.

These changes translated directly into improved adherence to antibiotic regimens, reduced misuse, and better treatment outcomes. The results align with existing literature highlighting the critical role of pharmacists in antibiotic stewardship. Pharmacists serve as a vital link between healthcare providers and patients, offering education and guidance that directly impacts health behaviors and outcomes. Improved parental KAP and reduced misuse contribute to combating AMR, a critical global health challenge. By reducing inappropriate antibiotic use, pharmacist-led interventions can help preserve the efficacy of existing antibiotics and slow the emergence of resistant bacterial strains. The study's findings underscore the need to integrate pharmacists more actively into pediatric care teams, particularly in resource-limited settings like Nepal. The study also highlights systemic challenges, such as high patient loads in government hospitals and economic-driven practices in private hospitals that impede optimal antibiotic use.

Addressing these barriers requires a multi-faceted approach, including enhancing diagnostic capabilities in both sectors to support evidence-based prescribing, strengthening antibiotic stewardship programs through standardized protocols and regular training for healthcare providers, and scaling up pharmacist-led counseling initiatives as part of routine pediatric care to improve parental understanding and adherence.

This study's limitations include a potentially unrepresentative sample and no long-term assessment of parental KAP or antibiotic resistance. Future research should focus on longitudinal studies and explore factors influencing healthcare providers' prescribing behaviors.

Conclusion

This study underscores the issue of antibiotic over-prescription and misuse in pediatric care, with distinct differences in prescription habits between government and private hospitals. The findings highlight the need for standardized guidelines and stricter adherence to protocols across both sectors. Pharmacist-mediated parental counseling significantly improved parents' knowledge of antibiotics, leading to more responsible use and better treatment outcomes for children. These results emphasize the crucial role of pharmacists in pediatric care and the importance of integrating them more actively into the healthcare process. Moving forward, efforts should focus on promoting awareness of appropriate antibiotic use, strengthening antibiotic stewardship among healthcare providers, and ensuring consistent and effective interventions to combat antibiotic resistance and improve pediatric health outcomes.

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