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Antibiotics use among residents in Eastern Nepal: a community-based mixed method study

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Introduction: According to the WHO, more than two-thirds of all antibiotics are used in the community, of which about 30% are used inappropriately. The antimicrobial resistance (AMR) problem is a growing threat to Nepal because of indiscriminate and inappropriate use. However, exact data on the extent of inappropriate use of antibiotics in the community is scarce in Nepal.
Objectives: To know the extent of inappropriate use of antibiotics among the community and their knowledge and practice towards the usage of antibiotics.
Methods: A community-based cross-sectional study was conducted from 20 December 2017 to 20 March 2018 using a purposive sampling technique. A semi-structured questionnaire was used while conducting face-to-face interviews with 336 respondents to find out the knowledge and practice regarding antibiotic use. Investigators took different antibiotics (in all dosage forms) with them to show participants whether they knew and/or used the antibiotics in the last year.
Results: The mean age of respondents with standard deviation was 39.87 ± 13.67 years ranging from 18 to 84 years. Around 35.42% of respondents were farmers and 34.52% were homemakers. 28.87% of respondents were illiterate, 32.44% had primary education and 33.33% had secondary education. Almost half of them (48.51%) think that antibiotics are safe and can be commonly used. So, 43.15% of them preferred taking antibiotics when they had a common cold. The majority of the participants (81.84%) did not have any idea about antibiotic resistance. 94.6% of the respondents used antibiotics inappropriately.
Conclusion: The results of the present study revealed that inappropriate use of antibiotics is high and associated with low earning wages in both males and females in the age group 18–39 years.

Keywords: Antibiotics, Eastern Nepal, inappropriate use, knowledge, resistance

Introduction

The WHO has defined antibiotics as antimicrobial agents or medicines used to fight organisms such as bacteria, viruses, fungi, and parasites that cause infections. However, not all antimicrobial agents are antibiotics because some of them are synthesized chemically and not obtained from a living organism. Nevertheless, for ease of communication, "antibiotics" and "antimicrobial agents" are used interchangeably. Microorganisms that cause infections have devised mechanisms by which they can evade the action of antibiotics. This is broadly referred to as "antimicrobial resistance" or resistance to antibiotics[1]. The overuse and misuse in most of the developing countries including Nepal has increased the burden of antimicrobial resistance[2,3]. Availability of antibiotics readily over the counter (without prescriptions), through unregulated supply chains, unnecessary prescriptions by health professionals, the non-standard frequency of administration,

HIGHLIGHTS

- Inappropriate use of antibiotics is prevalent in low income countries; we tried to look for its association in a Municipality of Nepal.
- We observed that inappropriate use of antibiotics is mostly prevalent in low earning wages population.
- Antimicrobial resistance is a global threat of current antibiotic use throughout the world.
- We recommend further awareness on antimicrobial resistance from several stakeholders and public health authorities.
- Further research regarding the extent of resistance to commonly used antibiotics in the community should be conducted and further discussion for effective interventions to use antibiotics appropriately is necessary.

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treatment duration, and non-compliance in their use are some of the major issues. While some miss the doses by chance, most people stop the medication by themselves especially when signs and symptoms begin to subside or in some cases, patients seek their first-line treatment from traditional healers providing them with herbal combinations for the treatment of infections which may potentially enhance the pathogen fitness contributing to the development of resistance[2–9].

Each year 700 000 people die due to drug-resistant infection and this number is estimated to scale up to 10 million deaths by 2050[10]. According to the WHO, more than two-thirds of all antibiotics are used in the community, of which about 30% are used inappropriately[11]. Many previous studies documented factors associated with inappropriate use of antibiotics including culture, educational status, residency, marital status, age, health insurance, and level of satisfaction with the healthcare services, and storing antibiotics at home[12].

In Nepal, the irrational use of antibiotics by the community, patients as well and healthcare providers contributes to the development of antibiotic resistance. Key findings from a detailed situation analysis produced by the Global Antibiotic Resistance Partnership (GARP)-Nepal working group pointed out that in the absence of nationally representative surveillance, it is not possible to fully describe antibiotic resistance in the country, but many important bacterial pathogens are highly resistant to most first-line and some second-line antibiotics, according to available reports[13].

So, the antimicrobial resistance (AMR) problem is a growing threat to Nepal because of indiscriminate, inadequate, and inappropriate use of antimicrobials. Self-medication is quite common, and patients go to the doctor only after they become unsuccessful to cure themselves[14,15]. However, exact data on the extent of inappropriate use of antibiotics in the community is scarce in Nepal[16]. The objective of this study is to assess the knowledge and practice of antibiotic use among the people in the Letang Municipality of Morang district in Eastern Nepal. In addition, it aims to assess the knowledge, attitude, and perception about antibiotic use and to know the extent of inappropriate use of antibiotics in the community.

Methods

A community-based descriptive cross-sectional study was conducted from 20 December 2017 to 20 March 2018 to find out the knowledge, attitude, and practice regarding antibiotic use among communities of Letang Municipality, Morang, Nepal. The study population included all the residents of Letang Municipality and considered a 95% CI and 85% power to estimate the sample size. According to a study by Daniel Asfaw Erku and colleagues, the prevalence regarding inappropriate antibiotic use is 35.9%. The sample size calculation is done using the following formula:

$$n = 4pq/d^2 \text{ where,}$$

$$p(\text{prevalence}) = 35.9\%;\ q(\text{complement of prevalence}) = 1 - p = 64.1$$

$$d(\text{permissible error}) = 15\% \text{ of } p = 5.385$$

Then, $n = 305$.

Adding 10% to adjust for non-responder's bias to the calculated sample size, the actual sample size becomes ~335. So, 336 individuals meeting the inclusion criteria were included in the study.

Inclusion criteria

Residents of Letang Municipality who provided the consent
Age above 18 years.
Use of antibiotics within the past year.

Exclusion criteria

Persons not willing to give consent.
Unavailability on the day of data collection.

Sampling technique

A random sampling method was used to select the study participants. Data collection was performed by fifth-semester MBBS students through an interviewer-administered questionnaire. The questionnaire asked respondents about their socio-demographic characteristics and knowledge as well as the use of antibiotics. Investigators took different antibiotics (in all dosage forms) with them to show participants whether they knew and/or used the antibiotics in the last 1 year. took help from other family members. Likewise, Key Informant Interviews (KII) were done using open-ended questions with pharmacists from all pharmacies ($n = 10$) of Letang municipality to take on their perception related to inappropriate antibiotic use and factors contributing to that practice.

Data collection tool: Preformed semi-structured questionnaire was used to collect the data. It had three parts: socio-demographic information, knowledge about self-medication, and factors influencing them to self-medicate.

Variables

Independent variables: Socio-demographic (age, sex, employment status, education, family monthly income).

Dependent variables: attitude and inappropriate use of antibiotics

Operational definitions

In our study, inappropriate use of antibiotics was defined as the non-prescribed use of antibiotics for themselves and/or their family members, the use of leftover antibiotics, or the use of prescribed antibiotics for a reason other than intended for or the cessation of antibiotics before completing the course[17].

Similarly, based on the responses of the participants on attitude and practice of antibiotics use, we categorized the attitudes of the respondents as excellent, good, and poor based on a 3-point Likert's Scale analysis using cumulative percentage categorization of 75% and above as excellent attitude, 50–75% as good attitude and below 50% as poor attitude.

Statistical analysis

Data were entered in MS Excel and later on, analyzed by using the Package for the Social Sciences (SPSS) software package for statistical analysis. For descriptive statistics, percentage, proportion mean with standard deviation was calculated along with graphical and tabular presentation of the data. A χ^2 test was used to find out the association between dependent and independent variables and an independent *t*-test was used to compare the knowledge scores. Univariate and multivariate logistic regressions were used to come up with predictors of inappropriate use of antibiotics. Associations with a significance level of less than

0.20 ($P < 0.20$) in the univariate analysis were included in the multivariate logistic regression analysis. The results were adjusted for patients' demographic and disease characteristics. The odds ratio (OR) with 95% CI was also computed along with the corresponding P value ($P < 0.05$) as cut-off points for determining statistical significance.

The work has been reported in line with the STROCSS 2021 criteria[18]. The research unique identifying number for our study is researchregistry9486 https://www.researchregistry.com/browse-the-registry#home/.

Results

Socio-demographic characteristics of respondents

Table 1 shows that 38.4% of the total respondents were male and 61.6% were female with an F: M sex ratio of 1.6:1. The mean of the respondents was 39.87 ± 13.67 years ranging from 18 to 84 years. About half of the respondents (51.8%) belonged to the age group 18–39 years. Regarding occupation, 33.3% of respondents were farmers and 34.5% were homemakers. The monthly family income of 75.9% of the total respondents was less than or equal to NRs.20 000. Out of the total respondents, 28.9% were illiterate, 32.4% had primary education and 33.3% had secondary education. Most of the respondents (86.6%) belonged to the Hindu religion followed by the Kirat religion (6.25%). Looking at the employment status, 44% of them were found to be unemployed while the rest 56% were employed. Similarly, 87.2% of them were found to be married, 9.8% were unmarried and the remaining 3% were widowed or divorced.

Table 1

Socio-demographic information of the respondent

Characteristics	Category	Frequency (percentage), *n* (%)
Sex (F: M = 1.6:1)	Male	129 (38.4)
	Female	207 (61.6)
Age (in years)	Mean ± SD	39.87 ± 13.67 (18–84 years)
	18–39	174 (51.8)
	40–59	125 (37.2)
	60–79	36 (10.7)
	≥ 80	1 (0.3)
Religion	Hindu	291 (86.6)
	Kirat	20 (6.0)
	Buddhist	14 (4.2)
	Christian	8 (2.4)
	Muslim	3 (0.9)
Occupation	Farmer	112 (33.3)
	Homemaker	116 (34.5)
	Business	11 (3.3)
	Student	23 (6.9)
	Skilled worker	23 (6.8)
	Service	10 (3.0)
	Unskilled worker	29 (8.6)
	Migrant worker	3 (0.9)
	Unemployed	9 (2.7)
Family monthly income (in N.Rs.)	≤ 20 000	255 (75.9)
	> 20 000	81 (24.1)
Education Status	Illiterate	97 (28.9)
	Primary education	109 (32.4)
	Secondary education	112 (33.3)
	Tertiary education	18 (5.4)
Employment Status	Unemployed	148 (44.0)
	Employed	188 (56.0)
Marital status	Unmarried	33 (9.8)
	Married	293 (87.2)
	Widow/divorced	10 (3.0)

F, female; M, male.

Table 2 shows that out of the total households approached, 336 of them used antibiotics in the last year. Among the total participants, 92.86% of them used antibiotics when prescribed by health care professionals. Antibiotics were mostly used (19.0%) for the respiratory tract symptoms only. About 54.8% of them used antibiotics for more than one purpose.

Table 3 shows the practices and attitudes of respondents toward antibiotic use. Regarding their practices, almost half of them (49.1%) never stopped taking medication after symptomatic relief whereas 31.9% of the respondents always/usually stopped further medication after symptomatic relief. Most of the respondents (65.5%) did not save the remaining antibiotics and almost half of the responders (49.4%) discarded the leftover medications. A majority of the responders (78%) always/usually consulted the doctor before starting an antibiotic. Among the responders, half of them (57.7%) always/usually completed the full course of the treatment. Most of the responders (62.8%) always/usually checked the expiry date of the antibiotics before using them. Almost half of them (48.5%) think that antibiotics are safe and can be commonly used so 43.2% of them preferred taking antibiotics when they had a common cold. In their opinion, indiscriminate and injudicious use of antibiotics can lead to ineffective treatment (16.4%) and prolongation of illness (24.7%). The majority of them (81.8%) did not have any idea about antibiotic resistance. While looking at the expense of the family on each antibiotic therapy, 39.6% said that it amounted to less than Rs.500; similarly, one-third of the study population had Rs. 500–1000 per antibiotic therapy while the rest 27.4% of the participants had the cost of each antibiotic therapy around Rs 1000 and above.

Based on the responses of the participants on attitude and practice of antibiotics use, we categorized the attitudes of the respondents as excellent, good, and poor based on a 3-point Likert's Scale analysis using cumulative percentage categorization of 75% and above as excellent attitude, 50–75% as good attitude and below 50% as poor attitude.

Table 2

Extent of use of antibiotics among study participants

Characteristics	Category	Frequency (percentage), *n* (%)
Mode of antibiotics used	Prescribed by health care professionals	312 (92.86)
	Family member medication	8 (2.38)
	Self-medication	12 (3.57)
	Prescribed by health care professionals and by self-medication	4 (1.19)
Purpose of antibiotics use	Respiratory tract symptoms	64 (19.0)
	Acute diarrhoea	13 (3.9)
	Mechanical injury/wound	10 (3.0)
	Urinary tract infections	10 (3.0)
	Colicky pain	3 (0.9)
	Headache/fever	48 (14.3)
	Could not remember	4 (1.2)
	More than one purpose	184 (54.8)

Table 3

Practices and attitudes regarding the antibiotics use

Characteristics	Category	Frequency (percentage), *n* (%)
1. Do you stop taking further treatment after symptomatic relief?	Always or usually	107 (31.9)
	Sometimes	64 (19.0)
	Seldom or never	165 (49.1)
2. Do you save the remaining antibiotics for the next time you get sick?	Always or usually	34 (10.1)
	Sometimes	82 (24.4)
	Seldom or never	220 (65.5)
3. Do you discard the remaining, leftover medications?	Always or usually	166 (49.4)
	Sometimes	80 (23.8)
	Seldom or never	90 (26.8)
4. Do you give the leftover antibiotics to your friends/family members if they get sick?	Always or usually	33 (9.8)
	Sometimes	76 (22.6)
	Seldom or never	227 (67.6)
5. Do you complete the full course of treatment?	Always or usually	194 (57.7)
	Sometimes	91 (27.1)
	Seldom or never	51 (15.2)
6. Do you consult a doctor before starting an antibiotic?	Always or usually	262 (78.0)
	Sometimes	70 (20.8)
	Seldom or never	4 (1.2)
7. Do you check the expiry date of the antibiotic before using it?	Always or usually	211 (62.8)
	Sometimes	44 (13.1)
	Seldom or never	81 (24.1)
8. Do you prefer to take an antibiotic when you have a common cold?	Always or usually	58 (17.3)
	Sometimes	145 (43.1)
	Seldom or never	133 (39.6)
9. Do you think antibiotics are safe drugs and can be commonly used?	Yes	163 (48.5)
	No	96 (28.6)
	Don't know	77 (22.9
10. What do you think indiscriminate and injudicious use of antibiotics can lead to?	Ineffective treatment	55 (16.4)
	Prolongation of illness	83 (24.7)
	Emergence of resistance	8 (2.4)
	Additional burden of medical cost to the patient	38 (11.3)
	Adverse reaction	34 (10.1)
	Don't know	33 (9.8)
	More than one reply	85 (25.3)
11. What was the cost of the course of antibiotics therapy?	≤ NRs. 500	133 (39.6)
	NRs. 500–1000	111 (33.0)
	NRs. 1000–2000	50 (14.9)
	≥ NRs. 2000	42 (12.5)
12. Do you have any idea about antibiotic resistance?	Yes	61 (18.2)
	No	275 (81.8)

On overall assessment, an excellent attitude of the medical students towards cultural diversity was observed in 1.2% of the respondents, 28.3% had a good attitude while the rest majority 70.5% were found to have a poor attitude towards antibiotics use.

Likewise, inappropriate use of antibiotics was defined as the non-prescribed use of antibiotics for themselves and/or their family members, the use of leftover antibiotics, or the use of prescribed antibiotics for a reason other than intended[17]. It was found that almost every respondent (94.6%) used antibiotics inappropriately in various ways while only a few (5.4%) used the antibiotics appropriately (Table 4).

Bivariate analysis for the association between inappropriate use of antibiotics and outcome variables

For defining the, we defined some outcome variables like age, sex, employment status, education, family income per month and attitude of the respondents on antibiotics use and carried out a bivariate analysis to see for the association between inappropriate use of antibiotics and these outcome variables.

As depicted by Table 5, a significant association was found between family monthly income and inappropriate use of antibiotics with P value = 0.038. Those families which earned

Table 4

Attitude and inappropriate use of antibiotics among the respondents

	N (%)
Attitude	
Excellent	4 (1.2)
Good	95 (28.3)
Poor	237 (70.5)
Use of antibiotic	
Appropriate	18 (5.4)
Inappropriate	318 (94.6)

Table 5

Association between inappropriate use of antibiotics and demographic characteristics among residents of Letang-Bhogateni municipality

Variables	Total ($n=336$), n (%)	Inappropriate use		OR, 95% of CI	P
		No, n (%)	Yes, n (%)		
Sex					
Male	129 (38.4)	9 (7)	120 (93)	1.650 (0.6–4.2)	0.298
Female	207 (61.6)	9 (4.3)	198 (95.7)		
Age (in years)					
≤35 years	148 (44.0)	8 (5.4)	140 (94.6)	1.017 (0.3–2.6)	0.972
>35 years	188 (56.0)	10 (5.3)	178 (94.7)		
Family monthly income (N. Rs):					
≤20 000	255 (75.9)	10 (3.9)	245 (96.1)	0.372 (0.1–0.9)	**0.038**
>20 000	81 (24.1)	8 (9.9)	73 (90.1)		
Education					
Illiterate	97 (28.9)	6 (6.2)	91 (93.8)	1.247 (0.4–3.4)	0.667
Literate	239 (71.1)	12 (5)	227 (95)		
Employment status					
Unemployed	148 (44.0)	6 (4.1)	142 (95.9)	0.620 (0.2–1.6)	0.347
Employed	188 (56.0)	12 (6.4)	176 (93.6)		
Attitude					
Excellent/Good	99 (29.5)	6 (6.1)	93 (93.9)	1.210 (0.4–3.3)	0.711
Poor	237 (70.5)	12 (5.4)	225 (94.9)		

Bold values represent statistically significant.
OR, odds ratio.

more than N.Rs. 20 000 per month were less likely to use the antibiotics inappropriately as compared to those who earn less than or equal to N.Rs. 20 000 per month with OR = 0.372, 95% CI = (0.1–0.9).

Besides family monthly income, other outcome variables like age, sex, employment status, education, and attitude of the respondents on antibiotics showed no significant association with inappropriate antibiotic use.

Qualitative findings

According to the responses received from interviews with owners of pharmacies, their opinions regarding the practice of antibiotics were as follows:

A 30-year-old pharmacist said, "Most patients come without prescriptions for the medicine and they also prescribe the drugs, however, most of the patients do not complete the full course of antibiotics."

A 45-year-old male pharmacist said, "Packaging of the medicines should be done in such a way that it becomes impossible for the pharmacist to dispatch less than the recommended doses, so the customers don't get to buy only one or two tablets."

A 62-year-old male health assistant stressed the notion that "Public awareness programs should be conducted in communities regarding the importance of appropriate antibiotics use."

A 24-year-old female student studying Bachelor's in Pharmacy raised the concern that "Without the active involvement of youths and the students of the medical field in social awareness campaign, the issue of antimicrobial abuse won't get addressed."

A 28-year-old female doctor said, "Some patients come to me saying they have been prescribed this and this medicine by a local pharmacist based on their symptoms, which is a complete malpractice."

A 65 years' retired male government official said "It's obvious that in our nation most of the pharmacists do not own their license, they have been running the store with a hired license which is even aware to authority but they also stay silent."

A 45-year-old female doctor said "We have been continuously delivering public awareness to our local community and have been able to control the misuse of antimicrobial and any other types of self-prescription habits", stressing the need for activism from the medical professionals themselves.

A 16 years' male high school student admitted as a patient said: "My elder brother used to bring me some tablets whenever I got a common cold and sore throat which made me well within few days, but this time I am getting an injection for similar problem which had become worse and was not controlled with my brother's tablets this time."

A 45-year-old' female who is the President of the local pharmacist association said "Around 20-30% of our revenue is generated by selling antimicrobials over the counter which we even can't deny after patients' insistence."

A 67-year-old' female patient said, "Due to my haphazard use of antimicrobials from the local shops I have developed resistance to many medications as per my doctor, that's why this time my urinary problem is not getting better even with these many injectable medications."

They thought that the majority of the people used antibiotics inappropriately. Reasons for these inappropriate uses were poverty, lack of awareness about antibiotics, ignorance, and

carelessness. In their perception to stop the inappropriate use of antibiotics, awareness programs regarding rational use of antibiotics should be conducted.

Discussion

AMR is a global problem in public health. The causes of AMR in developing countries like Nepal are complex and deeply rooted in the practices of healthcare professionals and patients' behaviour towards the use of antimicrobials as well as supply chains of antimicrobials in the population. Nepal is one of the major contributors to the growing burden of AMR due to the widespread irrational use of antibiotics along with poor healthcare systems, and poor infection control and prevention measures[17,19]. A systematic review on self-medication with antibiotics in the WHO SEAR region by Nepal *et al.*[20] reported an overall prevalence of 42.64% of which the situation was worse in India and Nepal.

According to the findings of our study, 336 respondents took antibiotics in the past 1 year, of which 312 (92.86%) used the prescribed medication, while 3.57% of respondents employed self-medication and 2.38% used it as per family member medication. The prevalence of self-medication reported in this study is drastically low as compared to the studies done in Ethiopia and Ghana which amounted to 63.5% and 64%, respectively[5,21]. A similar community study conducted in Western Nepal also showed that 94.5% of participants consulted doctors before starting antibiotics which is very similar to our study[22]. A study done to assess antibiotic use in Asian and African countries showed that self-medication with antibiotics was found to be widespread in Vietnam (55·2% of antibiotics dispensed without prescription), Bangladesh (45·7%), and Ghana (36·1%), but lesser or so in Mozambique (8·0%), South Africa (1·2%), and Thailand (3·9%)[23]. Amoxicillin and Amoxicillin-clavulanate combination were the two most commonly utilized antibiotics recognized by the investigators but the respondents seemed merely aware of the antibiotics used. Respiratory tract infection (19.5%) was the most common disease problem to which antibiotics had been sought followed by acute diarrhoea (3.87) and mechanical injury/wound and Urinary Tract Infections (3% each). Similar findings were also reported in the study conducted in Gondar Ethiopia, Ghana, and Nepal[5], which reported that Amoxicillin and amoxicillin-clavulanate were the most commonly used antibiotics.

It is widely believed that antimicrobial resistance can potentially arise from inadequate dosing and discontinuation of the full course of treatment[6,8]. In our study, one-third of respondents (31.84%) discontinued the use of antibiotics once their symptoms were gone. This finding is comparable with the study done in Gondar, Ethiopia (32.1%)[5]. In the other two studies conducted in Nepal, 46.3% and 53.87% of participants responded that they would stop the antibiotics after symptoms resolved[23,24]. This antibiotic misuse may put the patient at risk of relapse with drug-resistant bacteria.

Several studies conducted in different parts of the globe reported that antimicrobials are purchased without a valid prescription and could be simply possessed regardless of policies prohibiting such practice[9–11]. In our study and other studies conducted in Nepal, the majority of the respondents got antibiotics with a valid prescription. However, this data does not match the overall incidences worldwide obtained in studies mentioned in the above considerations[9–11]. In a similar study done in Gondar, Ethiopia, over half of the respondents (55.9%) got antibiotics from community drug retail outlets without a valid prescription or sharing them with family members or neighbours[5]. Similar findings were also reported in studies conducted elsewhere[12–14]. The low rate of non-prescription antibiotics used in our study is an encouraging finding. Yet, the risk of antibiotic resistance is still high due to inappropriate use. It also reflects the important role of healthcare providers in counselling patients properly regarding the correct use of antibiotics. Patients may still prefer to go directly to pharmacies rather than visiting a hospital due to several reasons including ease of accessibility, shorter waiting time, and accommodating patients' ability to pay[15,16].

According to the findings of our study, 318 (94.64%) of respondents used antibiotics inappropriately which was similar to a study done in Ghana (86.6%), whereas compared to that of a similar study done in Gondar, Ethiopia (35.9%) is found out to be extremely high[5]. Having other variables controlled, low educational status, being employed, and unsatisfied with health care services provided are found to be strong predictors of inappropriate use of antibiotics in the multivariate logistic model. Several other studies have also reported that lower educational status[17,19], engagement with regular jobs[20,21], and being unsatisfied with health care services[23,24] were associated with inappropriate use of antibiotics. In our study, the maximum (81.8%) of the respondents did not have any knowledge about antibiotic resistance which was similar to findings from other studies done in different parts of Nepal[19,24,25]. The low educational status of participants, which may render them to have insufficient knowledge of the use of antibiotics, could have a weighty impact on the rational use of antimicrobials and the development of antimicrobial resistance in the community. Hence, a customized educational campaign regarding the rational use of antibiotics and its impact on the development of antimicrobial resistance should be provided to the community. Furthermore, the relative lack of time to visit healthcare facilities during working hours, along with having pocket money in respondents with regular jobs may cause them to purchase antibiotics directly from community drug retail outlets without visiting healthcare facilities, ultimately increasing the potential for inappropriate use of these medications. Moreover, a lack of satisfaction with health care services provided may discourage people from seeking medical care from hospitals, encouraging them to look for other options for the management of their medical condition[25]. With understanding of the epidemiology, biology, and behaviour of infectious agents can contribute to improved guidance for prescribing antimicrobial medications[26].

Limitations of the study

Though this study effectively depicts the real scenario of inappropriate use of antibiotics in our society when not much has been found in the literature in the case of Nepal, caution is needed to be taken to generalize its findings to other parts of Nepal as this is more of an observational study and involves

only one municipality in Eastern Nepal. This study may also have the potential for unmeasured confounding and recall bias while collecting data for the history of antibiotic use. Nevertheless, this study has significant implications for promoting the rational use of antibiotics and may aid in understanding the development of antimicrobial resistance in the community.

Conclusion and recommendation

The results of the present study revealed that inappropriate use of antibiotics is high and associated with low earning wages in both males and females in the age group 18–39 years. Different stakeholders working in the public health sectors should provide comprehensive and customized education to the public to improve their knowledge about antibiotics.

It is also essential to adopt a strong and explicit line of action against the accessibility of antibiotics without a valid prescription in community medicine retail outlets. Further research regarding the extent of resistance to commonly used antibiotics in the community should be conducted and further discussion for effective interventions to use antibiotics appropriately is necessary. In addition, we do recommend upcoming studies focus on the identification of areas of antibiotic treatment failure and referral to healthcare facilities due to various infectious diseases.

Ethical approval

Institutional Review Committee, B.P. Koirala Institute of Health Sciences, Dharan, Nepal. The reference number is SPHCM: 37/2075.

Patient consent

Informed written consent was taken from the patient in this study. We also ensured, none of the identifying characteristics are included in the study.

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Author contribution

S.P., R.A. and P.K. formulated the idea of the study and wrote the initial draft of the proposal. B.B., K.B. and R.A. finalized the proposal and it was submitted to Institutional Review Committee. S.S., B.B., D.N., A.T., S.P. and P.K. collected the data. L.B.B. and K.K. Analyzed the data. S.P. and B.B. wrote the discussion and prepared the initial draft of manuscript along with R.A. and R.A. P.K., S.P., V.K.K. and A.G. edited and finalized the manuscript. The final version of the manuscript was approved by all authors.

Conflicts of interest disclosure

There are no conflicts of interest.

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