

# Perceptions Regarding Antimicrobial Resistance and Stewardship Programs among Healthcare Professionals

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## ABSTRACT

**Background:** Antimicrobial resistance is an important global problem resulting in an improper response of infections to antimicrobials and an increase in the duration and cost of treatment. Healthcare professionals play an important role in addressing Antimicrobial resistance and positive perception is important for involvement in antimicrobial stewardship policies. Hence the perception of key Healthcare professionals, including physicians, nurses, and hospital pharmacists, towards Antimicrobial resistance antimicrobial stewardship policies was studied.

**Methods:** A cross-sectional study was conducted in a tertiary care hospital at Lalitpur, from January to March 2021 using stratified random sampling. An online questionnaire was circulated to the selected Healthcare professionals. Median Antimicrobial resistance and antimicrobial stewardship policy scores were calculated and compared among different subgroups. Previous engagement with Antimicrobial resistance and antimicrobial stewardship policies programs was also noted. Descriptive statistics, Mann Whitney, and Kruskal Wallis tests were used for data analysis.

**Results:** The response rate was 89.3% (202/226). Antimicrobial resistance was regarded as a serious problem in the Nepali community by participants with work experience of 1-5 years, 87 (75.6%,  $p=0.029$ ), and female participants, 62 (45.5%,  $p<0.001$ ). Most physicians, females, and participants with working experience 1-5 years believed inappropriate use of antibiotics can harm patients and is professionally unethical. Physicians supported the availability of local antimicrobial guidelines and protocols. The median scores for Antimicrobial resistance ( $p<0.001$ ) and Antimicrobial resistance eradication ( $p=0.048$ ) differed according to age groups.

**Conclusions:** Healthcare professionals believed Antimicrobial resistance was an important issue. Antibiotic guidelines developed should be strictly implemented. Healthcare professionals also believed inappropriate use of antibiotics can harm patients and is professionally unethical.

**Keywords:** Antimicrobial resistance; antimicrobial stewardship; healthcare professional; perception.

## INTRODUCTION

Antimicrobial resistance (AMR) is a burning issue especially for healthcare professionals, in developing countries. AMR can take us back to the pre-antibiotic era during which infections played havoc with human lives<sup>1</sup> and is projected as a major threat to healthcare systems.<sup>2,3</sup>

Antimicrobial stewardship (AMS) is a collective and continuous effort for optimizing the use of antimicrobials for improving patient outcomes.<sup>4</sup> Evidence shows the benefits of AMS towards favorable outcomes in

patient care and it can be effective to reduce the financial burden and the duration of hospitalization.<sup>5</sup> Antimicrobial stewardship has only been implemented in a few hospitals in Nepal. Studies from Nepal and other developing countries have shown availability of antibiotics over the counter and being used for self-medication.<sup>6-8</sup>

The objectives of this study were to study the perception of healthcare professionals working in a teaching hospital towards antimicrobial resistance and antimicrobial stewardship.

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## METHODS

This cross-sectional study was done at a tertiary care teaching hospital located in Lalitpur, Nepal. The hospital offers specialty and super specialty care and has renal transplant, dialysis, and geriatric care facilities. Currently, the hospital lacks antimicrobial stewardship policies.

A structured questionnaire previously used in a study in Pakistan was used for collecting the data<sup>5</sup> with the consent of the main author of the study. Face and content validation was done. The questionnaire has six sections with 33 statements. Section-1 had four items and examined how serious a problem the respondent believes AMR is in different healthcare settings.

Section 2 examined the respondents' beliefs regarding the contribution of different factors toward AMR in Nepal. This section had 5 statements. Section 3 had four statements about previous involvement with AMR and hospital ASPs. Section 4 examined participants' agreement or disagreement with nine statements regarding the ASP measures, while section 5 with five statements examined the respondents' previous involvement in AMR and hospital ASPs. Section 6 collected demographic data about the respondents including age, gender, work experience, and profession. The statements in sections one and two were rated on a 7-point Likert scale (1 = not a problem to 7 = very serious problem and 1 = does not contribute to 7 = strongly contribute, respectively). Statements in the third section were rated as 1 = strongly disagree to 7 = strongly agree. Statements in the fourth section were rated using a 7-point Likert scale (1 = very unhelpful to 7 = very helpful). The fifth section statements had three options "yes," "no," and "do not know."

Informed consent was obtained online from the participants. The questionnaire was pretested among 20 HCPs with respondents selected as per the sampling strata. Their information was not included in the final study. The validity was checked by providing the questionnaire to three content experts and by pretesting. The Cronbach alpha value was calculated and was found to be 0.79, indicating good reliability.

The list of HCPs working at the hospital was obtained from the human resource department. Participants were selected using stratified random sampling. The number of HCPs selected (physicians, medical officers, nurses, interns, and pharmacists) was according to their

proportion in the institution.

The email address of all HCPs was collected but the link to the questionnaire was only sent to selected individuals. Information about the study was also shared through social media groups. The total number of HCPs was 429, and the required sample size was calculated as 226 using the open epidemiologic statistics for public health programs.

Frequencies and percentages were calculated for the demographic data. Statistical Package for the Social Sciences (SPSS) version 21 was used. Data were tested for normality using the one-sample Kolmogorov-Smirnov test. The data was not found to follow a normal distribution; hence, median, and interquartile ranges (IQRs) were calculated.

The data were presented as the proportion of respondents who provided a "6" and "7" Likert scale response of agreement with the statements. Median AMR perception scores (measuring awareness about AMR and its contributing factors), AMR eradication perception scores (measuring AMR eradication approaches), and ASP perception scores (measuring ASP strategies) were also calculated and compared among demographic subgroups. A p-value <0.05 was regarded as statistically significant.

The study was approved by the Institutional Review Committee of KIST Medical College with reference number 2077/78/49. The participants were informed about the purpose of the research.

## RESULTS

A total of 202 HCPs participated in the study out of the calculated sample size of 226 providing a response rate of 89.3% (202/226). The maximum number of respondents were physicians (n=77, 38.1%), followed by nurses (n=62, 30.7%). Respondents from the age group 31-40 years were most common (n=140, 69.3%), followed by those (n=56, 27.7%) from the 41-50 years age group. More participants were females, (n=136, 67.3%). Maximum (n=115, 56.9%) participants were having a work experience of 1-5 years. Table 1 shows the respondents' demographic characteristics.

Statements with significant differences in % of agreement among different subgroups of respondents have been shown in table 2 below.

**Table 1. Demographic characteristics of respondents (n =202)**

Characteristic	Number (percentage)
<b>Gender</b>	
Male	66 (32.7)
Female	136 (67.3)
<b>Age (in years)</b>	
31-40	140 (69.3)
41-50	56 (27.7)
51-60	4 (2)
>60 years	2 (1)
<b>Occupation</b>	
Staff Physician	77 (38.1)
Nurse	62 (30.7)
Medical Officer	29 (14.4)
Interns	25 (12.4)
Pharmacists	9 (4.5)
<b>Work experience</b>	
<1 year	43 (21.3)
1-5 year	115 (56.9)
6-10 year	28 (13.9)
10-20 year	14 (6.9)
>20 years	2 (1)

**Table 2. Statements with significant differences in percentage of agreement among different age and gender subgroups of respondents.**

Statement	Parameter	Subgroups	% Agreement among subgroups	P-value
The problem of AMR is seen globally.	AMR	31-40	60	p=0.029
		41-50	76.8	
		51-60	100	
		>60 years	100	
The problem of AMR in Nepalese hospitals was considered serious	AMR	31-40	40.8	p=0.023
		41-50	53.6	
		51-60	100	
		>60 years	100	
Irrational use of antibiotics in the community could lead to antimicrobial resistance.	AMR	31-40	37.9	p=0.010
		41-50	53.5	
		51-60	100	
		>60 years	50	
Inappropriate antibiotic use is professionally unethical.	AMR	31-40	78.5	p=0.002
		41-50	96.4	
		51-60	50	
		>60 years	100	

**Table 2. Statements with significant differences in percentage of agreement among different age and gender subgroups of respondents.**

Statement	Parameter	Subgroups	% Agreement among subgroups	P-value
ASP would help improve antibiotic utilization in Nepal by reducing prescriptions.	AMS	31-40	26.4	p<0.001
		41-50	10.7	
		51-60	100	
		>60 years	100	
AMR is a problem in the Nepalese community.	AMR	Females	45.5	p<0.001
		Males	45.5	
Patient pressure might also be a contributory factor to the problem of AMR.	AMR	Females	44.8	p=<0.001
		Males	21.2	

**Table 3. Statements with significant differences in percentage of agreement among working experience and professional subgroups of respondents.**

Statement	Parameter	Subgroups	% Agreement among subgroups	P-value
The problem of AMR in Nepalese hospitals was considered serious.	AMR	<1 year	13.9	p=0.007
		1-5 year	36.5	
		6-10 year	35.7	
		10-20 year	14.2	
		>20 years	100	
The use of antimicrobials in the community can promote AMR in Nepal.	AMR	<1 year	18.6	p=0.010
		1-5 year	48.2	
		6-10 year	46.4	
		10-20 year	78.5	
		>20 years	100	
The irrational use of antibiotics in their hospital was a factor contributing to AMR in Nepal	AMR	Physicians	28.5%	p=0.046
		Nurse	33.8	
		Medical Officer	55.1	
		Interns	44.0	
		Pharmacists	11.2	
Agreed for establishing an antimicrobial stewardship team in their hospital.	AMS	Physicians	74.0	p=0.003
		Nurse	54.8	
		Medical Officer	89.6	
		Interns	56.0	
		Pharmacists	88.9	

The findings based on the age group showed that the respondents from the age group of 31-40 years, viewed the problem of AMR as a global problem. The participants were convinced that irrational use of antibiotics in the community could lead to antimicrobial resistance and inappropriate use of antibiotics can harm patients and can be unethical.

They also agreed that ASP would help improve antibiotic utilization in Nepal by reducing prescriptions (Table 2).

A greater proportion of female participants viewed AMR as a problem in the Nepalese community and were convinced that patient pressure might also be a contributory factor to the problem of AMR. They also believed that inappropriate use of antibiotics can harm patients and regular educational sessions could also be an approach to promoting rational use of antibiotics. (Table 2).

Participants having 1-5 years of work experience viewed AMR as a serious problem. They were convinced that patient pressure might also be a contributory factor to the problem of AMR and that rational use of

antibiotics would reduce problems with antibiotic-resistant organisms. These people were also convinced that inappropriate use of antibiotics can harm patients and that improving antimicrobial prescribing in their ward will help decrease AMR at the hospital. They also believed that ASP would help improve antibiotic utilization in Nepal by restricting prescriptions,  $p=0.013$  (Table 3).

Most physicians agreed that the irrational use of antibiotics in their hospital was a factor contributing to AMR in Nepal and believed that AMR could significantly affect patients under their supervision. Moreover, a larger number of physicians agreed that rational use of antibiotics would reduce problems with antibiotic-resistant organisms (Table 3). Physicians also agreed that antimicrobial guidelines and protocols should be accompanied by a policy for antimicrobial use and agreed on establishing an antimicrobial stewardship team in their hospital. They also believed that the audit and feedback on the use of antibiotics could be a useful strategy for promoting antimicrobial stewardship,  $p=0.048$  (Table 3).

**Table 4. Median AMR, AMR eradication and ASP perception scores among subgroups of respondents.**

Characteristic	AMR Median perception score (IQR)	P-value	AMR eradication Median perception score (IQR)	P-value	ASP score Median perception score (IQR)	P-value
<b>Age (in years)</b>						
31-40	5 (2)	<b>0.028</b>	7 (2)	0.531	6 (2)	0.349
41-50	5 (0.5)		7 (2)		5 (2)	
51-60	6 (0)		4.5 (5)		6 (0)	
>60 years	7 (0)		7 (0)		7 (0)	
<b>Gender</b>						
Male	5 (2)	0.489	7 (1)	<b>0.019</b>	6 (2)	0.717
Female	5 (2)		7 (2)		6 (2)	
<b>Occupation</b>						
Physician	5 (2)	0.179	7 (1)	<b>0.001</b>	6 (2)	0.067
Nurse	4.5 (1.5)		6 (3)		6 (2)	
Medical Officer	5.5 (2.5)		7 (0)		7 (1)	
Interns	5.5 (2.5)		7 (1)		6 (2.5)	
Pharmacists	4 (1)		6 (1.5)		5 (1.5)	
<b>Working experience</b>						
<1 year	4 (2.5)	<b>&lt;0.001</b>	6 (2)	<b>0.048</b>	6 (1.5)	0.135
1-5 year	5 (1.5)		7 (2)		6 (2)	
6-10 year	5 (2)		6 (1)		5.5 (2)	
10-20 year	5 (1.5)		4 (5)		6 (2.5)	
>20 years	7 (0)		7 (0)		7 (0)	

Most of the physicians (43/77, 55.8%), nurses (28/62, 45.1%), medical officers (24/29, 82.7%), interns (14/25, 56%), and pharmacists (3/9, 33.3%) were involved in the care of one or more patients with an antimicrobial-resistant infection. Similarly, most physicians (63/77, 81.8%) and nurses (32/62, 51.6%) agreed that over the past 10 years, there has been an increased number of cases of antimicrobial-resistant infections. About half of the HCPs (98/202, 48.5%) knew the term 'antimicrobial stewardship'. Very few HCPs (45/202, 22.2%) had worked in a healthcare institution with an operational ASP (Figure 1).

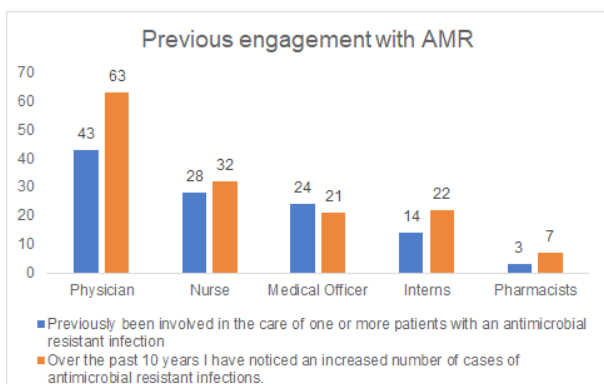


Figure 1. Previous engagement of healthcare professionals with AMR.

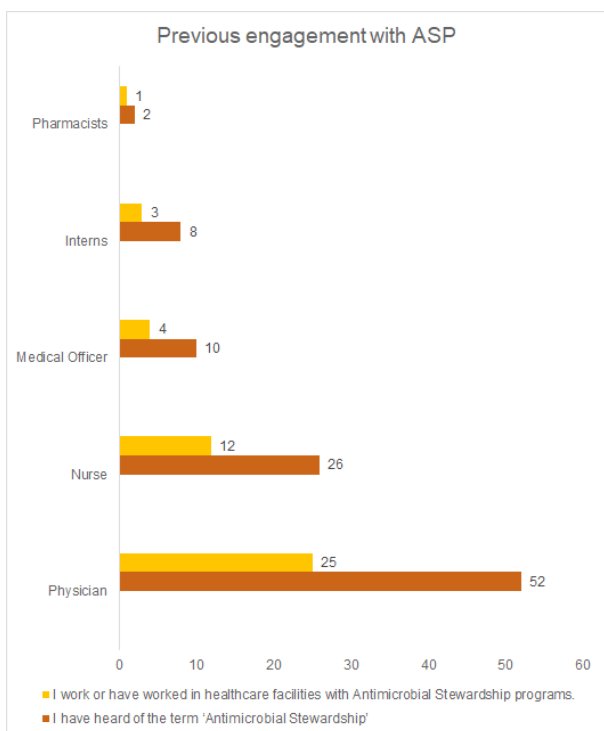


Figure 2. Previous engagement of healthcare professionals with ASP.

The median perception scores for AMR among different age groups ranged from 5 to 7 and were found to be significantly different ( $p=0.028$ ). The age group of more than sixty years were having the highest score. Similarly, the median perception score for AMR eradication among males and females was found to be significantly different ( $p=0.019$ ) and also among respondents of different occupations ( $p<0.001$ ). A significant difference was observed in the age group of participants with median scores for AMR ( $p<0.001$ ) and AMR eradication ( $p=0.048$ ).

## DISCUSSION

Antimicrobial stewardship is a collective and continuous effort for maximizing the use of antimicrobials for improving patient outcomes and promoting rational use of antibiotics. Healthcare professionals were convinced that the problem of AMR is a global problem and is a serious issue for Nepalese hospitals and the hospital/s where they are currently working. These results are in accordance with other published studies from countries like Ghana and Pakistan.<sup>5,9</sup> A recent survey from Ghana also described that physicians regard AMR as a severe problem.<sup>9</sup> The percentage of respondents agreeing with the statement about AMR being a global problem was significantly different among different age groups, male and female participants, and participants having different work experiences.

In this study, regarding the seriousness of the problem of AMR in Nepalese hospitals, most respondents, 57/140 (40.8%,  $p=0.023$ ) from the age group of 31-40 years, and half of the physicians, 39/77 (50.6%,  $p=0.038$ ) compared to other professions and those having a work experience of 1-5 years thought it was a serious problem 55/115 (47.8%,  $p=0.003$ ) compared to participants from other age groups, professions and having different work experience. This was similar to the findings reported in other studies.<sup>10-13</sup>

Most participants with a work experience of 1-5 years, females, and participants from the age group 31-40 years of age deemed that the irrational use of antimicrobials in the community can promote AMR in Nepal. Nurses also thought that AMR could cause problems in the community. This was in accordance with published studies from Thailand and Australia.<sup>14,15</sup>

Most physicians, as compared to other professionals, agreed that the irrational use of antibiotics in their hospitals is an important contributing factor to AMR in Nepal. Female participants and participants having

a work experience of 1-5 years were convinced that patient pressure might also be a contributory factor to the problem of AMR. Antibiotic prescribing directed by patient pressure for faster recovery can be an important factor contributing to AMR. Self-medication with antibiotics is an important factor contributing to their irrational use in a developing country like Nepal. Self-medication, irrational prescribing, and dispensing are seen in Nepal.

Pharmacists are also important HCPs in Nepal, as many people seek advice regarding their healthcare problems. Pharmacists may also be responsible for promoting irrational use and misuse of antibiotics in low- and middle-income countries (LMICs).<sup>16-19</sup>

Using antimicrobials in animal/agricultural sectors as a reason for AMR was also highlighted by participants with one to five years of experience. The increasing use of antibiotics has been documented in animals and agriculture around the globe. A study has shown about 40.4% of antibiotics were dispensed without prescription by veterinarians, and many antibiotics are used in this sector. In addition, antibiotics are also used as a growth promoter to decrease morbidity and mortality in poultry farms in Nepal.<sup>20,21</sup> Overuse of antibiotics in animals can result in resistant infections in humans and can be considered an important factor in the problem of AMR and the one health approach.<sup>22,23</sup>

This was also agreed upon by other HCPs. Studies have documented the availability of antibiotics without a prescription in low- and middle-income countries like Nepal.<sup>6,24</sup> Pharmacists are also known to dispense antibiotics without prescription.<sup>23</sup> Nurses, interns, and medical officers were also in support of this statement in our study.

Among the HCPs, only physicians viewed that antimicrobial resistance could affect patients under their supervision significantly. Our result was like a study from Pakistan, where the percentage of healthcare professionals with this belief was 36.9%.<sup>5</sup> In Nepal, the physician-patient ratio is one to five thousand. Additionally, most patients must pay out of their pocket for utilizing healthcare services. Thus, people seek advice for their health issues from community pharmacists whose services are relatively cheaper and more easily available. Studies have shown that antibiotics in these community pharmacies are being dispensed without a prescription.<sup>6,25</sup> Additionally, these community pharmacies may also be operated by non-pharmacy personnel without legal registration. These

practices are unethical and can lead to irrational use of antimicrobials and AMR.<sup>6,25</sup>

Most HCPs believed there should be antimicrobial policies and guidelines to help contain the problem of AMR in Nepal. Studies have already shown these policies and guidelines are beneficial.<sup>5,26</sup> The national action plan for the containment of antimicrobial resistance was framed in 2016 in Nepal.<sup>27</sup> There is also a national antibiotic treatment guideline in Nepal, developed in 2014 but it has not yet been widely implemented.<sup>26,28</sup>

Most of the HCPs were convinced that policies and systems must be present in the hospitals and should be supported by ASP. Guidelines developed for antimicrobial use will promote their rational use. A study from Nepal recommends there should be strict implementation of the antimicrobial guidelines and the national plan.<sup>26</sup> Hospital-based ASPs are effective for the proper use of antibiotics.<sup>5</sup>

A study from Pakistan has revealed that hospital-wide audits of the use of antibiotics can be an important measure supporting the rational use of antibiotics. Creating a hospital formulary with the details of antibiotics suitable for different conditions will also be useful.<sup>5</sup> All HCPs also agreed that educational interventions could improve the use of antibiotics.

In this study, more than half of the HCPs including physicians (112/202, 55.4%) provided care to patients with resistant infections. This was different from another study where 84% of physicians were treating patients having resistant infections.<sup>15</sup> Less than half the HCPs knew the term 'antimicrobial stewardship', which was, however, greater than that mentioned in another study, where only 15.2% of HCPs knew about this term.<sup>5</sup> This may be due to an increased awareness of the term among the HCPs in this hospital as a large number had participated in a three-day workshop on 'Strategies for reducing antimicrobial resistance and promoting rational use of antimicrobials' conducted in April 2019.<sup>29</sup> Educational interventions in terms of continuing education sessions will be useful and should be conducted at regular intervals to better understand these terminologies and their benefits toward patient care.<sup>29,30</sup>

This study was a single-center study and thus may be difficult to generalize. Furthermore, the participation of the selected healthcare workers was voluntary, leading to selection bias.

## CONCLUSIONS

Healthcare professionals believed that the problem of antimicrobial resistance was important. The antibiotics guidelines developed by the government should be strictly implemented. It was seen that most HCPs had a positive attitude toward hospital-based ASPs and recognized their importance in antimicrobial stewardship programs.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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