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ASSESSING KNOWLEDGE AND AWARENESS OF ANTIBIOTIC RESISTANCE AMONG NURSES OF HAYATABAD MEDICAL COMPLEX PESHAWAR

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Abstract

Introduction: *Antibiotic resistance refers to the ability of bacteria to survive, multiply, or cause infection despite the use of antibiotics that were previously effective. This occurs due to genetic mutations or the acquisition of resistance mechanisms, posing a serious global public health challenge and compromising effective infection management.*

Objective: *To assess the level of knowledge regarding antibiotic resistance among nurses working at Hayatabad Medical Complex, Peshawar.*

Methodology: *A descriptive cross-sectional study was conducted from September to December 2025 at Hayatabad Medical Complex, a tertiary care hospital in Peshawar. Data were collected using a validated and reliable questionnaire through a convenient sampling technique. The collected data were analyzed using SPSS version 27.*

Results: *Most participants were young female registered nurses holding a Bachelor of Science in Nursing degree. Overall, 57% of nurses demonstrated high knowledge, 38.6% had moderate knowledge, and 4.4% showed low knowledge of antibiotic resistance. While nurses were knowledgeable about antibiotic use and resistance, gaps existed in understanding resistance transmission and related misconceptions.*

Conclusion: *Although nurses exhibited generally good knowledge of antibiotic resistance, notable gaps persist, highlighting the need for targeted educational interventions to strengthen antibiotic stewardship.*

INTRODUCTION

Antibiotic resistance has emerged as a major global public health challenge, placing substantial strain on healthcare systems, particularly when healthcare professionals lack adequate knowledge regarding the rational use of antibiotics (1). Antibiotics have revolutionized the management of bacterial infections by significantly reducing morbidity and mortality and remain among the most frequently prescribed medications in clinical practice (2). However, their inappropriate and excessive use has accelerated the emergence and spread of antibiotic-resistant bacteria, threatening the effectiveness of

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treatments that were once highly successful. Antibiotic resistance occurs when bacteria undergo genetic changes that reduce or eliminate the effectiveness of antimicrobial agents, resulting in infections that are harder to treat, prolonged hospital stays, increased healthcare costs, and higher mortality rates (3–5).

Nurses play a central role in antibiotic administration, patient monitoring, and education regarding medication adherence, making their knowledge and awareness of antibiotic resistance critically important. Despite general awareness of antibiotic resistance, studies suggest that many nurses lack comprehensive understanding of appropriate antibiotic use, resistance mechanisms, and stewardship principles (6,11). Evidence from developing countries indicates that insufficient training, limited multidisciplinary collaboration, unclear professional roles, and lack of formal education in antimicrobial stewardship contribute to knowledge gaps among nurses (8,12,13). These deficiencies hinder effective infection control and promote inappropriate antibiotic use within healthcare settings.

The burden of antibiotic resistance is particularly pronounced in low- and middle-income countries, including Pakistan, where over-the-counter antibiotic availability, weak regulatory frameworks, and limited awareness among healthcare workers are common (7,14). Global surveillance data highlight alarming resistance rates, including high levels of methicillin-resistant Staphylococcus aureus and Escherichia coli resistance across multiple regions (8–10). Studies from Pakistan and neighboring regions, including Azad Jammu & Kashmir, reveal that while many nurses demonstrate good overall knowledge, significant gaps persist regarding resistance mechanisms and stewardship strategies (8,15). In high-patient-load tertiary hospitals such as Hayatabad Medical Complex, Peshawar, evaluating nurses' knowledge of antibiotic resistance is essential to identify gaps and inform targeted educational interventions aimed at improving antibiotic stewardship, patient safety, and public health outcomes.

Materials and Methods

This descriptive cross-sectional study was conducted at Hayatabad Medical Complex (HMC), Peshawar, Khyber Pakhtunkhwa, Pakistan, to assess nurses' knowledge regarding antibiotic resistance. The study population comprised registered nurses working in various departments, including medical, surgical, pediatric, intensive care, and emergency units.

A sample size of 110 nursing internees was calculated using the RaoSoft sample size calculator with a 95% confidence level, 5% margin of error, and an assumed population of 150 nurses; however, a total of 114 nurses were recruited using a convenience sampling technique. Registered nurses present during data collection and willing to participate were included, while those on leave or unwilling to participate were excluded.

Data were collected using a validated questionnaire adapted from a previous study, consisting of two sections: demographic information and 20 knowledge-based items covering antibiotic resistance, prevention strategies, and general antibiotic facts. Each correct response was scored as one, and incorrect responses as zero, with higher scores indicating better knowledge.

The tool demonstrated acceptable reliability (Cronbach's alpha = 0.71). Following ethical approval from the ethics and research committee of PGCN and administrative permission from HMC, questionnaires were distributed during duty hours and collected within two working days over a four-week period.

Data were analyzed using SPSS version 27, employing descriptive statistics such as frequencies, percentages, means, and standard deviations, and results were presented in tabular and graphical formats.

Results

Table 1. Demographic characteristics of the participants

S. No	Variable	Category	Frequency (n)	Percentage (%)
1	**Age (years)**	18–20	2	1.8
		21–23	32	28.1

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		≥ 24	80	70.2
2	**Gender**	Male	42	36.8
		Female	72	63.2
3	**Education Level**	Diploma	12	10.5
		BSN	98	86.0
		MSN	3	2.6
		PhD	1	0.9
4	**Work Experience**	< 5 years	89	78.1
		5–10 years	9	7.9
		> 10 years	16	14.0
5	**Marital Status**	Married	70	61.4
		Unmarried	44	38.6

The table presents the demographic characteristics of the study participants. The majority of nurses were aged 24 years or older (70.2%) and predominantly female (63.2%). Most participants held a Bachelor of Science in Nursing degree (86.0%) and had less than five years of work experience (78.1%). In terms of marital status, more than half of the nurses were married (61.4%). Overall, the sample reflects a relatively young, professionally qualified nursing workforce with limited years of clinical experience.

Table 2. Knowledge and Awareness about Antibiotic Resistance among Nurses (N = 114)

S. No	Knowledge Statement	Mean	Standard Deviation
1	Antibiotics kill or slow the growth of bacteria	0.94	0.24
2	Antibiotics can cause side effects (e.g., allergy, diarrhea)	0.88	0.33
3	Common side effects include rash, nausea, vomiting, diarrhea	0.90	0.30
4	Antibiotics act on normal and infectious flora	0.73	0.45
5	Incomplete antibiotic course reduces effectiveness	0.73	0.45
6	Nosocomial infections are acquired in healthcare settings	0.87	0.34
7	Antibiotic resistance is bacterial change reducing drug effectiveness	0.87	0.34
8	New antibiotic generations are *not* a cause of resistance	0.57	0.50
9	Antibiotic resistance can affect all age groups	0.78	0.42
10	Overuse of antibiotics is a major cause of resistance	0.78	0.42
11	Resistant infections are difficult or impossible to treat	0.69	0.46
12	Resistance spreads through humans and animals	0.56	0.50
13	Using antibiotics for viral infections is improper use	0.75	0.44
14	Handwashing is vital for infection prevention	0.89	0.31
15	Immunization and infection prevention reduce resistance	0.89	0.31
16	Antibiotic stewardship improves antibiotic use	0.76	0.43
17	Antibiotics should ideally start after microbiological confirmation	0.82	0.39
18	Stopping antibiotics when symptoms resolve reflects poor knowledge	0.63	0.48
19	Infection prevention practices prevent resistant spread	0.81	0.40
20	Stewardship strategies help combat resistance	0.83	0.37

The table presents nurses' knowledge and awareness regarding antibiotic resistance. Overall, participants demonstrated good understanding of the basic concepts of antibiotics, their side effects, infection prevention, and the role of antibiotic stewardship programs. High mean scores were observed for hand

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hygiene, immunization, and appropriate antibiotic use. However, relatively lower mean scores were noted for items related to resistance transmission, misconceptions about new antibiotics, and stopping antibiotics when symptoms improve, indicating important knowledge gaps. These findings suggest that while general awareness is satisfactory, focused education is needed to strengthen understanding of resistance mechanisms and stewardship strategies.

Table 3. Knowledge and Awareness Level of Nurses Regarding Antibiotic Resistance (N = 114)

S. No	Knowledge Level	Frequency (n)	Percentage (%)
1	Low level	5	4.4
2	Moderate level	44	38.6
3	High level	65	57.0
Total		**114**	**100.0**

Table 3 shows the overall knowledge and awareness levels of nurses regarding antibiotic resistance. More than half of the respondents (57.0%) demonstrated a high level of knowledge, while 38.6% had a moderate level of understanding. Only a small proportion (4.4%) exhibited a low level of knowledge. These results indicate that the majority of participants possess adequate awareness of antibiotic resistance, though some still require further education and reinforcement.

Discussion

Antibiotic resistance (ABR) remains one of the most serious global public health threats, requiring coordinated, multisectoral strategies for effective control (22). Nurses, as frontline healthcare providers, play a critical role in antibiotic stewardship, infection prevention, and patient education; therefore, their level of knowledge directly influences efforts to mitigate ABR (23). This study assessed nurses' knowledge regarding antibiotic use and resistance and found that, while overall understanding was satisfactory, important gaps persist that may limit nurses' full contribution to antimicrobial stewardship initiatives.

The findings demonstrated strong foundational knowledge among nurses. Most participants correctly identified the definition and purpose of antibiotics, recognized common side effects, and acknowledged the importance of hand hygiene and immunization in preventing infections. The high mean scores and low standard deviations for these items indicate strong consensus and alignment with global strategies that emphasize infection prevention as a cornerstone in reducing unnecessary antibiotic use (22). Such knowledge is essential for ensuring safe clinical practice and supporting effective patient counseling.

However, notable deficiencies were observed in areas related to the broader dynamics of antibiotic resistance. Misconceptions regarding the role of new antibiotic generations in resistance development and limited awareness of resistance transmission through humans and animals reflect an incomplete understanding of the ecological and behavioral drivers of ABR. These findings suggest insufficient familiarity with the "One Health" approach, which is vital for addressing antibiotic resistance across human, animal, and environmental domains (24). The lack of consensus on these items further highlights variability and uncertainty in nurses' understanding.

Although knowledge of antibiotic resistance definitions and stewardship program goals was relatively strong, the persistence of these gaps underscores the need for focused and continuous educational interventions. Addressing the complex, multifactorial nature of ABR requires moving beyond basic concepts to include transmission pathways, behavioral contributors, and interdisciplinary responsibilities (25). Strengthening hospital-based antibiotic stewardship programs and promoting ongoing professional development can enhance nurses' engagement and effectiveness in combating antibiotic resistance, as supported by existing evidence emphasizing education and collaborative practice (26).

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Conclusion

The study found that nurses generally possess poor knowledge of antibiotic use and resistance, though specific gaps remain in understanding the spread of resistance and misconceptions about antibiotics resistance spreading. These findings underscore the need for targeted educational strategies to strengthen nurses' roles in antibiotic stewardship.

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