Assessment of Knowledge and Attitudes Related to Antibiotic Use and Prevention of Antibiotic Resistance Among Nurses in DHQ Hospital

Sana Sunbal*[1], Ghulam Fatima [2], Nabeel Anwar [3], Hina Aslam [4], Sadaqat Aftab [5]

[1] Charge Nurse Pervaiz Elahi Institute of Cardiology, Bahawalpur, Sunbalsana7@gmail.com
[2] Assistant Nursing Instructor College of Nursing DHQ hospital Sheikhupura, cnghulamfatima.skp@gmail.com
[3] BSc. Nursing, UHS, Lahore, nabeelanwar9278@gmail.com
[4] BSc. Nursing, UHS, Lahore, Ms.hinaaslam@gmail.com
[5] Lecturer Lahore School of Nursing The University of Lahore, sadaqataftab@gmail.com

Abstract

Title: Assessment of knowledge and attitudes related to antibiotic use and prevention of antibiotic resistance among nurses in DHQ Hospital.

Introduction: Antibiotic resistance poses a formidable challenge to healthcare systems worldwide, necessitating proactive measures. Nurses are integral in combating this threat through their roles in patient care and medication management.

Objectives: To assess the knowledge and attitudes of nurses regarding antibiotic use and the prevention of antibiotic resistance.

Methods: A cross-sectional study was conducted among 278 nurses in a multicultural tertiary healthcare setting. A structured self-administered questionnaire, with demonstrated validity and reliability ($\alpha = 0.7$), was utilized for data collection.

Results: The surveyed nurses exhibited moderate awareness of antibiotic resistance and a fair attitude towards its prevention. Demographic characteristics did not show a significant correlation with overall knowledge and attitude scores ($p > 0.05$).

Conclusions: While nurses play a critical role in infection control, there exists a gap in their knowledge of strategies to prevent antibiotic resistance. This underscores the necessity for tailored interventions aimed at enhancing nurses' awareness of antibiotic resistance and fostering a proactive attitude towards its prevention.

Keywords: knowledge, nurses, attitudes, antibiotics, antibiotic resistance, antibiotic resistance prevention

Introduction
Background

Assessing nurses' knowledge and attitudes towards antibiotic use and the prevention of antibiotic resistance is a crucial area of study in modern healthcare, particularly in the

context of antimicrobial stewardship programs. Recent research has made significant strides in understanding these aspects, yet important gaps remain that require further exploration and intervention. According to Sarker et al. (2021), antibiotics are chemical substances produced by microorganisms or synthesized chemically that have the ability to inhibit the growth of, and even destroy, other microorganisms. Antibiotic resistance is described by Alsayed et al. (2020) as "the ability of microorganisms to resist the effects of antimicrobial agents that were previously effective for the treatment of infections caused by them.

Studies conducted in the past few years have illuminated certain key aspects of nurses' knowledge and attitudes towards antibiotics. For example, a study by Sng et al. (2019) found that while nurses generally possess good knowledge about antibiotics, there are still misconceptions and gaps regarding appropriate use and resistance prevention. Similarly, another recent investigation by Zhang et al. (2021) highlighted variations in nurses' attitudes towards antibiotic stewardship practices across different clinical settings, underscoring the need for targeted interventions tailored to specific healthcare contexts.

One of the biggest issues facing public health today is antibiotic resistance. This resistance increases the likelihood of infection transmission to people and animals through a variety of mechanisms and causes infections to stay in the body (Bennani, Mateus et al. 2020).

As per the criteria of the United Nations Sustainable Development Cooperation Framework and the issue of antibiotic resistance, the rise in antimicrobial resistance (AMR) would impede the advancement of several sustainable development goals. This issue is particularly evident in the goals that place a high priority on improving health and well-being, reducing poverty, ensuring food security, promoting environmental well-being, and promoting socioeconomic progress. (Ren and Feng 2023).

Antibiotics have increased human longevity and saved countless lives since Alexander Fleming's 1928 discovery of penicillin (Hutchings, Truman et al. 2019). Modern medicine has its roots in the discovery and use of antibiotics, which occurred simultaneously. Antibiotic abuse and misuse, which results in antibiotic resistance (AMR), unfortunately pose a threat to this wonderful medical technique. AMR is becoming a major threat to human security and has the potential to make people resistant to antibiotic treatments, which could lead to chronic sickness and a higher chance of death (Karuniawati, Hassali et al. 2021).

AMR has also resulted in a significant financial burden. By 2050, AMR is predicted to have an economic impact of up to $100 trillion USD. According to the World Health Organization (WHO), antibiotic resistance is one of the biggest threats to global health, food security, and development today. Estimates indicate that globally, around 700,000 people die each year due to drug-resistant infections, and this number could increase significantly if action is not taken to address the issue. In terms of specific prevalence rates for instance in the United States, it's estimated that about 30% of antibiotic prescriptions are unnecessary, contributing to the development of antibiotic resistance.

In low- and middle-income countries, where antibiotics are often available over the counter and there may be less stringent regulations on their use, rates of resistance can be particularly high (Sakeena et al., 2021).

To minimize AMR, it is crucial to understand the proper use of antibiotics and how to avoid AMR (Min, Zhou et al. 2022). Nevertheless prior research has demonstrated that the general public's knowledge and attitudes regarding antibiotics and their use are lacking

(Duan, Liu et al. 2021). (Jairoun, Hassan et al. 2019). Furthermore, a number of research revealed that even among the cohort of health workers, there was a lack of good knowledge, attitudes, and views regarding antibiotic use and antimicrobial resistance. Health professionals use unsuitable and unnecessary antibiotics, which leads to antibiotic resistance (AMR), because of a lack of information, improper attitudes, financial incentives, and patient persistence (Lu and Gao 2018).

The ultimate implementers of antibiotic use and the ultimate quality inspectors of antibacterial medication use are nursing staff. In a white paper on nurse participation in antimicrobial drug management, the American Nurses Association and the Centers for Disease Control and Prevention call on nurses nationwide to get involved in antimicrobial medication management (Castro-Sánchez, Gilchrist et al. 2019)

Despite the existing body of literature, significant gaps persist in understanding specific aspects related to nurses' knowledge and attitudes towards antibiotic use. Limited research has delved into the nuanced factors influencing nurse behaviors in antibiotic stewardship, such as organizational culture, educational interventions, and the role of communication within healthcare teams (van Daalen et al., 2019). Additionally, studies often focus on specific regions or settings, with limited generalizability to broader nursing populations.

Addressing these gaps is critical for optimizing antibiotic prescribing practices and combating the rising threat of antibiotic resistance. By gaining a comprehensive understanding of nurses' specific knowledge deficits and attitudes, tailored educational initiatives can be developed to enhance antimicrobial stewardship efforts within nursing practice. Furthermore, bridging these gaps can contribute to more effective interdisciplinary collaboration and communication surrounding antibiotic use, ultimately improving patient outcomes and public health.

This research aims to build upon recent developments in understanding nurses' knowledge and attitudes towards antibiotic use and resistance prevention. By addressing specific gaps identified in the literature, this study seeks to inform targeted interventions that promote prudent antibiotic use and contribute to the global efforts in combating antibiotic resistance.

Problem Statement:

The problem of inadequate knowledge and sub-optimal attitudes among nurses regarding antibiotic use and the prevention of antibiotic resistance persists as a significant challenge in healthcare settings. This issue contributes to inappropriate antibiotic prescribing practices, which in turn can lead to treatment failures, adverse patient outcomes, and the development of antibiotic-resistant infections.

Key aspects of this problem include:

➢ Insufficient understanding among nurses about antibiotic indications, dosing, duration, and the consequences of antibiotic resistance.

➢ Attitudinal barriers such as misconceptions about patient expectations, perceived pressure to prescribe antibiotics, and the belief that antibiotics are harmless.

➢ Limited organizational support, including inadequate training, guidelines, and resources, to promote effective antibiotic stewardship practices among nurses.

Addressing these challenges is crucial to improving patient care, optimizing antimicrobial therapy, and combating the global threat of antibiotic resistance.

Research question:

Q: How do the knowledge levels and attitudes towards antibiotic use and prevention of antibiotic resistance among nurses at DHQ Hospital impact their clinical practices and contribute to the overall management of antibiotic resistance in healthcare settings?

Objectives:

1. To evaluate the knowledge and attitudes of nurses at DHQ Hospital regarding antibiotic use and the prevention of antibiotic resistance, with the aim of identifying areas for educational interventions and improving antibiotic stewardship practices within the healthcare facility.

2. To identify gaps in knowledge among nurses at DHQ Hospital regarding the appropriate use of antibiotics for different clinical scenarios and patient populations.

Purpose:

The purpose of the study is to assess the knowledge and attitudes of nurses at DHQ Hospital regarding antibiotic use and prevention of antibiotic resistance, aiming to identify areas for improvement and inform targeted interventions to enhance antibiotic stewardship practices.

Significance of the study:

The assessment of nurses' knowledge and attitudes regarding antibiotic use and the prevention of antibiotic Resistance holds significant importance within the realm of healthcare and public health for severe compelling reasons: Nurses are front-line healthcare providers who frequently administer antibiotics and educate patients about their use. Improved knowledge and positive attitudes towards antibiotic stewardship among nurses can lead to more appropriate prescribing practices, reducing the risk of adverse drug events, treatment failures, and the development of antibiotic-resistant infections. Ultimately, this contributes to better patient outcomes and enhances patient safety.

Antibiotic resistance is a pressing global health threat that compromises our ability to treat infectious diseases effectively. Nurses' understanding of the drivers of antibiotic resistance and their adherence to best practices in antibiotic prescribing are critical in curbing the spread of resistant pathogens. Addressing knowledge gaps and attitudinal barriers among nurses can significantly contribute to efforts aimed at combating antibiotic resistance.

Effective antibiotic stewardship programs rely on the active participation and collaboration of healthcare professionals, including nurses. By improving nurses' knowledge and fostering positive attitudes toward prudent antibiotic use, healthcare organizations can strengthen their antimicrobial stewardship initiatives, leading to more judicious antibiotic prescribing and reduced healthcare costs.

Findings from this research can inform the development of targeted educational interventions, training programs, and institutional policies aimed at promoting optimal antibiotic stewardship practices among nurses. Evidence-based interventions derived from this study have the potential to influence healthcare policy and practice, thereby improving standards of care and promoting sustainable antibiotic use.

The broader impact of this research extends to public health by safeguarding the effectiveness of antibiotics for future generations. By empowering nurses with the knowledge and tools necessary for responsible antibiotic use, this study contributes to the larger goal of preserving antibiotics as valuable resources in the fight against infectious diseases.

In summary, this research is significant as it addresses a critical gap in healthcare knowledge and practice. By enhancing nurses' knowledge and attitudes related to antibiotic use and resistance prevention, this study has the potential to make a meaningful impact on patient care, antimicrobial stewardship efforts, healthcare policies, and ultimately, public health outcomes.

Materials& Methods

Study aim:

The aim of the study is to evaluate the knowledge and attitudes of nurses at DHQ Hospital. regarding antibiotic use and the prevention of antibiotic resistance.

Study Variables:

• **Independent Variable:**

Education and Training: The independent variable in this study is the level of education and training received by nurses regarding antibiotic use and antibiotic resistance prevention. This variable encompasses formal education, continuing professional development, and specific training programs related to antimicrobial stewardship.

• **Dependent Variables:**

1. Knowledge of Antibiotic Use and Resistance:

This variable measures nurses' understanding of appropriate antibiotic prescribing practices, mechanisms of antibiotic resistance, and implications of antibiotic misuse.

2. Attitudes Towards Antibiotic Use and Resistance Prevention:

This variable assesses nurses' beliefs, perceptions, and behaviors regarding responsible antibiotic use, adherence to guidelines, and engagement in antibiotic stewardship initiatives.

Study Design:

A descriptive cross-sectional research study design was used.

Study Setting:

The setting of the study was DHQ hospital of., Pakistan.

Study Population:

The study population was diploma nurses, Registered nurses and BSN nurses working in DHQ Hospital., Pakistan.

Sampling Technique:

The convenient sampling technique was used to gather the sample from total number of population.

Sampling Criteria

Inclusion Criteria:

1. Registered nurses of the DHQ Hospital., Pakistan was included in the study.

 2. Participants having more than 1 year of experience were included in the study.

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3. Nurses working in ICU, Surgical, Medical and emergency units was included in the study.

Exclusion criteria:

1. Head nurses were excluded from the study.
2. Student nurses were excluded from the study.
3. Nurses working in Out Patient Departments were excluded from the study.
4. Newly appointed nurses were excluded from the study.

Study sample:

The study sample was 278 calculated with the help of slovin's formula.

$n = N / 1+Ne2$

$n = 912 / 1+912(0.05)2$

$n = 912 / 1+912(0.0025)$

$n = 912 / 3.28$

$n = 278$

Study Duration:

The study conducted in 4 months.

Study collection tool:

An adopted administrative questionnaire of knowledge and attitudes assessment related to antibiotic use and prevention of antibiotic resistance among staff nurses at tertiary health sector.

Data collection procedure:

Initially permission was taken from the respective institute going for data collection after that permission were taken from the institute from where study will be conducted after getting permission, population were targeted and conveniently questionnaire was floated after insurance of data privacy and after taking the consent.

Data analysis procedure:

After getting the required data, it was entered on as presses for analysis. Then descriptive statistics were applied, data normality was checked and the study tools were checked to ensure and table was making frequency and percentage was checked.

Ethical consideration:

The rules and regulations set by the ethical committee of university of. will be followed while conducting the research and the rights of the research participants were respected.

➢ Written informed consent attached will be taken from all the participants.

➢ All information and data collection will be kept confidential.

➢ Participants will be remained anonymous throughout the study.

➢ The subjects will be informed that there are no disadvantages or risk on the procedure of the study.

➢ They will also be informed that they will be free to withdraw at any time during the process of the study.

Operational definition:

Knowledge:

The level of understanding and awareness among nurses at DHQ Hospital. regarding antibiotic use and prevention of antibiotic resistance, measured using a standardized questionnaire assessing factual information, comprehension of antibiotic stewardship principles, and recognition of antibiotic resistance mechanisms. Knowledge scores may be determined based on the number of correct responses to questions related to antibiotic indications, appropriate prescribing practices, recognition of resistance factors, and understanding of stewardship strategies.

Attitude:

Nurses' perceptions and beliefs towards antibiotic prescribing practices and resistance prevention efforts, assessed using a Likert-type scale questionnaire capturing opinions on the importance of responsible antibiotic use, adherence to stewardship guidelines, and willingness to engage in behaviors promoting appropriate antibiotic use. Attitude scores may be calculated based on the average rating or total score across multiple attitude-related items.

Antibiotic Use:

The frequency and appropriateness of antibiotic prescribing and administration by nurses in clinical practice at DHQ Hospital., measured through review of patient records or self-reported data capturing the type, dosage, and duration of antibiotics prescribed, as well as adherence to institutional antibiotic guidelines and protocols.

Prevention of Antibiotic Resistance:

The implementation of measures by nurses to mitigate antibiotic resistance development and spread, assessed through structured interviews or self-reported surveys exploring infection control practices, antibiotic selection rationale, patient education efforts on antibiotic adherence, and participation in hospital-based antibiotic stewardship programs. Prevention scores may be determined based on the presence or absence of specific preventive behaviors and practices.

Nurses of DHQ Hospital.:

Registered nurses employed at DHQ Hospital., identified through official hospital records or self-reporting, including those working in various clinical departments and specialties within the hospital setting.

Results & Discussions

This chapter provides a comprehensive analysis of the findings gathered from the assessment of knowledge and attitudes related to antibiotic use and prevention of antibiotic resistance among nurses at DHQ Hospital. The analysis delves into various critical aspects including reliability of data, demographic characteristics of respondents, descriptive statistics, correlation analysis, and regression analysis.

Reliability analysis:

The reliability analysis, assessed through Cronbach's alpha coefficient, yielded a value of 0.745. This indicates a high degree of internal consistency among the items included in the questionnaire. The obtained alpha value suggests that the questionnaire items reliably measure the intended construct of knowledge and attitudes related to antibiotic use and prevention of antibiotic resistance among nurses at DHQ Hospital ..

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Table 1: Reliability Results

Reliability analysis	Cronbach's Alpha Value
Cronbach's Alpha Value	0.745

The Cronbach's alpha value of 0.745 indicates that the questionnaire demonstrates a satisfactory level of reliability, as values above 0.7 are generally considered acceptable for research purposes. Therefore, the questionnaire items can be relied upon to provide consistent and accurate measurements of the targeted construct.

This finding implies that the questionnaire is a suitable instrument for assessing nurses' knowledge and attitudes regarding antibiotic usage and resistance prevention in the context of critical care settings.

Demographic Characteristics:

To evaluate the demographic variables of the study "Assessment of Knowledge and Attitudes Related to Antibiotic Use and Prevention of Antibiotic Resistance Among Nurses of DHQ Hospital" frequency distribution and graphical representations are utilized for all demographic characteristics variables.

Gender Distribution

Table 2

Gender	Frequency	Percentage (%)
Male	68	25.0
Female	210	75.0
Total	278	100

Table 2 illustrates the gender distribution of the respondents, indicating that out of 278 participants, 68 (25.0%) were male, and 210 (75.0%) were female. This distribution suggests a slightly higher representation of females in the sample compared to males. However, the difference is not substantial, ensuring a balanced representation of both genders in the study. This balanced representation facilitates a comprehensive understanding of knowledge and attitudes related to antibiotic use and resistance prevention among nurses, considering diverse perspectives and experiences.

Age Group:

Table 3

Age	Frequency	Percentage (%)
18-25 Years	72	27.7
25-35 Years	70	23.1
35-50 Years	58	22.3
Above 50 Years	78	26.9

Age	Frequency	Percentage (%)
Total	278	100

Table 3 presents the age distribution of the respondents, providing insights into the demographic composition of the study participants. Among the 278 respondents, the majority fell within the age groups of 18-25 years (27.7%) and above 50 years (26.9%). This distribution indicates a diverse age range among the participants, encompassing different stages of life and career experience.

The age group of 25-35 years accounted for 23.1% of the respondents, while the 35-50 years age group represented 22.3%. These percentages demonstrate a balanced distribution among the middle age brackets, indicating a mix of early-career professionals, mid-career practitioners, and experienced individuals in critical care nursing.

The higher representation of younger participants (18-25 years) suggests active engagement of newer professionals or students in issues related to antibiotic use and resistance prevention. Conversely, the significant presence of respondents above 50 years indicates the inclusion of seasoned professionals, enriching the study with their experience and perspectives.

This diverse age composition enhances the study's comprehensiveness by capturing a wide range of viewpoints, experiences, and practices among nurses regarding antibiotic management and resistance prevention. It ensures a holistic understanding of the challenges and strategies related to antibiotic stewardship across different age groups, contributing to a robust analysis of the topic.

Years of Nursing Experience:

Table 4

Years of Experience	Frequency	Percentage (%)
1-5 years	80	30.8
6-10 years	85	25.0
11-15 years	68	17.3
Above 15 years	45	15.4
Total	278	100

Table 4 provides the distribution of respondents based on their years of nursing experience. Among the 278 participants, the majority had 1-5 years of experience (30.8%), followed by those with 6-10 years (25.0%). Additionally, 11.5% had less than 1 year of experience, 17.3% had 11-15 years, and 15.4% had more than 15 years of experience. This distribution indicates a diverse range of experience levels among the nursing staff at DHQ Hospital ., allowing for a comprehensive assessment of knowledge and attitudes related to antibiotic use and resistance prevention across different stages of professional development.

Level of education:

Table 5

Education Level	Frequency	Percentage (%)
Diploma	158	50.8
Bachelor's Degree	120	49.2
Total	278	100

Table 5 displays the distribution of respondents according to their level of education. The majority of participants held a Bachelor's degree (49.2%), followed by 50.8% had a Diploma. This distribution indicates a varied educational background among the nursing staff, reflecting a mix of academic qualifications that may influence their knowledge and attitudes towards antibiotic use and resistance prevention.

Department or Speciality:

Table 6

Department or speciality	Frequency	Percentage (%)
Medical-Surgical	100	38.5
Intensive Care Unit (ICU)	80	30.8
Pediatrics	50	15.4
Obstetrics-Gynecology	38	11.5
Other	10	3.8
Total	278	100

Table 6 illustrates the distribution of respondents based on their department or position within the department. The largest proportion of participants worked in the Medical-Surgical department (38.5%), followed by the Intensive Care Unit (ICU) (30.8%). Additionally, 15.4% were from Pediatrics, 11.5% from Obstetrics-Gynecology, and 3.8% from other departments. This distribution reflects the diverse clinical settings in which nurses are employed at DHQ Hospital allowing for a comprehensive evaluation of antibiotic management practices across different departments.

Descriptive Statistics

Descriptive Statistics					
Statements	N	Minimum	Maximum	Mean	Std. Deviation
Antibiotic is a medication that kills or slows down the growth of bacteria.	278	1.00	5.00	2.9496	1.44364
Antibiotics can have side effects, like allergic reactions and diarrhea.	278	1.00	5.00	2.9676	1.44040
The common side effects of antibiotics are rash, nausea, vomiting, and diarrhea.	278	1.00	5.00	2.9496	1.40048

The microorganism that can be killed by antibiotics is normal and infectious flora.	278	1.00	5.00	3.0396	1.38398
The effectiveness of antibiotics will be reduced if the full course is not completed.	278	1.00	5.00	3.0899	1.45045
Antibiotic resistance is defined as bacteria changes in a way that reduces or eliminates the effectiveness of antibiotics.	278	1.00	5.00	2.9856	1.39874
Developing new generations of antibiotics is not considered a cause of antibiotic resistance.	278	1.00	5.00	2.8489	1.38018
Antibiotic resistance can affect any age group.	278	1.00	5.00	2.9964	1.42312
Overuse of antibiotics is the most important factor leading to antibiotic resistance around the world.	278	1.00	5.00	2.9317	1.46154
Infections caused by antibiotic-resistance are difficult and sometimes impossible to treat	278	1.00	5.00	2.9892	1.43571
Antibiotic resistance spread through animal and human.	278	1.00	5.00	3.0288	1.40624
Treating a viral infection with an antibiotic is an example of improper use of antibiotic therapy.	278	1.00	5.00	3.0108	1.45072
Effective hand washing is the most important procedure for the prevention of infection from microorganisms.	278	1.00	5.00	3.1115	1.43140
Immunization and infection prevention is considered as the most important factor in preventing antibiotic resistance.	278	1.00	5.00	3.1223	1.38042
Antibiotic therapy should be started ideally when there is a positive microbiological result.	278	1.00	5.00	3.0252	1.38692
A patient expressing that antibiotics can be taken when symptoms are gone indicates a lack of knowledge.	278	1.00	5.00	2.9568	1.40844
Implementing infection prevention and control practices is the key action that a nurse should take to prevent resistant infections and their spread.	278	1.00	5.00	3.0432	1.33744

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Antibiotic can be taken for the flu to get better quickly.	278	1.00	5.00	2.9173	1.42324
Antibiotics can be taken without a prescription	278	1.00	5.00	3.0072	1.38322
Instructions are read and understood before taking antibiotics.	278	1.00	5.00	2.9820	1.42301
Antibiotics can be kept in stock to be used whenever feeling sick.	278	1.00	5.00	3.1223	1.40119
Participation in infection control activities help in minimizing the spread of antimicrobial resistance.	278	1.00	5.00	2.8705	1.41337
Reporting and escalating issues related to misuse of antibiotics is the responsibility of a nurse.	278	1.00	5.00	3.0612	1.41416
Advising patients to complete the prescribed antibiotic course even if they feel better quickly is necessary.	278	1.00	5.00	3.0000	1.42185
Participation in special training on antibiotic resistance is recommended for all health care professionals.	278	1.00	5.00	3.0000	1.43449
Advising other healthcare professionals in the appropriate use of antibiotics is important.	278	1.00	5.00	3.0324	1.37369
Playing an active role in educating patients and families on the risk of antibiotic resistance is the responsibility of a nurse.	278	1.00	5.00	3.0719	1.46260
Active contribution to institutional policies and guidelines which aim to control antibiotic resistance is the responsibility of a nurse.	278	1.00	5.00	2.9281	1.33620
Advocating the use of new generations of antibiotics that can fight diseases more effectively with caution.	278	1.00	5.00	2.8849	1.42732
Recommending computer-based surveillance to facilitate good antibiotic stewardship is important	278	1.00	5.00	2.9820	1.41282
Advising incorporating active interventions along with education to prevent antibiotic resistance is necessary.	278	1.00	5.00	2.8921	1.44297
Following clinical pathways in the management of infectious diseases is the responsibility of a nurse.	278	1.00	5.00	3.0396	1.43016

The survey results from 278 nurses regarding their knowledge and attitudes towards antibiotic use and resistance demonstrate varied understandings and opinions, with means generally centering on the neutral value of 3, indicating a moderate level of agreement across different statements. The responses exhibit significant variability, as shown by the standard deviations.

Starting with basic definitions and roles of antibiotics, the statement that antibiotics kill or slow down the growth of bacteria recorded a mean of 2.9496 and a standard deviation of 1.44364. This indicates a moderate acknowledgment but varied opinions about the common knowledge of antibiotics. Similarly, responses to the side effects of antibiotics like allergic reactions and diarrhea had a mean of 2.9676 and a standard deviation of 1.44040, suggesting a moderate level of agreement with considerable variability.

More specific statements about the effects of antibiotics showed slightly higher means. The effectiveness of antibiotics being reduced if the full course is not completed was agreed upon with a mean of 3.0899 and a standard deviation of 1.45045, indicating better understanding but still mixed opinions.

Discussion on antibiotic resistance showed a mean of 2.9856 with a standard deviation of 1.39874 for the statement defining antibiotic resistance. This near-neutral response suggests general agreement but diverse levels of understanding. In contrast, the role of antibiotic overuse as a leading factor in resistance worldwide showed slightly less agreement with a mean of 2.9317 and a standard deviation of 1.46154, pointing to some uncertainty or variance in opinions about the causes of resistance.

Misuse and implications of antibiotic use, such as treating viral infections with antibiotics or keeping antibiotics in stock for future sickness, leaned towards disagreement, especially with the improper use for viral infections like the flu, which had a mean of 3.0108 and a standard deviation of 1.45072, indicating a recognition of correct antibiotic use practices.

Statements about the responsibilities of nurses in managing antibiotic use and resistance garnered moderate agreement. For instance, the importance of implementing infection control practices had a mean of 3.0432 and a standard deviation of 1.33744. However, the higher variability in these responses suggests differing levels of engagement or perceived importance among the respondents.

Strategic and policy-oriented statements received slightly lower agreement. Active contributions to institutional policies had a mean of 2.9281 and a standard deviation of 1.33620, and advocating for new generations of antibiotics had a mean of 2.8849 and a standard deviation of 1.42732, highlighting areas where more emphasis in nursing education might be beneficial.

Overall, the survey reveals foundational understanding among nurses about antibiotics and resistance, with notable differences in how strongly these ideas are held. This underscores an opportunity for targeted educational programs to enhance understanding and standardize practices regarding antibiotic use and resistance across the nursing spectrum.

Correlation Analysis:

Correlation is a useful approach to explore the relationships between different survey responses. Correlation will help to understand if certain beliefs about antibiotics are associated with others, indicating patterns in knowledge and attitudes among nurses. Examine the relationships between various aspects of nurses' knowledge and attitudes

towards antibiotic use and resistance, Pearson correlation coefficients were calculated. The coefficients range from -1 to 1, where 1 indicates a perfect positive correlation, -1 indicates a perfect negative correlation, and 0 indicates no correlation.

Statements	Correlation Coefficient	p-value
Antibiotics kill bacteria & Antibiotics kill normal and infectious flora	0.65	0.00
Knowledge of common antibiotic side effects & Understanding of treatment difficulty in antibiotic-resistant infections	0.58	0.00
Overuse as a factor in resistance & Resistance spread between animals and humans	0.76	0.00
Awareness of antibiotic side effects & Knowledge of specific side effects like rash and nausea	0.82	0.00
Importance of completing antibiotic courses & Necessity of advising patients to complete courses	0.69	0.00
Implementing infection prevention practices & Educating patients on resistance	0.63	0.00

The correlation analysis presented in the study reveals significant relationships between various aspects of nurses' knowledge and attitudes towards antibiotic use and resistance. These relationships are quantified using Pearson correlation coefficients, demonstrating varying degrees of association between different pairs of statements from the survey.

A strong positive correlation of 0.65 with a p-value less than 0.001 was observed between the belief that antibiotics are medications that kill or slow down the growth of bacteria (Q1) and the understanding that antibiotics target both normal and infectious flora (Q4). This indicates that nurses who understand the general function of antibiotics also tend to have a good grasp of the specific types of microorganisms affected by antibiotics.

Similarly, a correlation coefficient of 0.58, also with a statistically significant p-value of less than 0.001, was found between nurses' knowledge of common antibiotic side effects (Q3) and their understanding of the challenges in treating antibiotic-resistant infections (Q10). This suggests that awareness of side effects is associated with a better comprehension of the difficulties posed by resistant infections, highlighting a comprehensive understanding of the impacts of antibiotics.

A notably strong correlation of 0.76 between recognizing the overuse of antibiotics as a major factor in antibiotic resistance (Q9) and the belief that antibiotic resistance can spread between animals and humans (Q11) underscores the interconnected understanding of how antibiotic practices impact broader ecological and health contexts. This strong correlation suggests that nurses who are aware of the causes of antibiotic resistance are also knowledgeable about its transmission routes.

Another very strong correlation of 0.82 was observed between awareness of antibiotic side effects in general (Q2) and knowledge of specific side effects like rash, nausea, vomiting, and diarrhea (Q3). This indicates a consistent understanding of the side effects among the

respondents, where those aware of the general risks are also informed about specific adverse effects.

Further, the importance of completing antibiotic courses (Q5) and the necessity of advising patients to complete their courses (Q24) showed a strong positive correlation of 0.69. This correlation reveals that nurses who understand the clinical importance of completing antibiotic treatments also actively communicate this necessity to their patients, reflecting a responsible approach to antibiotic stewardship.

Lastly, a correlation of 0.63 was found between implementing infection prevention practices (Q17) and educating patients about antibiotic resistance (Q27). This moderate to strong correlation indicates that nurses who are proactive in infection control also take responsibility for educating patients about the risks of antibiotic resistance, suggesting a holistic approach to infection management and patient education.

These correlations not only demonstrate the relationships between various knowledge and attitude dimensions but also suggest areas where interventions could be targeted to enhance understanding and practices concerning antibiotic use and resistance. By addressing these correlated areas, educational programs could more effectively improve both the depth and the breadth of nurses' competencies in antibiotic stewardship.

Regression Analysis

Regression analysis is a statistical technique used to analyze the relationship between the independent and dependent variable. In this analysis, we analyze the relationship between the Antibiotic is a medication that kills or slows down the growth of bacteria as an "independent variable" and Antibiotics can be taken without a prescription as a "dependent variable".

Regression Analysis

Dependent Variable: Antibiotics can be taken without a prescription	
Coefficient	1.475
Constant	12.365
Antibiotic is a medication that kills or slows down the growth of bacteria	2.245
Significance Value	0.000
R-square	0.19
Adjusted R-square	0.21

Regression analysis allows us to examine the association between variables, specifically looking at how the statement "Antibiotic is a medication that kills or slows down the growth of bacteria" (considered the independent variable) relates to the statement "Antibiotics can be taken without a prescription" (the dependent variable). The analysis yielded a coefficient of 1.475 for the dependent variable, indicating that for every unit increase in the independent variable, there is a predicted increase of 1.475 units in the likelihood of antibiotics being taken without a prescription. The constant value of 12.365 suggests the expected value of the dependent variable when the independent variable is zero.

The coefficient of 2.245 for the independent variable implies a positive relationship with the dependent variable. This means that a stronger agreement or belief in the efficacy of antibiotics (as indicated by the independent variable) is associated with a higher likelihood of considering

antibiotics can be taken without a prescription (the dependent variable). The significance value of 0.000 indicates that this relationship is statistically significant.

The R-square value of 0.19 suggests that around 19% of the variability in the dependent variable can be explained by the independent variable. The adjusted R-square of 0.21 indicates a slight improvement in explanatory power when accounting for the number of predictors in the model.

Overall, the regression analysis highlights a significant positive relationship between beliefs about antibiotics' effectiveness and the perception that they can be taken without a prescription, although the model explains only a moderate portion of the variability in this perception.

Conclusion:

The research on the assessment of knowledge and attitude related to antibiotic use and prevention of antibiotic resistance among nurses of DHQ Hospital concludes that while nurses generally possess a moderate level of knowledge about antibiotics and antibiotic resistance, there are gaps in their understanding, particularly regarding appropriate antibiotic use and the consequences of antibiotic resistance. Additionally, the study highlights the importance of improving educational programs and training sessions aimed at enhancing nurses' knowledge and promoting responsible antibiotic use to mitigate the growing threat of antibiotic resistance. Furthermore, the findings underscore the need for continuous monitoring and evaluation of antibiotic prescribing practices and infection control measures within healthcare settings to combat the emergence and spread of antibiotic-resistant bacteria effectively.

Recommendations:

- Implementing tailored educational interventions and fostering interdisciplinary collaboration can enhance nurses' awareness and adherence to evidence-based practices in antibiotic use, thereby combating antibiotic resistance effectively.
- Regular monitoring and feedback mechanisms should be established to assess nurses' knowledge retention and attitude changes over time, ensuring sustained improvement in antibiotic stewardship practices.

Limitations:

- Limited generalization beyond DHQ Hospital ..
- Possible measurement errors in assessing knowledge and attitudes.
- Language and cultural barriers may affect data validity.
- External factors may influence nurses' attitudes independently.

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