ONLINE ISSN :3007-309X
PRINT ISSN :3007-3081

Journal of Medical & Health Science Review

AWARENESS REGARDING ANTIBIOTIC USES, RESISTANCE AND PREVENTION PRACTICES AMONG NURSES ACROSS DIFFERENT CLINICAL SETTINGS

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ARTICLE INFO

Keywords

Nurses, Knowledge, Antibiotics, Antibiotic Resistance, Antibiotic Stewardship, infection Prevention.

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ABSTRACT

Background: Antibiotics are essential in treating bacterial infections,butantibiotic resistance (ABR) increasing globally due to over use and misuse of antibiotics. ABR leads to higher mortality rate, harder to treat infection and prolonged hospital stay.As key health worker ,Nurses play a critical role in infection prevention and antibiotic stewardship. This study designed to evalutethe knowledge ofNurses at Liaquat University Hospital (LUH), Hyderabad/Jamshoro, regarding antibiotic, antibiotic resistance, and prevention of ABR.

Objective: The objective of this study was evalutethe awarness of Nurses regarding antibiotics, antibiotic resistance, and prevention of ABR across different clinical settings at Liaquat University Hospital (LUH), Hyderabad/Jamshoro.

Methodology: The research involved a cross-sectional study conducted at LUH. The participants were 67 Nurses working in different settings . A structured questionnaire consisting of 20 multiple-choice questions related to antibiotics, antibiotic resistance, and prevention of ABR. Data were analyzed using SPSS version 26.

Results:67 nurses participate in this study , revealed a generally good understanding of basic antibiotic concepts, with high scores on nosocomial infections (98.5%) and identifying side effects (95.5%). Morever, a significant gapsfound in understanding antibiotic resistance (41.8%) and recognizing overuse as a key contributing factor (55.2%). While participants were aware of key stewardship strategies (88.1%) and infection control practices, areas like side effect identification and resistance mechanisms require further education.

Conclusion: The Nurses showed moderate knowledge of antibiotic, ABR, and prevention of ABR. While they understood basic functions and prevention practices, gaps remained in awareness of resistance mechanisms and contributing factors. they need for targeted educational interventions to strengthen understanding and promote effective practices as evidenced by limited knowledge of antibiotic stewardship highlights.

INTRODUCTION

Antibiotics have revolutionized medical practice since their discovery, providing a means to treat bacterial infections that were once fatal(1). In addition, antibiotics are used to treat a wide variety of conditions from common infections such as pneumonia and urinary tract infections to life-threatening disorders such as sepsis and tuberculosis(2). In clinical settings, antibiotics are routinely used for infection prophylaxis during surgery, hospital-acquired infections (HAI) and antimicrobial therapy for bacterial infections in immunocompromised patients(3). Although antibiotics are vitally important to modern health care, their misuse and overuse have made them a major contributing factor to the development of antibiotic-resistant bacteria (AR)(4). Antibiotic resistance restricts the effectiveness of antibiotics, causing infections to become increasingly difficult to treat and resulting in an increased risk of death(5). Antibiotic resistance arises when bacteria adapt to alter the effect of drugs that killed them or impaired their growth(4, 6). It occurs in all animals, but is accelerated significantly by the intentional or accidental overuse and misuse of antibiotics in health care and in the community(7). The World Health Organization (WHO) has determined that antibiotic resistance has reached an "advanced stage, " threatening the significant achievements of modern medicine, leading to complicated infections being more difficult to treat, prolonging hospitalization, increasing medical costs, and increasing mortality(2, 8). These recent reports contribute to this point of danger. In October 2010, the CDC reported a 20% increase in hospital-onset bacterial antimicrobial-resistant infections while the COVID-19 pandemic was taking place. But this rise is not over, and resistance has continued after the outbreak(9). Further findings from WHO's Global Antimicrobial Resistance and Use Surveillance System (GLASS) suggest disturbingly high rates of resistance among common pathogens. For instance, 42% of Escherichia coli strains are resistant to third generation cephalosporins and 35% of Staphylococcus aureus strains are resistant to methicillin(10). As already noted, antibiotic resistance remains a significant problem in Pakistan. Recent studies in this country suggest high sensitivity among common pathogens and their higher ability to induce resistance further exacerbates the challenges of treating infections effectively(11). This highlights the urgent need for aggressive interventions, including better antibiotic stewardship programs in clinics. Nurses are essential in the management of antibiotics and the prevention of antibiotic resistance being, more generally, the first point of contact with patients and entrusted with the administration of antibiotics and monitoring of their effects and proper procedures being followed(12). Studies have shown that nurses can play a role important in the prevention of antibiotic resistance in implementing appropriate infection control strategies and using appropriate antibiotic stewardship practices(13). However, many studies have shown that the level of knowledge of antibiotic resistance and antibiotic stewardship among nurses is often low(14). A recent

study found that “as a nursing profession they are rarely adequately informed about the risks of antimicrobial resistance and proper antibiotic use. ”“Instead nurses routinely misuse antibiotics resulting in drug-resistant bacteria being spread. ” (15). Nurses are responsible for implementing infection control strategies to prevent transmission of infections, such as those caused by resistant organisms. “While nurses have reasonable knowledge regarding the actions of antibiotics and their side effects, there is a significant gap in knowledge regarding antibiotic resistance”, according to a study published in 2023. At the same time, most nurses used appropriate antibiotic practices, such as taking antibiotics as directed by their doctor and not sharing medication with other people(16). The study showed that educational interventions are needed to bridge the gap in knowledge and raise the level of antibiotic stewardship among nursing professionals. Researchers report that nurses were aware of their involvement in many aspects of the management of patients at risk of infection, including but not limited to administering antibiotics and de-escalation. Yet, barriers such as lack of knowledge, poor communication with multidisciplinary teams, and non-formal training have made engaging nurses in ASPs challenging(14, 17). AdvertisementIn order to prevent patients from developing antimicrobial resistance, nurses should screen prospectively for patients who have an allergic reaction to antibiotics, carefully administer and monitor antimicrobials, and participate actively in the multidisciplinary team. Many nurse routine activities identify objectives of the antibiotic stewardship program (ASP), emphasising that nurses are key in the work done in order to combat antimicrobial resistance (AMR) (13, 18). Antibiotic resistance (ABR) stands as one of the largest obstacles to modern health. The incapacity of antibiotics to treat serious bacterial infections would increase rapidly since bacteria ever evolve resistance to every type of medication(19, 20). The World Health Organization (WHO) stated in its year 2021 report on reality, World Health Organization (2021)(21). The management of antibiotics is vital in environments where there is rapid transmission of infections and patients are usually immunocompromised(22). Nursing as the primary care givers would, therefore, combat fight against antibiotic availability from the angle of knowledge concerning proper antibiotic use, mechanisms of resistance, and preventive strategies to keep assuring the effectiveness of antibiotic therapies and preventing further resistance(23).

The Role and Function of Antibiotics

Antibiotics are medications used to treat bacterial infections; they kill bacteria (bactericidal) or inhibit bacterial growth (bacteriostatic). The role of antibiotics in the treatment of bacterial infections is well recognized and is a key component in the treatment of diseases such as pneumonia, urinary tract infections and sepsis(24). Antibiotics are not effective in treating viral infections, such as the common cold or the flu or many other viral illnesses. Even so, antibiotics are often misused in clinical practice

by being prescribed for viral infections, which contributes substantially to antibiotic resistance(25). Antibiotics function primarily by targeting bacterial specific processes that human cells do not possess. For example, a class of antibiotics, beta-lactams such as penicillin, is able to block bacterial cell wall synthesis and eventually lead to death of the bacterial cell. Other antibiotics such as macrolides inhibit protein synthesis, while fluoroquinolones inhibit replication of bacterial DNA(26). This is the specificity of antibiotics; targeting processes in bacteria without harming human cells.It is important for healthcare providers, especially nurses, to understand the role and limitations of antibiotics because they may provide education for the patient and they may administer antibiotics(27). Nurses must understand that antibiotics are only useful for bacterial infections and not viral infections. It is important to educate patients on the proper use of antibiotics so they are not needlessly prescribed and to help curb the onset of antibiotic resistance(28). In a study conducted by Abuhammad et al., (2023), the authors studied the knowledge of the nurses in regards to antibiotics. They found that the majority of the nurses understood that antibiotics treat bacterial infections, however, there were misconceptions and misunderstandings about the antibiotics effectiveness against viral infections(29). This is problematic because of the ramifications of inappropriate prescribing and ultimately the inappropriate use of antibiotics fuels antibiotic resistance.

Common Side Effects of Antibiotics

Antibiotics are vital in the management of bacterial infections, but it is important to note that there can be significant side effects associated with their use. The more frequently reported side effects of antibiotics are gastrointestinal side effects such as nausea, vomiting-diarrhea, and abdominal cramps(30). Some antibiotics may cause different types of skin reactions, such as rashes and serious (as in, life threatening) conditions such as anaphylaxis. Even though these side effects can generally be managed, they can be bothersome for patients and lead to treatment termination(31). In the clinical setting, nurses have a key responsibility of monitoring their patients for adverse reactions to antibiotics. Nurses not only provide patients with educational material (45), about what side effects to expect, how to manage them and when to consult a healthcare provider if certain side effects are severe (32), but nurses have a role in being aware of and managing more serious reactions such as an allergic response that precipitates anaphylaxis. While there is some understanding among nurses regarding certain side effects of antibiotics, such as nausea and diarrhea, a relevant study completed by Bradley & Geiger (2021) indicated that nurses had little knowledge with regard to potentially life threatening events of anaphylaxis(33). This is additional evidence that nurse training may not be thorough enough on the full scale of different antibiotic side effects. Even more troubling, despite side effects being fails with antibiotic therapy, it is still important for nurses to have the communication framework in place for

patients who may develop a significant side effects. Studies have shown that inadequate patient education about the side effects of antibiotics can lead to non-compliance and premature discontinuation of the medication, which may contribute to antibiotic resistance(34).

Antibiotic Resistance: A Growing Threat

Antibiotic resistance occurs when bacteria evolve mechanisms that allow them to resist the effects of the drugs that previously treated them well. Resistance can develop itself via natural mutations or some other way of acquiring resistance genes from those with resistance(34, 35). Unfortunately, there is rampant overuse and misuse of antibiotics, especially in healthcare, so the development of resistant strains is becoming more common. Particularly, antibiotics are more often overprescribed or incorrectly prescribed, and this gives bacteria the opportunity to evolve and develop resistance, which means the bacteria are becoming less susceptible to antibiotics or totally resistant(36).The consequences of antibiotic resistance can be severe. For example, patients may have longer hospital stays, more intense treatments, or even increased risk of death when an infection is caused by bacteria that are resistant to the antibiotic prescribed(37). Abuhammad et al. (2023) mentioned there has been an alarming increase in resistant infections and rates of resistance, particularly in the hospital setting where the use of antibiotics is greatest. They discovered that antibiotic-resistant bacteria were often more difficult to treat, requiring some patients to receive treatment with more expensive and more toxic drugs(7, 38). Nurses play an important role in managing antibiotic resistance. Their tasks include administering an antibiotic correctly, ensuring patients do not skip doses or miss doses, and educating patients about why they must follow the prescribed regimen for antibiotics(12). Furthermore, nurses must be vigilant in identifying signs of antibiotic resistance, such as treatment failure or prolonged infection duration, and escalating concerns to the appropriate healthcare providers(20).A study conducted by Smith et al. (2019) found that while many nurses understood the concept of antibiotic resistance, there was a lack of comprehensive knowledge regarding the mechanisms behind it. This gap in knowledge could lead to poor decision-making regarding antibiotic prescriptions and the management of resistant infections. Increasing nurses' understanding of antibiotic resistance is crucial in the fight against ABR(39).

Preventive Measures and Antibiotic Stewardship

To prevent antibiotic resistance, a multifactorial approach is needed that encompasses antibiotic stewardship, infection control behaviors, and community education. Antibiotic stewardship initiatives focus on optimizing the use of antibiotics, ensuring that they remain effective, and minimizing the risk of development of resistance(40). Elements of antibiotic stewardship include prescribing the appropriate antibiotic, at the correct dose, for the appropriate duration, and only when antibiotics are

indicated. Nurses are important stakeholders in antibiotic stewardship, as they can ensure antibiotics are used appropriately, as well as educate patients on the importance of adhering to treatment plans(41). In addition to engaging in antibiotic stewardship behaviors, implementing infection control procedures, including appropriate hand hygiene, wearing appropriate personal protective equipment (PPE), and isolating patients with resistant infections, is also fundamental to preventing resistant bacteria transmission. Nurses are most often responsible for wound care on the front line of infection control measures, and must be able to employ these standard precautions when caring for patients(42). Research has demonstrated that while nurses reported awareness of the importance of infection control procedures, there was inconsistently apply infection control precautions across various clinical environments. Factors such as workload, inability to provide appropriate staffing, and insufficient supplies/sources made it difficult for nurses to implement effective infection control practices. Therefore, resolving these issues is significant first step to improving nurses' capacity to reduce the spread of resistant infections(43).

Knowledge Gaps and Training Needs

While nurses are a critical component of antibiotic use and resistance, there is evidence that shows there are notable knowledge gaps. Many health care professionals have an understanding of antibiotic use, with fewer that know or understand anything about the complexities of antibiotic resistance and the global impact of ABR(44). With staff research, most of the nurses had knowledge about the importance of completing the antibiotic course but few were knowledgeable of the long-term effectsof antibiotic resistance and the way that bacteria adapt to antibiotics(45).It is important to note that these types of gaps in knowledge will have severe implications both for patient safety outcomes and antibiotic stewardship programs. Ongoing education and training is critical for all nurses, enabling them to be informed of current guidelines and best practices regarding antibiotic use, prevention of resistance and infection control.

MATERIAL AND METHODS:

Research Design: A cross-sectional study design was conducted to evaluate the knowledge among nurses regarding antibiotic use and the prevention of antibiotic resistance working in different settings.

Study Setting: The research is conducted at Liquat university hospital Hyderabad/Jamshoro target nurses working in various departments, including medical, surgical, ICU, and emergency units.

Study Population: The study population consisted of Nurses working at above mentioned hospital, who were directly involved in patient care and the administration of antibiotics. Nurses were selected based on their roles in antibiotic management and prevention.

Sample Size: The sample size 67 calculated for this study was determined using RaoSoft online sample size calculator, with the following parameters:

- Confidence Interval: 95%
- Margin of Error: 5%

Sampling Technique: A non-probability convenience sampling technique was employed to select participants due to its feasibility and resource limitation.

Data Collection Process: The Liaquat University Hospital in Hyderabad's Medical Superintendent and Ward In-Charge gave their approval. Participants received comprehensive information on the goals, methods, risks, and advantages of the study. In order to guarantee that participation was entirely voluntary and that withdrawal at any moment would not impact care, informed consent was acquired both verbally and in writing.

Data Collection Tool: Data were collected using a structured questionnaire, divided into two sections.

Section A: Gathered demographic information, including age, gender, qualification, area of working, and years of experience.

Section B: Asessed nurses' knowledge through 20 multiple-choice questions, covering three dimensions: facts about antibiotics, antibiotic resistance, and prevention of antibiotic resistance (AR). Each question had four options, with one correct answer. A score of 1 was assigned for each correct answer, and 0 for incorrect answers. The scoring system categorized knowledge as follows: 16 to 20 correct answers (80-100%) as “Good knowledge,” 12 to 15 correct answers (60-79%) as “Moderate knowledge,” and below 12 correct answers (<60%) as “Poor knowledge.”

Data Analysis: Data were analyzed using SPSS version 26. Descriptive statistics, including percentages, were used to summarize the data.

RESULTS

DEMOGRAPHIC ANALYSIS

Figure 1: Classification Of Gender

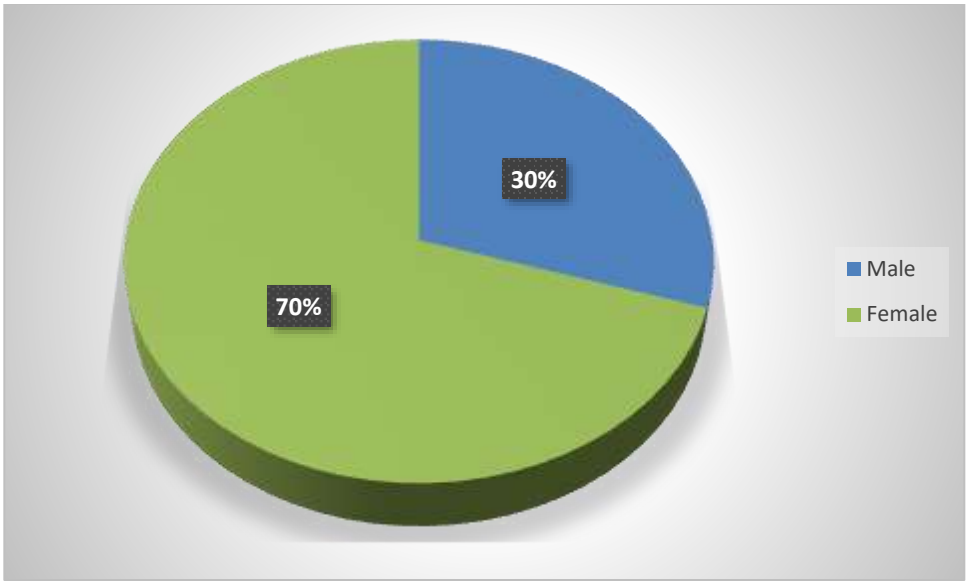


Figure No.1, shows the distribution of gender among the participants. It shows that the majority of participants, 70.1% (n=47), were female, while 29.8% (n=20) were male.

Table No 01: Classification Of Age

CATEGORIES	FREQUENCY	PERCENTAGE
20-25 Years	48	71.6 4%
26-30 Years	8	11.94%
31-35 Years	5	7.46%
36-40 Years	3	4.47%
Above 40 Years	**3**	**4.47%**
Total	**67**	**100.0**

Table No. 01, shows that majority of participants, comprising 71.6% (n=48), were in the range of age 20-25years , 11.9% (n=8) were in range 26-30years, 7.5% (n=5) were in range 31-35years and only 4.5%(n=3) were in the both 36-40years and above 40years .

Table No 2: Classification Of Qualification

CATEGORIES	FREQUENCY	PERCENTAGE
Diploma	8	11.94%
Post RN BSN	7	10.44%

BSN	47	70.15%
MSN	5	7.46%
Total	**67**	**100.0**

Table No. 2 shows that 70.1% (n=47) of the participants hold a BSN, 11.9% (n=8) have diploma, 10.4% (n=7) who have completed a Post RN BSN program and 7.5% (n=5) participants had a Master of Science in Nursing (MSN) degree.

Table No 03: Classification Of Area Of Working

CATEGORIES	FREQUENCY	PERCENTAGE
Neurology	6	8.96%
ICU	13	19.40%
Medicine	11	16.41%
Surgery	11	16.41%
Others:	26	38.81%
Total	**67**	**100.0**

Table No. 4 shows that 9% (n=6) of participants were in Neurology, while ICU and Medicine were 19.4% (n=13) and 16.4% (n=11), respectively. Surgery fields represent 16.4% (n=11) and 38.8% (n=26) of participants"Others" category , indicating a wide range of area of working beyond those specified categories.

Table No 4: Classification Of Experience

CATEGORIES	FREQUENCY	PERCENTAGE
< 1 Year	36	53.73%
1-5 Years	18	26.86%
5- 10 Years	07	10.45%
Above 10 Years	06	8.96%
Total	**67**	**100.0**

TableNo.4 shows 53.7% (n=36) participants were of less than 1 year of experience, while 26.9% (n=18) were 1-5 years of experience. 10.4% (n=7) were 5-10 years of experience, and 9.0% (n=6) of participants were above 10 years of experience.

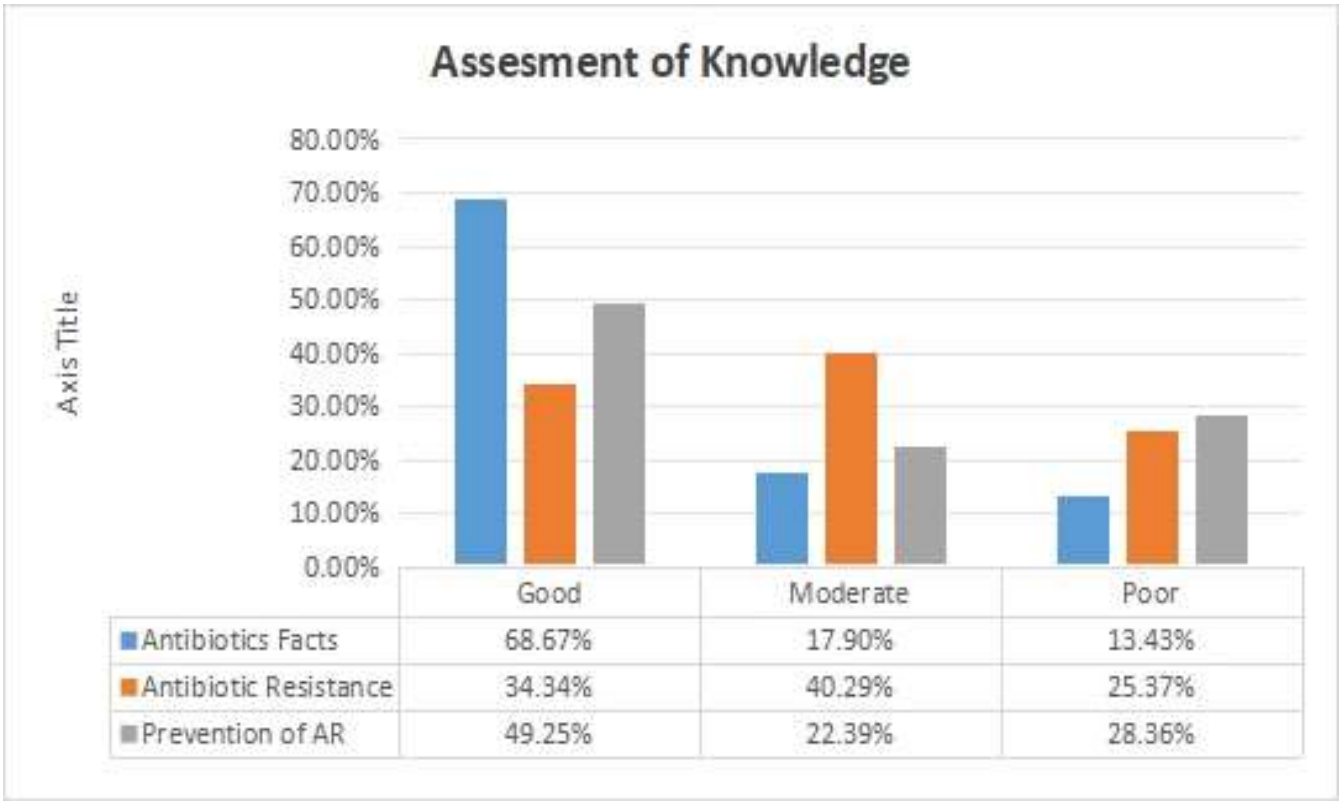
TABLE NO: 05 KNOWLEDG E OF THE PARTICIPANTS

S.No	Questions	%Correct Answers
	Antibiotic is a medication that kills or slows down the growth of bacteria.	91%
	Antibiotics can have side effects, like allergic reactions and diarrhea.	95.5%
	The common side effects of antibiotics are rash, nausea, vomiting, and diarrhea.	55.2%
	The microorganism that can be killed by antibiotics is normal and infectious flora	73.1%
	The effectiveness of antibiotics will be reduced if the full course is not completed.	64.2%
	Nosocomial infection is the type of infection acquired in the health care setting	98.5%
	Antibiotic resistance is defined as bacteria changes in a way that reduces or eliminates the effectiveness of antibiotics.	41.8%
	Developing new generations of antibiotics is not considered a cause of antibiotic resistance.	86.6%
	Antibiotic resistance can affect any age group.	64.2%
.	Overuse of antibiotics is the most important factor leading to antibiotic resistance around the world	55.2%
.	Infections caused by antibiotic resistance are difficult and sometimes impossible to treat.	74.6%
.	Antibiotic resistance spreads through animals and humans	55.2%
.	Treating a viral infection with an antibiotic is an example of improper use of antibiotic therapy.	74.6%
.	Effective hand washing is the most important procedure for the prevention of infection from microorganisms.	71.6%
.	Immunization and infection prevention is considered as the most important factor in preventing antibiotic resistance	70.1%

.	The antibiotic stewardship program aims to improve the use of antibiotics and prevent antibiotic resistance	74.6%
.	Antibiotic therapy should be started ideally when there is a positive microbiological result.	61.2%
.	A patient expressing that antibiotics can be taken when symptoms are gone indicates a lack of knowledge	79.1%
.	implement infection prevention and control practices is the key action that a nurse should take to prevent resistant infections and their spread	70.1%
.	Prospective audit, formulary restriction, preauthorization, guidelines, and clinical pathways are considered antibiotic stewardship strategies to combat antibiotic resistance.	88.1%

Table No. 05demonstrate that majority 91.0% of participants correctly identified the use of antibiotics as toinhibitor kill the growth of bacteria, and 95.5% were aware about antibioticsside effects such asdiarrhea and allergic reaction. Adittionally, nearly all participants (98.5%) knew about nosocomial infections, those acquired within healthcare settings, emphasizing a strong grasp of hospital-associated risks. Only 55.2% of participants familiar about the common side effects of antibiotics include diarrhea, vomiting, nausea, and rash, suggesting some uncertainty regarding more specific adverse reactions. Morever, only 41.8% correctly defined antibiotic resistance as the ability of bacteria to alter in ways that reduce or eliminate the effectiveness of antibiotics, indicating a significant knowledge gap about the mechanisms driving resistance.About antibiotic stewardship, 86.6% of participants accurately stated that developing new generations of antibiotics prevent from antibiotic resistance, and 88.1% accurately recognized the key strategies of antibiotic stewardship, including clinical pathway and prospective audits. While most participants understood the importance of completing antibiotic courses and the need for infection prevention measures (64.2% and 71.6% respectively), there was a lower recognition of the significance of overuse of antibiotics in resistance development, with only 55.2% acknowledging it as the most important factor.

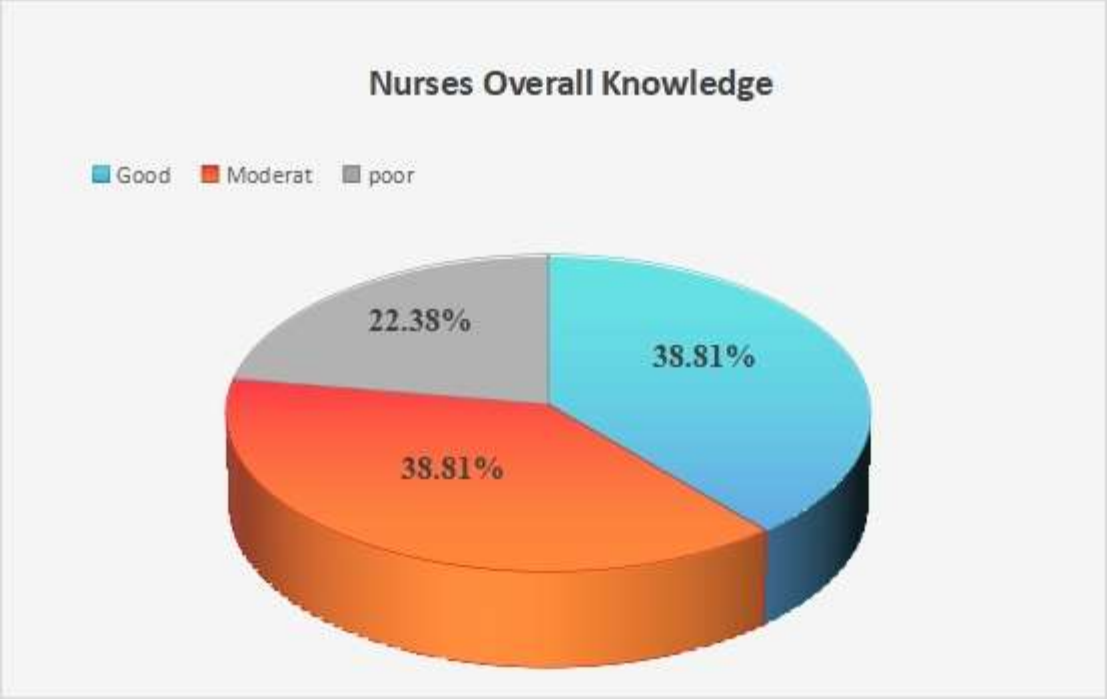
Table#O6:Nurses Knowledge Regarding Antibiotics use, Antibiotic resistance and Prevention of Antibiotics Resistance.



	Good	Moderate	Poor
Antibiotics Facts	68.67%	17.90%	13.43%
Antibiotic Resistance	34.34%	40.29%	25.37%
Prevention of AR	49.25%	22.39%	28.36%

Knowledge of Antibiotic among the nurses was observed to be 68.67% with Good Knowledge, 17.91% with Moderate Knowledge, and 13.43% with Poor Knowledge. Nurses knowledge regarding antibiotic resistance was seen to be 40.29% with Moderate Knowledge, 34.34% with Good Knowledge and 25.37% with Poor Knowledge . Knowledge of prevention of antibiotic resistance was seen to be 49.25% with Good Knowledge , 28.36 with Poor Knowledge and 22.39% with Moderate Knowledge (Table 06)

Table#07; Nurses Overall Knowledge Regarding Antibiotics use, Antibiotic resistance and Prevention of Antibiotics Resistance.



The overall score on knowledge regarding Antibiotics, Antibiotic resistance , and Prevention of antibiotic resistance was 38.80% with Good Knowledge , 38.80% with Moderate Knowledge and 22.38% with Poor Knowledge (Table 07).

Table#08:Association of Knowledge with Demographic Variables

Variables	Antibiotics	AR	Prevention of AR	Overall Knowledge
Gender	P=0.048	P=0.915	P=0.201	P=0.759
Age	P=0.02	P=0.643	P=0.030	P=0.021
Qualification	P=0.144	P=0.998	P=0.715	P=0.845
Area of working	P=0.033	P=0.792	P=0.061	P=0.626
Experience	P=0.022	P=0.867	P=0.213	P=0.240

A significant correlation was seen among the nurses, age and antibiotics knowledge (p=0.020) also with prevention of AR (p=0.030) suggesting that age may influence level of knowledge, years of experience with knowledge of antibiotics (p=0.022) implied that greater experience contribute to higher knowledge , area of working with antibiotic knowledge (p=0.033) also with prevention of AR (p=0.061) suggested work environment impacts knowledge level, and a significant correlation with over all knowledge was found with age (p=0.024). There was no statistically significant association between AR knowledge with any demographic variable (p>0.05).

DISCUSSION

The study was conducted to document the knowledge, awareness and practices of nurses regarding antibiotic use, resistance and preventive actions in Liaquat University Hospital. Nurse respondents were predominantly young (71. 1%) and relatively inexperienced (53. 7%; 1 year of experience). This is likely to have contributed to some of the surveyed knowledge gaps. Nurses with a higher educational background (70. 1%) had a good knowledge base, but formal education may not be enough to provide awareness of emerging issues like antimicrobial resistance (AMR). Nurse participants demonstrated extensive basic knowledge of antibiotics. According to the study, 91% of nurses correctly identified that antibiotics kill or inhibit bacterial growth and 95. 5% were aware of common side effects. These findings are consistent with those findings by De Vita et al. (2024), which found that young Italian nurses and students were well informed regarding antibiotic use and AMR, although some gaps were observed in certain aspects(46). Contrary to earlier data, only 41. 8% of nurses in this study correctly defined antibiotic resistance in terms of the magnitude of difficulty experienced. In relation to other studies that have been conducted in North India, nurses were more informed about antibiotic resistance. Given that AMR has increased globally, its awareness gap is of great concern, wherein training is urgently needed.Additionally, 55. 2 % of participants reported that resistance to antibiotics could be considered “overuse of antibiotics”. A comparison between the Nigerian and Nigerian data suggests that healthcare workers in the two countries appear to have poor knowledge of the epidemiology of antibiotic resistance partly due to “poor contact with pharmacists, lack of information and communications, lack of enlightenment programs, ” or partly because, as the study in Nigeria suggest, continuing education programs may not focus on stewardship programs(14, 47). Knowledge regarding infection control practices was slightly more comprehensive than previously reported (e. g., 71. 6 %). In conclusion, 71. 6 %) reported that effective handwashing is the main preventive strategy and 74. 1 %) were understood the importance of antimicrobial stewardship programs in their functioning. 17 Among all health workers, awareness of the importance of antimicrobial stewardship strategies in healthcare systems was high. More importantly, 88. 1 %) acknowledged the importance of audit, clinical guidelines, and restrictions on formulations, which was consistent with calls by the World Health Organization to improve stewardship for stewardship in healthcare systems(48). Advertisement Yet, only 61. 2% of respondents reported that ideally initiation of antibiotic therapy should take place after microscopic confirmation (the reason for empirical overutilisation). (18, 49). These findings suggest that while foundational knowledge exists, there is a pressing need for ongoing education especially on resistance mechanisms and appropriate antibiotic use timing. The relatively high knowledge levels in infection prevention may reflect hospital-level policies or recent post-pandemic

emphasis on infection control.

CONCLUSION

The moderate level of the knowledge of Nurses at Liaquat University Hospital regarding antibiotic use, resistance, and prevention practices was concluded. While nurses showed a good understanding of basic antibiotic functions and infection prevention practices, significant gaps were identified in their knowledge of antibiotic resistance mechanisms and the factors contributing to resistance. The knowledge of antibiotic stewardship strategies was also limited. Targeted educational interventions are essential to enhance their knowledge of antibiotic resistance and improve their practices in antibiotic stewardship.

ACKNOWLEDGMENTS:

The authors would like to acknowledge People's Nursing School Department Spacially Dr. Parveen Akhtar Director PNS, Dr. Husan Bano Channar Academic Incharge PNS, Mr. Mairaj Hafeez Lecturer PNS, Ms. Khushboo Chandio Lecturer PNS and All faculty those guided and helped in this research.

CONFLICT OF INTREST: None

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