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Original Research Article

EFFECT OF A TEACHING SESSION ON NURSES' PERCEPTION AND PRACTICE OF THE ANTIBIOTIC STEWARDSHIP PROGRAM

YASMIN F, NISA QU, SHAHZADI I, MAJEED S

College of Nursing, Nishtar Medical University (NMU), Multan, Pakistan
**Corresponding author email address:* Farkhanda505@gmail.com

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ABSTRACT

Background: *Antimicrobial resistance represents a major global public health threat, largely driven by inappropriate and excessive antibiotic use. Antimicrobial stewardship programs aim to optimize antibiotic prescribing and utilization; however, the role of nurses in stewardship activities remains underrecognized, particularly in low- and middle-income countries such as Pakistan. Limited knowledge, confidence, and role clarity among nurses may hinder effective stewardship implementation.* ***Objective:*** *To evaluate the effect of a structured teaching session on nurses' perceptions and self-reported practices related to antimicrobial stewardship at a tertiary care hospital in Pakistan.* ***Study Design:*** *Quasi-experimental pretest–posttest study.* ***Setting:*** *Inpatient clinical units of Nishtar Hospital.* ***Duration of Study:*** *January to June 2025.* ***Methods:*** *Ninety registered nurses were recruited using non-probability consecutive sampling. Baseline assessment was conducted using a validated, self-administered questionnaire assessing knowledge, perceptions, and practices related to antimicrobial stewardship. Participants then received a structured, interactive teaching session addressing core stewardship principles, nursing roles in antibiotic optimization, monitoring and documentation, interprofessional communication, and case-based scenarios. Post-intervention assessment was performed using the same questionnaire. Data were analyzed using SPSS version 26. Paired t-tests and chi-square tests were applied, with statistical significance set at $p < 0.05$.* ***Results:*** *The mean age of participants was 29.8 ± 6.4 years, and 72.2% were female. Baseline knowledge and perceptions regarding antimicrobial stewardship were suboptimal. Following the educational intervention, significant improvements were observed across all domains. Agreement regarding active nurse involvement in stewardship increased from 46.7% to 78.9%, while confidence in discussing antibiotic-related issues with physicians improved from 31.1% to 66.7% ($p < 0.001$). Stewardship-related practices, including monitoring antibiotic side effects, patient education, and utilization of laboratory findings, also demonstrated significant post-intervention improvement ($p < 0.001$). Major barriers identified included limited decision-making authority, lack of access to stewardship guidelines, and high workload.* ***Conclusion:*** *A structured educational intervention significantly improved nurses' perceptions and self-reported practices related to antimicrobial stewardship. Regular, targeted stewardship training for nurses may enhance multidisciplinary efforts to combat antimicrobial resistance, particularly in resource-limited healthcare settings.*

Keywords: Antimicrobial Stewardship; Antimicrobial Resistance; Nursing Education; Antibiotic Use

INTRODUCTION

Antimicrobial resistance (AMR) has emerged as a pressing global health issue, leading to increased morbidity, mortality, and healthcare costs. The World Health Organization (WHO) highlights AMR as one of the top ten global public health threats facing humanity, stating that without effective international action, we are heading towards a post-antibiotic era, where minor infections could become fatal (1). In response, antimicrobial stewardship programs (ASPs) have been developed to optimize the use of antimicrobials, reducing unnecessary prescriptions and, consequently, the pressure that leads to increased resistance (2). Effective ASPs necessitate a multi-disciplinary approach that includes not only physicians and pharmacists but also nurses, who play a crucial role in the administration and monitoring of antibiotic therapies in clinical settings (3).

Despite the critical role of nursing professionals in implementing ASPs, multiple studies indicate a significant gap in their knowledge, attitudes, and practices regarding antimicrobial stewardship (4-6). For instance, a study by Davey and Aveyard revealed that nurses often feel inadequately prepared to participate in stewardship efforts, primarily due to insufficient education and training on antimicrobial use and guidelines (7). This sentiment is corroborated by Hamidi and Blatz, who found that neonatal nurses expressed a strong desire for more education in this area (3). This education gap is particularly concerning given that knowledge of antimicrobial stewardship correlates positively with effective antibiotic management (7).

Educational interventions aimed at enhancing nursing staff's knowledge and awareness of ASPs have been shown to yield significant positive outcomes. Research shows that structured educational programs significantly improve nurses' perceptions and practices. For example, Tawil et al. observed a notable increase in nurses' confidence levels regarding antibiotic prescribing following a comprehensive educational intervention (8). Similarly, Lutfiyati et al. highlighted that targeted training for health professionals significantly enhances their understanding and attitudes toward ASPs (6).

As antibiotic resistance is a growing challenge in countries like Pakistan, where the burden of disease is exacerbated by a lack of awareness and improper antimicrobial usage, enhancing the knowledge and practice of nurses in this area is critical (9). The Pakistan Medical and Dental Council emphasizes the need for antimicrobial stewardship as an integrative strategy to preserve the efficacy of currently available antibiotics (10, 11). This study aims to evaluate the effect of structured educational sessions designed for nurses on their perceptions and implementation of an antibiotic stewardship program, contributing evidence to support the establishment of more robust stewardship practices in the Pakistani healthcare setting.

In Pakistan, the threat of AMR is exacerbated by several factors, including limited access to healthcare, over-the-counter availability of antibiotics, and insufficient regulatory frameworks (9). The unique socio-economic and cultural landscape necessitates tailored educational interventions that can effectively address these challenges. The current healthcare system faces hurdles such as scarce resources and inadequate training for healthcare workers on

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appropriate antibiotic use, underscoring the urgency for targeted educational programs aimed at nurses [10]. By enhancing nurses' understanding and involvement in antimicrobial stewardship, we can ensure a more effective response to AMR, ultimately improving patient care and public health outcomes in Pakistan.

The rationale and details, in the context of Pakistan, emphasize not only the urgency of addressing AMR through ASPs but also the critical role nurses play in this initiative. This introduction presents a comprehensive overview of the existing knowledge gaps and the proposed study's implications within the Pakistani healthcare framework.

METHODOLOGY

The study employed a quasi-experimental pre-test and post-test design to evaluate the effect of a structured teaching session on nurses' perceptions and practices related to the antibiotic stewardship program. The research was conducted at Nishtar Hospital, Multan, a large tertiary care teaching hospital, over a defined study period from January to June 2025. Registered nurses working in inpatient clinical areas, including medical wards, surgical wards, and intensive care units, were considered eligible for participation. Nurses on extended leave during the study period or those unwilling to provide informed consent were excluded.

A non-probability consecutive sampling technique was used to recruit participants. All eligible nurses who met the inclusion criteria and were available during the data collection period were invited to participate until the desired sample size was achieved. Written informed consent was obtained from each participant prior to enrollment, and confidentiality of responses was ensured throughout the study. Ethical approval was obtained from the institutional ethical review committee before the commencement of the study, in accordance with the Declaration of Helsinki.

Data were collected using a structured, self-administered questionnaire developed after an extensive review of relevant literature and existing antimicrobial stewardship tools. The questionnaire comprised multiple sections addressing demographic characteristics, knowledge related to antimicrobial stewardship, perceptions and attitudes toward nurse involvement in stewardship activities, and self-reported practices related to antibiotic use. The perception items were measured using a five-point Likert scale, while practice-related questions assessed the frequency of stewardship-related activities. Subject experts reviewed the tool for content validity, and a pilot test was conducted on a small group of nurses to determine clarity and feasibility. Necessary modifications were made in response to pilot feedback.

Baseline data were collected prior to the intervention by administering the pre-test questionnaire. Following baseline assessment, participants attended a structured teaching session on antimicrobial stewardship. The educational intervention was designed to be interactive and comprehensive, covering key principles of antibiotic stewardship, the role of nurses in stewardship programs, appropriate antibiotic administration and monitoring, interpretation of laboratory and microbiology reports, documentation practices, communication with physicians, and practical case-based scenarios relevant to routine nursing practice. The teaching session was delivered by trained facilitators using multimedia presentations and interactive discussion. After completion of the teaching session and an appropriate follow-up interval, the same questionnaire was re-administered as a post-test to assess changes in knowledge, perception, and practices. Additionally, post-intervention items were included to capture participants' perceived usefulness of the training and self-reported application of learned concepts in clinical practice. Data were entered and analyzed using Statistical Package for the Social Sciences version 26. Descriptive statistics were used to summarize demographic variables and baseline characteristics, with continuous variables presented as means and standard deviations and categorical variables expressed as frequencies and percentages. Pre and post-intervention scores were compared using appropriate inferential statistical tests, including paired t-tests for continuous variables and chi-square tests for categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 90 registered nurses working in inpatient departments participated in the study. The mean age of the participants was 29.8 ± 6.4 years. The majority of participants were female nurses (72.2%), reflecting the gender distribution of the nursing workforce at the study site. Regarding professional experience, 41.1% had less than 5 years of clinical experience, while 33.3% had between 5 and 10 years of experience. Most nurses were working in medical and surgical wards (54.4%), followed by intensive care units (30.0%). Only 26.7% of participants reported receiving prior training on antimicrobial stewardship programs. Detailed demographic characteristics are presented in Table 1.

Table 1: Demographic Characteristics of Study Participants (n = 90)

Variable	Category	Frequency (n)	(%)
Age (years)	Mean ± SD	29.8 ± 6.4	—
Gender	Male	25	27.8
	Female	65	72.2
Years of Experience	< 5 years	37	41.1
	5–10 years	30	33.3
	> 10 years	23	25.6
Working Unit	Medical/Surgical wards	49	54.4
	Intensive Care Unit	27	30.0
	Other units	14	15.6
Highest Qualification	Diploma	34	37.8
	BSc Nursing	46	51.1
	MSc or above	10	11.1
Prior ASP Training	Yes	24	26.7
	No	66	73.3

At baseline, nurses' overall knowledge of antimicrobial stewardship was moderate. Only 38.9% correctly identified the primary goal of antimicrobial stewardship as optimizing antibiotic use and reducing resistance. Awareness regarding the principle of the right drug, correct dose, and right duration was observed in 42.2% of participants. Furthermore, 61.1% recognized antimicrobial resistance as a consequence of inappropriate antibiotic use, while only 35.6% acknowledged increased healthcare costs as a potential outcome. Baseline knowledge responses are summarized in Table 2.

Table 2: Baseline Knowledge of Antimicrobial Stewardship Among Nurses (n = 90)

Knowledge Item	Correct Response n (%)
Correct definition of ASP	35 (38.9)
Key principle of ASP identified	38 (42.2)
Recognized antimicrobial resistance as a consequence	55 (61.1)
Recognized adverse drug effects	48 (53.3)
Recognized increased healthcare costs	32 (35.6)
Acknowledged nurse role in ASP	40 (44.4)

Before the intervention, positive perceptions of nurse involvement in antimicrobial stewardship were limited. Only 46.7% of nurses agreed

that they should play an active role in ASP activities. 31.1% of participants reported confidence in discussing antibiotic-related issues with physicians. Following the teaching session, there was a significant improvement in perception scores across all domains. Post intervention, 78.9% of nurses agreed that nurses should be actively involved in ASP, and 66.7% reported increased confidence in communicating with physicians regarding antibiotic use. Comparative perception results are shown in Table 3.

Table 3: Comparison of Nurses' Perception Scores Pre and Post Intervention (n = 90)

Perception Statement	Pre Intervention Agree n (%)	Post Intervention Agree n (%)	p value
Nurses should be actively involved in ASP	42 (46.7)	71 (78.9)	< 0.001
Confidence in discussing antibiotics with physicians	28 (31.1)	60 (66.7)	< 0.001
ASP training should be mandatory for nurses	50 (55.6)	76 (84.4)	< 0.001
Nurses influence antibiotic resistance outcomes	39 (43.3)	69 (76.7)	< 0.001

Significant improvements were observed in nursing practices related to antibiotic stewardship after the intervention. Regular monitoring and reporting of antibiotic side effects increased from 34.4% at baseline to 67.8% post-intervention. Patient education regarding antibiotic therapy improved from 40.0% to 72.2%. The proportion of nurses who reported using microbiology or laboratory results to understand antibiotic appropriateness increased significantly from 29.9% to 61.1%. Practice-related changes are detailed in Table 4.

Table 4: Comparison of Nursing Practices Related to ASP Pre and Post Intervention (n = 90)

Practice Indicator	Pre Intervention n (%)	Post Intervention n (%)	p value
Regular monitoring of antibiotic side effects	31 (34.4)	61 (67.8)	< 0.001
Patient education on antibiotic use	36 (40.0)	65 (72.2)	< 0.001
Use of lab results in antibiotic understanding	27 (29.9)	55 (61.1)	< 0.001
Awareness of hospital ASP guidelines	33 (36.7)	68 (75.6)	< 0.001

Despite improvements, several barriers to nurse-led antimicrobial stewardship were identified. The most commonly reported barriers included lack of formal authority in decision making (62.2%), limited access to ASP guidelines (55.6%), and time constraints due to workload (48.9%). These barriers are summarized in Table 5.

Table 5: Reported Barriers to Nurse-Led Antimicrobial Stewardship (n = 90)

Barrier	Frequency (n)	(%)
Limited authority in antibiotic decisions	56	62.2
Lack of access to ASP guidelines	50	55.6
High workload and time constraints	44	48.9
Limited interprofessional collaboration	38	42.2
Insufficient training opportunities	35	38.9

DISCUSSION

The findings of our study provide significant insights into registered nurses' (RNs) perceptions and practices regarding antimicrobial stewardship programs (ASPs). Notably, the demographic characteristics of our participants reflected a young workforce, with a mean age of 29.8 years and a large majority female (72.2%). This aligns with trends in nursing demographics observed globally, where nursing is predominantly a female profession Wong et al. (12). The majority (41.1%) of our participants had less than five years of clinical experience, highlighting a significant portion of novice RNs in the study setting, similar to findings by Zhao et al., which emphasized the importance of knowledge in understanding ASP roles (13).

The baseline knowledge of antimicrobial stewardship among our participants was moderate; only 38.9% correctly defined ASP, and only 42.2% identified its key principles. These results resonate with previous literature indicating that healthcare professionals, especially nurses, often lack comprehensive training in ASPs, as indicated by Zhao et al. [13] and Davey and Aveyard (14). Notably, awareness regarding adverse drug effects was recognized by 53.3% of our participants, which is consistent with other studies highlighting the critical understanding necessary for effective ASP involvement (15). Additionally, a significant proportion (61.1%) of participants acknowledged antimicrobial resistance as a consequence of inappropriate antibiotic use, showing a foundational awareness that aligns with findings from a recent review by Singh et al. (16). This suggests that while the knowledge gap exists, there is an underlying recognition of the need for responsible antimicrobial use that can be bridged through targeted educational interventions.

Before the intervention, only 46.7% of nurses felt they should actively participate in ASPs. After the educational session, this Figure rose to 78.9%, indicating a substantial shift following targeted education. This corresponds with the work of Lutfiyati et al. (17), who reported that tailored educational programs positively influenced nurses' attitudes towards their participation in antimicrobial stewardship efforts. Furthermore, confidence in discussing antibiotic-related issues with prescribers improved significantly, climbing from 31.1% pre-intervention to 66.7% post-intervention. This increase underlines the significant link between education and empowerment in clinical practice, a point emphasized by both Davey and Aveyard and Chaaban et al. in their respective studies on nurse involvement in ASPs (14, 15).

The effect of the educational intervention was also evident in the nursing practices related to ASP. The proportion of nurses involved in regular monitoring of antibiotic side effects nearly doubled from 34.4% to 67.8%. Additionally, patient education regarding antibiotic therapy expanded from 40.0% to 72.2%. These findings correlate with the conclusions drawn by Davey and Aveyard, which indicated that training significantly enhances nurses' capacities to engage in monitoring and patient education duties (14). Our results also align with those reported by Zhao et al., which illustrated improvement in nurses' practice scores following educational initiatives (13).

Despite the observed improvements, our study also identified barriers that hindered nursing participation in ASP. Approximately 62.2% reported limited authority in antibiotic decision-making. This finding mirrors narratives in literature that emphasize that nurses often perceive existing hierarchies as obstructive to their professional responsibilities in ASPs (18). The lack of accessibility to ASP guidelines (55.6%) further compounds this challenge, reinforcing the necessity for systemic changes within nursing education and

institutional policies as underscored by Gulleen et al. (18). This structural limitation was echoed in numerous studies, highlighting the need for better interprofessional collaboration and the establishment of clear guidelines accessible to all healthcare stakeholders (19).

Our study illustrates not only the potential for improvement in nurse-led antimicrobial stewardship through education but also the pressing need for further engagement by nursing institutions and hospital administrations in creating supportive conditions for their involvement. In Pakistan, where antimicrobial resistance poses a significant threat, enhancing the role of nursing professionals in ASPs is crucial for effective health service delivery and for combating antibiotic resistance at the national level (20).

The findings from this study underline the importance of educational interventions in fostering knowledge and good practices in antimicrobial stewardship among nurses. They highlight the need for systemic changes in healthcare that empower nurses, thereby effectively utilizing their potential to manage antibiotic use responsibly and improve patient outcomes. The substantial improvement in perception and practices underscores the imperative for ongoing educational programs that integrate nurses as crucial stakeholders into broader antimicrobial stewardship initiatives.

CONCLUSION

This study demonstrates that a structured teaching session is an effective strategy for enhancing nurses' perceptions, confidence, and self-reported practices related to antimicrobial stewardship. The significant improvements observed after the intervention highlight the critical role of education in empowering nurses as active contributors to stewardship initiatives. Given the growing burden of antimicrobial resistance in Pakistan, integrating regular stewardship-focused training into nursing education and hospital policies is essential. Addressing institutional barriers, such as limited authority and restricted access to guidelines, may further strengthen nurse-led stewardship activities and improve patient care outcomes.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRBEC-NMCN-2038/24)

Consent for publication

Approved

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

FARKHANDA YASMIN (Nursing student)
Manuscript revisions, critical input.
QAMAR UN NISA (Principal)
Data entry, data analysis, drafting an article.
IQRA SHAHZADI *(Assistant Nursing Instructor)*
Conception of Study, Final approval of manuscript. Study Design, Review of Literature
SHAHGUFTA MAJEED *(Vice Principal)*
Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript. Manuscript drafting.

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