

Antimicrobial Stewardship: How much do the nurses realize their role?

Fatima Khan¹, Bhanu Chaudhary², Fatima Mohtashim³, Arsalan⁴, Asfia Sultan¹, Ritik Garg², Yasir Alvi⁵, Haris M Khan¹

Department of Microbiology¹, MBBS Intern², Department of Business Administration³, MBBS Phase 3⁴, JNMCH, AMU; Department of Community Medicine, HIMSR, New Delhi⁵

***Corresponding Author**

Dr. Fatima Khan, Associate Professor, Department of Microbiology, JNMCH, AMU

fatimasalmanshah@gmail.com

Abstract: Background: Antimicrobial stewardship is a team work and Nurses can especially play an essential role in optimizing diagnostic tests or diagnostic stewardship and patient education. However, there is little focus on antimicrobial stewardship training amongst healthcare professionals. Even more neglected is the concept of the role of nursing and their training on antimicrobial stewardship. This study was conducted in a tertiary care centre of Aligarh City of India to 1) evaluate the nurses' knowledge about antibiotic resistance and antimicrobial stewardship 2) To assess the willingness of nurses to participate in Antibiotic stewardship Programs. Methods: A multi-hospital exploratory, collective, mixed method approach (qualitative and quantitative) was used to assess the knowledge and attitude on antimicrobial stewardship amongst the nursing officers. Three-fifty (350) nurses from three hospitals of Aligarh, Jawaharlal Nehru Medical College Hospital (JNMCH), Mohanlal Gautam Rajkiya Mahila Chikitsalaya (MGRMC) and Pt Deen Dayal Upadhyay hospital were interviewed. Their awareness, knowledge and willingness to participate in hospital antimicrobial stewardship program were assessed using a predesigned questionnaire. Results: We observed most of the nurses had a poor knowledge (40.2%) while 29.8% had average and 30.0% had good knowledge. However, three-fourth (74.3%) of the participants agreed to participate in AMSP teaching learning and implementation, while 25.7% did not. Conclusion: Tailored interventions to improve awareness and create a favourable attitude among nurses towards the prevention of antibiotic resistance.

Key words: Antimicrobial resistance, Antimicrobial Stewardship, Nursing.

Introduction: Antimicrobial resistance kills around 7 lac people every year worldwide¹. It can lead to around 10 million deaths by 2050. World health organisation (WHO) has announced Antimicrobial stewardship as urgent priority area and several nations including India have formed National action (NAP) plans for containment of Antimicrobial resistance (AMR)². India formulated its National action plan on AMR for five years in April 2017-2021³. In a consensus meeting between the CDC, Infectious Diseases Society of America (IDSA) and the Society for Healthcare Epidemiology of America (SHEA) Antibiotic stewardship has been defined as “coordinated interventions designed to improve and measure the appropriate use of [antibiotic] agents by promoting the selection of the optimal [antibiotic] drug regimen including dosing, duration of therapy, and route of administration”^{4,5,6}. The benefits of antibiotic stewardship include improved patient outcomes, reduced adverse events including Clostridium difficile infection (CDI), improvement in rates of antibiotic susceptibilities to targeted antibiotics, and optimization of resource utilization across the continuum of care.

Antimicrobial stewardship is a team work and Nurses can especially play an essential role in optimizing diagnostic tests or diagnostic stewardship and patient education. Examples include triaging patients for isolation, a timely collection of culture samples before antimicrobial use, educating patients on how to take antimicrobials at discharge from the hospital⁷.

With the CBME model of medical education Infection control has been made a part of undergraduate curriculum for MBBS students⁸, however there is little focus on antimicrobial stewardship training in the same. Even more neglected is the concept of the role of nursing and their training on antimicrobial stewardship. This study was conducted in a tertiary care centre of Aligarh City of India to 1) evaluate the nurses’ knowledge about antibiotic resistance and antimicrobial stewardship 2) To assess the willingness of nurses to participate in Antibiotic stewardship Programs.

Methods: A multi-hospital exploratory, collective, mixed method approach (qualitative and quantitative) was used to assess the knowledge and attitude on antimicrobial stewardship amongst the nursing officers. Three-fifty (350) nurses from three hospitals

of Aligarh, Jawaharlal Nehru Medical College Hospital (JNMCH), Mohanlal Gautam Rajkiya Mahila Chikitsalaya (MGRMC) and Pt Deen Dayal Upadhyay hospital were interviewed. Their awareness, knowledge and willingness to participate in hospital antimicrobial stewardship

program were assessed using a predesigned questionnaire. The questionnaire was formulated on antimicrobial prophylaxis with six closed-ended questions. Evidenced based guidelines on antimicrobial stewardship established by the CDC⁴ were used as a reference in our study. The questionnaire was validated by face validity and a pilot study on 10% of the sample size. Challenges were identified and listed after every question and suggestions were given to overcome these challenges.

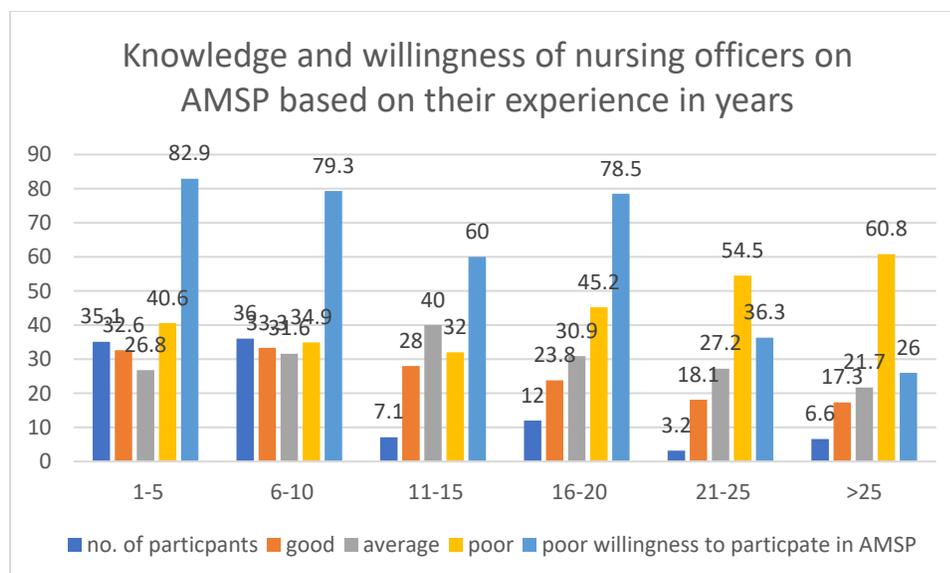
A questionnaire was prepared and nurses were interviewed at three government hospitals of Aligarh, Uttar Pradesh with major focus on Jawaharlal Nehru Medical College and Hospital. Nurses from all the departments and working in all specialities were interviewed about their knowledge and involvement in Antibiotic Stewardship. Their willingness to participate in ASP was also analysed.

The descriptive analysis of the questionnaire was performed using SPSS version 20.0 (IBM Corp, Armonk, NY) to characterize the population parameters and study variables. The collected data were checked regularly for clarity, completeness, consistency, accuracy, and validity.

Ethical consideration Permission was obtained from Jawaharlal Medical College Hospital Infection Control committee and administrators for conducting the study. The process of data collection was started after the objectives of the study were explained to the nursing officers and verbal informed consent was obtained from all participants. Participants were also informed that participation was voluntary and that they could withdraw from the study at any stage if they desired and that information was kept confidential.

Results: We enrolled 350 nurses working in three different government tertiary level hospital in Aligarh. Majority of the participants had 1-5 years (35.1%) and 5-10 years (36.0%) of experience (Graph 1). Majority (63.4%) of the nurses we enrolled worked in a multi-speciality Teaching hospital, while 19.1% and 17.5% were working at a non-teaching hospitals. We also measured their knowledge regarding the antimicrobial resistance. We observed most of the nurses had a poor knowledge (40.2%) while 29.8% had average and 30.0% had good knowledge.

Figure 1: Knowledge and willingness of nursing officers on AMSP based on their experience in years



We measured the participants' willingness to participate in AMSP. Three-fourth (74.3%) of the participants agreed to participate, while 25.7% did not. We observed that nurses with higher experience do not want to participate in AMSP in comparison to those with less years of experiences. This relationship was found to be statistically significant in chi-square test ($P < 0.0001$). We also observed that the nurses working in teaching hospital were more willing to participate in AMSP (92.8%) in comparison to those working in non-teaching hospital (43.3% and 42.6%) and relationship was found to be statistically significant in chi-square test ($P < 0.0001$) (Table 1).

Table 1: Comparison of knowledge and willingness amongst the three hospitals

Experience (in Years)	Hospital	Number of participants	Knowledge (Out of 10)			Willingness to participate in AMSP
			Good (>7)	Average (5-7)	Poor (<5)	
1-5	JNMCH	80 (22.8)	32 (40.0)	20 (25.0)	28 (35.0)	80 (100)
	MGMRC	21 (6.0)	4 (19.0)	6 (28.5)	11 (52.4)	11 (52.4)
	DDU	22 (6.2)	4 (18.2)	7 (31.8)	11 (50)	11 (50)
6-10	JNMCH	81 (23.1)	32 (39.5)	25 (30.7)	24 (29.6)	81 (100)
	MGMRC	24 (6.8)	6 (25.0)	8 (30.3)	10 (41.7)	11 (45.8)

	DDU	21 (6.0)	4 (19.0)	7 (33.3)	10 (47.6)	9 (42.9)
11-15	JNMCH	10 (2.8)	4 (40.0)	4 (40.0)	2 (20.0)	9 (90.0)
	MGMRC	8 (2.2)	1 (12.5)	3 (37.5)	4 (50.0)	3 (37.5)
	DDU	7 (2.0)	2 (28.6)	3 (42.8)	2 (28.6)	3 (42.9)
16-20	JNMCH	30 (8.5)	8 (26.7)	8 (26.7)	14 (46.6)	30 (100)
	MGMRC	8 (2.2)	1 (12.5)	3 (37.5)	4 (50.0)	2 (25.0)
	DDU	4 (1.1)	1 (25.0)	2 (50.0)	1 (25.0)	1 (25.0)
21-25	JNMCH	6 (1.7)	2 (33.3)	3 (50.0)	1 (16.7)	2 (33.3)
	MGMRC	2 (0.5)	0	0	2	1 (50.0)
	DDU	3 (0.8)	0	0	3	1 (33.3)
>25	JNMCH	15 (4.2)	3 (20.0)	5 (33.3)	7 (46.7)	4 (26.7)
	MGMRC	4 (1.1)	1	0	3	1 (25.0)
	DDU	4 (1.1)	0	0	4	1 (25.0)
Total		350	105 (30.0)	104 (29.8)	141(40.2)	

On qualitative analysis during focussed group discussions, we found that the main challenge was that the majority of nurses were not aware of the term “Antimicrobial Stewardship”, so we re-framed the questions based on antimicrobial resistance. On after explaining the term “antimicrobial stewardship” to them, when asked about their role in it, 224 (64%) majority of them were unaware that they could play any role in antimicrobial stewardship, because they were not trained or told to do so. 165 (47.1) nurses said that they know which antibiotic is to be given at what timings, but they [159(74%)] were not aware how this impacts AMSP. On asking about the importance of specimen collection, they didn’t knew its significance in preventing antimicrobial resistance and they considered themselves overburdened to communicate to the patients for they specimens the patients have to collect themselves.

Table 2: Challenges and solutions to AMSP in nursing

Components of AMSP & Roles of	Number of nursing	Challenge	Solution
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nursing officers in it	agreeing to the role (%)		
Nurses have a role in antimicrobial stewardship programme (AMSP)/Antibiotic resistance?	126 (36)	Most Nurses were not aware about the term antibiotic stewardship, so we included the term antibiotic resistance in questionnaire after a pilot survey. It is neither taught in nursing curriculum nor any training provided to them regarding AMSP.	AMSP should be made a component of the routine monthly infection control training program for nurses run by the hospitals.
Has anyone ever discussed of antimicrobial stewardship with you before?	31 (8.8)	Nobody discussed this term with them ever in JNMCH, Malkan Singh and Deendayaal hospital. Few Exceptions were the nursing staff who had previous work experience in hospitals like AIIMS, hospitals in Saudi Arabia, and corporate hospitals	There is an urgent need to advance the monthly trainings and include antimicrobial stewardship to it.
Are you aware which patient is given which antibiotic and its timings?	165 (47.1)	Yes, since this is the responsibility of the nurses to give medication to the patients, particularly the IV medications.	
Do you think correct timing and dosages can play a role in AMSP?	91 (26)	Although most of the nurses said they know which antibiotic is to be given and and what timing,	An overview of pharmacokinetics and dynamics of the drugs should also be given to

		but they were not aware how the dose and timings affects the patients' outcome through the pharmacokinetics and pharmacodynamics of the drug.	them so that they can understand the significance of correct dosage and timings.
Do you review the reports of the patients and suggest change of treatment?	98 (28)	Although the nurses take rounds with the consultants, but they are not a part of any decision making and do not review the reports of the patients neither they can suggest any treatment changes.	Since the nurses are the most assessable healthcare workers in wards and various units, they should be at least trained to recognise the critical investigations and raise red flags by communicating to the doctors when necessary.
Do you think nurses should raise alert to review the antimicrobials at 48-72 hours of prescription?	87 (24.8)	Same as above	It should be made a routine practice for the nurses to remind the doctors to review the antimicrobial therapy at 72 hours or as soon as the culture reports are available.
Do you think specimen collection has any role in AMSP?	86 (24.6)	They were sure that specimen collection is significant for correct diagnosis and treatment but were not aware how it can play a role in AMSP.	Introducing them to Diagnostic Stewardship along with AMSP is necessary and should be done during AMSP trainings, once they are introduced.

Do you ensure to collect timely cultures before starting the antibiotics?	35 (10.0)	Since decision to go for culture is taken by consultants, nurses take timely culture only when consultants recommend it.	Once they would be sensitized about the terms AMSP & diagnostic stewardship, they would realise the significance of timely cultures.
Do you communicate with the patients regarding proper specimen which they collect on their own?	66 (18.8)	They considered themselves overburdened and do not have time most of the times for communication.	Communicating with the patients for proper specimen collection, would ease in correct diagnosis and treatment, better and early patient recovery and discharge, thus saving their own time.
Do you think AMSP should be a part of nursing practice?	260 (74.3)	Majority agreed but few were hesitant, considering it to be an extra work load on themselves.	The HICC should include and empower nurses and assign them roles and responsibilities for AMSP.
Do you think nurses should be trained for AMSP?	288(82..3)	-	The eagerness to learn new concepts was clearly visible and should be exploited to the benefit of the patients.

Discussion: The alarming rise in AMR rates is a worldwide problem, but it is perhaps most severe in India. The rising AMR rates in India can be attributed to a number of different causes⁹. These include insufficient infection prevention and control guidelines, an abundance of infectious diseases, and the excessive and inappropriate use of antibiotics. HCPs particularly doctors and nurses are often at the forefront of efforts to reduce antimicrobial resistance (AMR). Everyone has

a part to play in the collective effort to avert antimicrobial resistance. Being the frontline workers, nurses' knowledge and outlook affect the quality of care provided and the learnings imparted hence it is crucial to ascertain their knowledge and attitude with respect to antimicrobial resistance ¹⁰.

There was a major lacunae amongst the knowledge of nurses on the antimicrobial stewardship and thus majority of them 224 (64%) were unaware of their role in it, since they were not sensitised for it earlier. AMSP should be made a component of the routine monthly infection control training program for nurses run by the hospitals. Similarly despite knowing the timing and duration of antibiotics to be given, they were unaware of its significance and also of the importance of specimen collection before starting the antimicrobials. An overview of pharmacokinetics and dynamics of the drugs should also be given to them so that they can understand the significance of correct dosage and timings. Since the nurses are the most assessable healthcare workers in wards and various units, they should be at least trained to recognise the critical investigations and raise red flags by communicating to the doctors when necessary. Introducing them to Diagnostic Stewardship along with AMSP is necessary and should be done during AMSP trainings, once they are introduced. Once they would be sensitized about the terms AMSP & diagnostic stewardship, they would realise the significance of timely cultures. Majority 284 (81.2%) considered themselves overburdened to communicate to the patients for the specimens the patients have to collect themselves. They were sensitized during the FGDs that communicating with the patients for proper specimen collection, would ease in correct diagnosis and treatment, better and early patient recovery and discharge, thus saving their own time.

The silver lining is that the nurses in this study were generally supportive of stewardship programmes and their associated antimicrobial activities. Although they didn't score high, but most of them were eager to learn and participate in antimicrobial stewardship program. Results from this study are consistent with those from a study conducted in Pakistan, which found that despite low levels of knowledge about ASPs, the majority of healthcare professionals (HCPs), including nurses, had a favourable attitude towards implementing them in hospitals ¹¹.

Training on ASPs was recognised as a necessity by a strong majority of respondents (82.2 percent). Abera et al¹² found that the majority of nurses wanted ASPs, so this finding is in line with their conclusions. Alex et al¹³ reports that survey data from a medical school show that 87% of students

want to learn more about antimicrobial resistance as a result of these results, it is clear that HCPs require more education and training to raise their level of awareness¹⁴.

There is an increasing consensus that nurses need more education on the topic before they can be given the competence to hold meaningful contributions, such as feeling confident enough to voice concerns about antibiotic management practises¹⁵⁻¹⁶.

The argument that education will help overcome some of the barriers identified in this study is endorsed by studies showing a positive correlation between nurses' Anti-microbial stewardship education, their contribution to successful antibiotic management, and their competence in discussing antibiotic administration with prescribers^{17,18}.

In this study, nurses were aware of their place in antimicrobial stewardship and eager to contribute to the worldwide effort to address this issue. This finding is encouraging because it shows that nurses want to collaborate for this goal. However, nurses will only be able to effectively voice their concerns if they have the self-assurance to do so. It is generally agreed that nurses need to speak up to ensure the safety of their patients and to fulfil their role as advocates for their patients¹⁹.

According to studies, nurses may be reluctant to speak up because they worry they won't be taken seriously^{20,21} or because they want to fit in with the rest of the ward team by avoiding conflict^{22,23}. More specifically, nurses are hesitant to doubt antibiotic prescribers due to concerns that doing so would be met with resistance from doctors^{24,25}; and because challenging prescribing decisions is seen as one of the most difficult aspects of ward work¹². As a result, nurses may have to prioritise their own psychological and social well-being over that of their patients²¹.

Education on the significance of speaking up as a whole, and of Anti-microbial stewardship in particular, may be more effective when given on an inter-professional basis¹³ because, in addition to facilitating learning, it would contribute to efforts to breakdown customary hierarchies, promote collaboration and coordination¹², and allow for an understanding from various perspectives¹³.

Strengths and limitations: In this article, we discuss the critical issue of antibiotic resistance and antimicrobial stewardship and the critical role that nurses can play in developing and implementing strategies to combat this growing global threat. It also reveals that the nurses who took part in the study had a positive outlook on the need to take measures to reduce antibiotic resistance. Our

research also highlights the importance of involving clinical nurses in the fight against antibiotic resistance by providing them with education and tools to improve antimicrobial stewardship. However, the present study is restricted to nurses working in three different government hospitals in Aligarh, Uttar Pradesh. Nurses working in corporate or private hospitals may have a different view and may have different knowledge and attitude towards AMSP. Variation in recall abilities and the propensity to provide a socially acceptable answer rather than one's genuine belief about antibiotic use and prevention of antibiotic resistance both increase the likelihood that the response is inaccurate. Regardless of these caveats, the study still sheds light on how frontline nurses perceive their role in preventing antibiotic resistance and its stewardship and what they know about the topic.

Implication for practice: Antimicrobial stewardship programmes and the prevention of antibiotic resistance require knowledge of the problem and a positive, proactive outlook. Based on the results of this research, nurses need to acquire more information and adopt a more positive mindset before they can make meaningful contributions to antimicrobial resistance prevention strategies and antimicrobial stewardship initiatives. Researchers can use the study's context-specific baseline data to shape a curriculum that educates and inspires nurses.

Conclusion: The present study showed that nurses themselves are not fully aware of the basics of antibiotics antibiotic resistance and the methods to be employed in its prevention. As such, this study highlights the importance of tailored interventions to improve awareness and create a favourable attitude among nurses towards the prevention of antibiotic resistance.

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