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Assessing knowledge, attitudes, and practices regarding antimicrobial resistance: Insights from a questionnaire-based study

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Abstract

Introduction: Antibiotic resistance poses a grave threat, causing 700,000 deaths yearly, with the potential to reach 10 million by 2050. Overuse and self-medication exacerbate the issue UN and WHO advocate public education to enhance antibiotic use. Hospital Antibiotic Stewardship programs target optimized use. Understanding healthcare professionals' and patients' attitudes toward AMR is crucial for effective interventions.

Objectives: To assess the awareness and knowledge of AMR among patients and healthcare professionals. To understand the attitudes towards AMR and its perceived impact on public health. To evaluate the practices and behaviors related to antibiotic use. To identify challenges and opportunities in combating AMR.

Materials and Methods: A cross-sectional study at a Rural Tertiary Care Teaching Hospital involved 244 participants (102 patients, 142 healthcare professionals) using Google Forms. The 21-question survey covered demographics, AMR awareness, antibiotic practices, attitudes, and challenges. Data analysis used SPSS 21.0, presenting descriptive statistics as frequencies and percentages.

Results: Study: Mostly 31-45 y/o, 64% male, 42% patients, 58% healthcare pros. 42% of patients are aware of AMR; pros follow guidelines. 67% of patients self-medicate, and many incomplete courses. Concerns on AMR, advocate stricter rules. Challenges: lack of resources (22%) and diagnostics (23%). Opportunities: enhance stewardship, education, and diagnostics.

Conclusion: Study on AMR views among mainly male 31-45 yo patients and healthcare pros. Patients lacked awareness and were self-medicated. Concerns on AMR, advocate stricter rules. Challenges: limited info, tools. Opportunities: improve stewardship, education, and engagement. Emphasizes the need for thorough AMR plans.

Keywords: Antimicrobial resistance, healthcare professionals, self-medication

Introduction

Antibiotic resistance is one of the most prominent threats to health systems and food security in the world, posing a major risk to human life and public health. An estimated 700,000 people die every year of infections caused by antibiotic-resistant bacteria, and the World Health Organization (WHO) predicts that this number could rise to 10 million by 2050 if new and better treatments are not found. Antibiotic resistance has been reported throughout the world. Antibiotic overuse contributes to its development, leading to antimicrobial resistance. Infections caused by resistant bacteria are typically characterized by a more prolonged duration of illness and more aggressive treatment measures, with corresponding complications and mortality rates that tend to be higher than those caused by non-resistant bacteria ^[1]. The general population plays a critical role in bacterial resistance due to inadequate practices such as self-medication, interruption of prescriptions, lack of therapeutic adherence, limited knowledge, and poor attitudes toward prevention. To address this issue, the United Nations General Assembly on Antimicrobial Resistance is committed to promoting activities that increase the general population's knowledge of antimicrobial resistance to encourage changes in their attitudes and practices towards these drugs. A greater understanding of the topic is assumed to lead to better attitudes and practices ^[2]. AMR is likely to significantly negatively affect the global economy - mainly in low and middle-income countries (LMICs).

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While the development of AMR is a natural process that has been long recognized, its spread is exacerbated by many factors, some of them related to inappropriate prescription and use. Many studies have reported that antibiotic regime non-adherence and inappropriate antibiotic use are strongly associated with public awareness and knowledge of antibiotics. Unfortunately, limited studies have examined the knowledge attitudes, and practices of users and prescribers of antimicrobials in developing countries [3]. Nowadays there are upcoming hospital-based programs, known as “Antibiotic Stewardship programs” which are mainly channelized to optimize antibiotic use in hospitals, can guide consultants on proper antibiotic use, improve the frequency of accurate prescribing, improve quality care of patients, decrease the emergence of resistance/failure of treatment, prevention of various adverse drug reactions, drug interactions, dropdown the financial expenses on unnecessary usage of drugs. According to WHO, education of healthcare workers and medical students on “Antimicrobial stewardship” is an integral part of all antimicrobial resistance containment procedures [4]. Antimicrobial resistance (AMR) is a growing global health threat that jeopardizes the effective treatment of infections, leading to prolonged illness, higher healthcare costs, and increased mortality. Understanding the knowledge, attitudes, and practices (KAP) of both healthcare professionals and patients towards AMR is critical for developing effective interventions. This article presents the design and findings of a comprehensive questionnaire-based study to evaluate these factors.

Objectives

The primary objectives of this study are

- To assess the awareness and knowledge of AMR among patients and healthcare professionals.
- To understand the attitudes towards AMR and its perceived impact on public health.
- To evaluate the practices and behaviors related to antibiotic use.
- To identify challenges and opportunities in combating AMR.

Materials and Methods

A cross-sectional, questionnaire-based study was carried out at a Rural Tertiary Care Teaching Hospital, using Google Forms, the questionnaire was shared through various social media channels (Such as WhatsApp, E-mails, etc.) in which 244 study participants were recruited, utilizing a structured questionnaire targeting two main groups: patients (102 participants) and healthcare professionals (142 participants). The questionnaire contained a total of 21 questions including sections on demographic information which contains five questions, awareness and knowledge of AMR contains four questions, practices and behaviors related to antibiotic use contains five questions, attitudes towards AMR contains three questions, and challenges and opportunities in addressing AMR contains four questions. The Excel sheet obtained from Google Forms was downloaded and then exported to the Statistical Package for Social Science (SPSS) version 21.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were presented as frequency and percentage of qualitative variables.

Questionnaire Design

Section 1: Demographic Information

We collected data on age, gender, role (patient or healthcare professional), profession, and years of experience.

Section 2: Awareness and Knowledge of AMR

Assessed familiarity with AMR, sources of information, and beliefs about its significance as a public health issue.

Section 3: Practices and Behaviors

Examined frequency of antibiotic prescribing and usage, factors influencing these decisions, and adherence to prescribed antibiotic courses.

Section 4: Attitudes towards AMR

Evaluated levels of concern about AMR, perceptions of public awareness, and views on effective measures to combat AMR.

Section 5: Challenges and Opportunities

Identified encountered challenges in managing or understanding AMR and perceived opportunities for improvement.

Results

Demographic Overview

The study included diverse participants across various age groups (the majority were 31-45 years (51%) followed by 46-60 years (21%), 18-30 years (20%), under 18 years (5%), and over 60 years (3%), and respectively, genders (male (64%) and female (36%)), and role of participants (42% patients) and (58% healthcare professional), and professional backgrounds (32% pharmacists, 30% physician, 22%, nurse, 8% microbiologist and 8% were others), and years of experience (38% in 1-5 years of experience followed by 33% in less than 1 year, 21% in 6-10 years, and 8% in more than 10 years of experience), providing a broad perspective on AMR (Table 1).

Awareness and Knowledge of AMR: Patients: A significant portion of participants were aware of AMR (42% very familiar, 26% not familiar at all, 23% familiar, and 9% somewhat familiar), primarily learning about it through (42% medical/pharmacy school, 31% media, 10% through other mode, 7% workplace training, 6% continuing education, and 4% personal research) (Table 2).

Practices and Behaviors

Healthcare Professionals: Antibiotics were prescribed regularly, with clinical guidelines and diagnostic test results being the main influencing factors. Patients: While the majority of patients had not requested antibiotics (66%), there was a notable incidence of taking antibiotics without a prescription (67%). Adherence to prescribed antibiotic courses varied, with many patients sometimes not completing their courses (Table 3).

Attitudes Towards AMR

High levels of concern were reported by both groups regarding the impact of AMR on public health. Many participants believed that public awareness of AMR was insufficient and highlighted the need for strict regulations on antibiotic prescribing (Table 4).

Challenges and Opportunities

Challenges: Common challenges included a lack of information/resources (22%), limited diagnostic tools (23%), technical difficulties, lack of digital literacy, privacy concerns, and regulatory barriers.

Opportunities

Key opportunities identified were strengthening

antimicrobial stewardship programs, better education and training for healthcare professionals, public engagement and education initiatives, enhanced surveillance and reporting of AMR, improved medication management, enhanced patient engagement, and cost reduction.

Both groups emphasized the need for better education and training, improved diagnostic tools, and stronger antimicrobial stewardship programs (Table 5).

Table 1: Demographic characteristics of the study participants (n=244).

Section 1: Demographic Information		
What is your age?	Frequency	Percentage
Under 18	12	5
18-30	49	20
31-45	124	51
46-60	51	21
Over 60	8	3
What is your gender?		
Male	155	64
Female	89	36
Transgender	0	0
What is your role?		
Patient	102	42
Healthcare Professional	142	58
If you are a healthcare professional, please specify your profession:		
Physician	43	30
Microbiologist	12	8
Pharmacist	46	32
Nurse	30	22
Other	11	8
How many years of experience do you have in your current role?		
Less than 1 year	47	33
1-5 years	54	38
6-10 years	29	21
More than 10 years	12	8

Table 2: Awareness and Knowledge of AMR

Section 2: Awareness and Knowledge of AMR		
How familiar are you with antimicrobial resistance (AMR)?	Frequency	Percentage
Very familiar	102	42
Familiar	55	23
Somewhat familiar	23	9
Not familiar at all	64	26
How did you first learn about AMR?		
Medical/Pharmacy school	102	42
Continuing education	15	6
Workplace training	16	7
Media (TV, newspapers, internet)	77	31
Personal research	10	4
Other	24	10
Do you believe that AMR is a significant public health issue?		
Yes	156	64
No	73	30
Unsure	15	6
Which of the following do you think contributes most to AMR?		
Overprescribing antibiotics	79	32
Patients not completing antibiotic courses	84	34
Use of antibiotics in livestock	33	14
Poor infection control in hospitals	27	11
Lack of new antibiotics being developed	11	5
Other	10	4

Table 3: Practices and Behaviors

Section 3: Practices and Behaviors		
For healthcare professionals: How often do you prescribe antibiotics?	Frequency	Percentage
Daily	44	31
Weekly	57	40
Monthly	32	23
Rarely	6	4
Never	3	2
For healthcare professionals: What factors influence your decision to prescribe antibiotics?		
Clinical guidelines	57	40
Patient demand	4	3
Diagnostic test results	44	31
Personal experience	32	23
Pressure from pharmaceutical companies	2	1
Other	3	2
For patients: Have you ever requested antibiotics from your healthcare provider?		
Yes	35	34
No	67	66
For patients: Have you ever taken antibiotics without a prescription (e.g., leftovers, obtained from others)?		
Yes	68	67
No	34	33
How often do you complete the full course of prescribed antibiotics?		
Always	23	23
Most of the time	27	26
Sometimes	22	22
Rarely	16	16
Never	14	13

Table 4: Attitudes towards AMR

Section 4: Attitudes Towards AMR		
How concerned are you about the impact of AMR on public health?	Frequency	Percentage
Very concerned	42	30
Concerned	55	39
Somewhat concerned	19	13
Not concerned	26	18
Do you think there is enough public awareness about AMR?		
Yes	35	25
No	89	63
Unsure	18	12
What measures would be most effective in combating AMR?		
Stricter regulations on antibiotic prescribing	45	32
Public education campaigns	22	15
Improved infection control practices	11	8
Increased funding for research and development of new antibiotics	27	19
Reducing antibiotic use in agriculture	32	22
Other	5	4

Table 5: Challenges and Opportunities

Section 5: Challenges and Opportunities		
What challenges do you face in managing or understanding AMR?	Frequency	Percentage
Lack of information/resources	35	25
Patient expectations/demands	26	18
Limited diagnostic tools	33	23
Regulatory constraints	23	16
Other	25	18
What opportunities do you see for improving the management of AMR?		
Better education and training for healthcare professionals	32	22
Development of rapid diagnostic tests	14	9
Strengthening antimicrobial stewardship programs	38	26
Enhanced surveillance and reporting of AMR	22	16
Public engagement and education initiatives	25	19
Other	11	8
For healthcare professionals: How likely are you to participate in further training or education on AMR?		
Very Likely	38	27
Likely	29	20
Neutral	23	16

Unlikely	22	15
Very unlikely	30	22
For patients: How likely are you to follow your healthcare provider's advice on antibiotic use?		
Very Likely	22	21
Likely	34	33
Neutral	13	13
Unlikely	23	23
Very unlikely	10	10

Discussion

The study included diverse participants, mostly aged 31-45 (51%), with a gender split of 64% male and 36% female. It involved 42% patients and 58% healthcare professionals, including pharmacists (32%), physicians (30%), nurses (22%), microbiologists (8%), and others (8%). Experience ranged from less than a year to over 10 years. 42% of patients were very familiar with antimicrobial resistance (AMR), learning about it mainly from medical/pharmacy school (42%) and media (31%). Healthcare professionals often prescribe antibiotics based on guidelines and tests. While 66% of patients didn't request antibiotics, 67% took them without prescriptions, and many didn't complete their courses. Both groups were highly concerned about AMR's public health impact and believed public awareness was insufficient, advocating for stricter prescribing regulations. Challenges included a lack of information/resources (22%), limited diagnostic tools (23%), and regulatory barriers. Opportunities focused on enhancing antimicrobial stewardship, education, public engagement, surveillance, medication management, and cost reduction.

The study offers valuable insights into the current state of antimicrobial resistance (AMR) awareness, practices, and attitudes among a diverse group of participants. The demographic overview reveals a well-rounded sample, including various age groups, genders, professional roles, and levels of experience, providing a comprehensive perspective on AMR.

70.9% of the 117 respondents were females, indicating a higher female representation in the study. 88.9% of participants expressed interest in pursuing a career as an Infectious Disease pharmacist or obtaining a certificate in antimicrobial stewardship, showing a strong inclination towards this specialization. The mean knowledge score towards antimicrobial resistance was 3.75, indicating a good level of knowledge among pharmacists in the UAE. 84.3% of participants correctly identified interventions for antibiotic resistance, demonstrating a high level of understanding in this area. 52.3% of participants received training on antimicrobial stewardship during their experiential rotation, leading to increased confidence in their performance and knowledge assessment. The gender distribution among the respondents showed that 52.6% were female, with a confidence interval of 49.3% to 55.9%. Additionally, 2.0% had no formal education, and 12.3% had educational qualifications in the health field. The knowledge score median was 73.3, with 36.9% of participants believing that antibiotics can be stopped once symptoms improve and 26.1% considering them as analgesics or antipyretics. The attitudes score was 83.3, with over 90% agreeing that more information is needed on antibiotic resistance. The practice score was the lowest at 63.9, with 48% being prescribed antibiotics at the pharmacy and 42.6% taking them to treat flu symptoms. The study revealed that only a small proportion of students correctly identified the necessity of antibiotics for specific medical conditions, with only 3 out

of 12 conditions being recognized as requiring antibiotic treatment. The awareness of the severity of antibiotic resistance was identified as the most significant predictor of the level of understanding regarding approaches to treating antibiotic resistance, followed by general knowledge.

Awareness and Knowledge of AMR

The findings indicate a significant awareness of AMR among the participants, particularly those with medical or pharmacy school backgrounds. However, the varied levels of familiarity highlight a crucial gap in knowledge among certain groups, especially patients who are less familiar with AMR. This disparity underscores the need for targeted educational initiatives to ensure a broader and more consistent understanding of AMR across all demographic segments.

Practices and Behaviors

The practices among healthcare professionals reflect a reliance on clinical guidelines and diagnostic tests for antibiotic prescribing, which is a positive indication of adherence to standard medical protocols. However, the patient behaviors present a cause for concern, with a notable proportion taking antibiotics without prescriptions and not completing prescribed courses. These practices contribute to the development of AMR and emphasize the necessity for stringent patient education and adherence strategies.

Attitudes towards AMR

The high levels of concern about the impact of AMR on public health among both healthcare professionals and patients highlight the perceived severity of the issue. The consensus on the insufficiency of public awareness and the need for stricter regulations on antibiotic prescribing points to a critical area for policy intervention. Enhancing public knowledge and implementing rigorous regulatory frameworks could play a significant role in mitigating the spread of AMR.

Challenges and Opportunities

The challenges identified, such as lack of information and resources, limited diagnostic tools, and regulatory barriers, are significant obstacles to effective AMR management. Addressing these challenges requires a multifaceted approach, including investment in better diagnostic technologies and reducing regulatory hurdles. On the other hand, the opportunities for improvement are encouraging. Strengthening antimicrobial stewardship programs, enhancing education and training for healthcare professionals, and engaging the public more effectively can lead to substantial progress. Additionally, improved surveillance and reporting, better medication management, and patient engagement are crucial steps toward controlling AMR. The focus on cost reduction is also vital, as it can facilitate broader access to necessary resources and interventions.

The study underscores the critical need for ongoing education and training on AMR for both healthcare professionals and patients. Effective communication strategies and public education campaigns are essential to raise awareness and encourage responsible antibiotic use.

Strengths and limitations of the study

Strengths

The study includes participants from various age groups, genders, and professional backgrounds, providing a broad perspective on AMR issues. By incorporating both patients and healthcare professionals, the study offers a well-rounded view of AMR awareness, practices, and attitudes from both ends of the healthcare spectrum. The study examines multiple aspects of AMR, including awareness, practices, attitudes, challenges, and opportunities, giving a holistic understanding of the issue. The study highlights significant opportunities for improving AMR management, such as enhanced education and training, which are critical for developing effective interventions.

Limitations

The gender distribution is skewed towards males (64%), which may limit the generalizability of the findings across a more balanced gender representation. Participants over 60 years and under 18 years are underrepresented, potentially overlooking insights from these age groups. The reliance on self-reported data may introduce bias, as participants might overestimate or underestimate their knowledge, practices, or attitudes. The study provides a snapshot in time, lacking longitudinal data that could better illustrate trends and changes in AMR awareness and behavior over time. If the study sample is drawn from a specific geographical area, the findings might not apply to other regions with different healthcare systems and AMR challenges.

Recommendations

- **Training and Education:** Implement comprehensive training programs for healthcare professionals and educational resources for patients to enhance understanding and management of AMR.
- **Public Awareness:** Launch public awareness campaigns to inform the community about the dangers of AMR and the importance of adhering to prescribed treatments.
- **Policy and Regulation:** Develop clear regulatory frameworks to address antibiotic prescribing and usage, ensuring compliance with best practices.
- **Research and Development:** Increase funding for research and development of new antibiotics and diagnostic tools to stay ahead of resistant strains.

Conclusion

The study provides a comprehensive examination of the diverse perspectives on antimicrobial resistance (AMR) among various demographic groups. Participants, predominantly aged 31-45 and largely male, included both patients and healthcare professionals from various backgrounds. The findings reveal a significant awareness of AMR, particularly among those educated in medical or pharmacy schools, although knowledge gaps remain, especially among patients who are less familiar with the issue. Practices among healthcare professionals highlighted the regular prescription of antibiotics guided by clinical

guidelines and diagnostic tests. However, patient behaviors showed concerning trends, such as a notable incidence of self-medication with antibiotics and inconsistent adherence to prescribed courses. Both groups expressed high levels of concern about the public health impact of AMR, stressing the inadequacy of current public awareness and the need for stricter antibiotic prescribing regulations. The study identified several challenges, including limited information, diagnostic tools, and regulatory barriers, while also pointing to opportunities such as enhanced antimicrobial stewardship, better education and training for healthcare professionals, and improved public engagement. Overall, the study underscores the critical need for comprehensive strategies to address AMR, emphasizing the importance of education, improved diagnostic tools, and robust stewardship programs to mitigate the threat of AMR effectively.

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