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Assessment of Knowledge and Awareness of Antibiotic Resistance Among University Students and Academics in Syria

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***Abstract*—** Antibiotic Resistance (AR) has recently attracted the attention of academics and researchers in the field of medicine to be a significant clinical concern and one of the top global public health and development threats. The purpose of this study is to investigate Syrian students' and academics' knowledge and awareness of antibiotic resistance. A quantitative research design was employed by administering a questionnaire to obtain the data. The data were analyzed using descriptive statistical methods. The respondents of this study were 210 university students and academics in Syria. This study highlights significant differences in knowledge and awareness of antibiotic resistance between university students and academic staff in Syria. Findings reveal a notable prevalence of misconceptions, including the erroneous belief that the human body, rather than bacteria, develops immunity to antibiotics, underscoring widespread inappropriate antibiotic use. The findings will help attain valuable insights regarding the level of knowledge and awareness of antibiotic resistance.

***Keywords*—** Antibiotic resistance; Antibiotic resistance (AR); Antibiotic use; Knowledge and awareness; Higher education; Public health.

I. INTRODUCTION

The rapid advancement of medical and pharmaceutical sciences has completely transformed several aspects of healthcare practices worldwide, offering innovative approaches to disease prevention and treatment. Nevertheless, alongside these advancements, antibiotic resistance is now proposed as one of the most serious global public health challenges of the modern era. Antibiotic resistance occurs when microorganisms develop the ability to resist the effects of antibiotic agents, rendering standard treatments ineffective and increasing the risk of disease spread, severe illness, and mortality (World Health Organization, 2023). Antibiotic resistance is primarily driven by the misuse and overuse of antibiotics. The inappropriate self-medication, prescription of antibiotics, and lack of adherence to treatment guidelines have accelerated the development of drug-resistant pathogens. Furthermore, the world is currently facing a critical antibiotic pipeline and access crisis, characterized by insufficient research and development of new antibiotic agents to combat rising resistance levels (WHO, 2023). This crisis highlights a huge need for effective strategies to promote rational use of antibiotics. In this case, awareness and knowledge play a key role in controlling the spread of antibiotic resistance. As future health care professionals, researchers, educators, and decision-makers who influence public behaviors and policy, university students and academics are an important part of society. These groups must have a sufficient grasp of AR. Adequate understanding of AR among these groups is crucial for promoting ethical antibiotic use and support public healthcare initiatives.

However, limited awareness and misconceptions about the use of antibiotics persist in so many countries, AR affects countries in all regions and at all income levels. Its drivers and consequences are exacerbated by poverty and inequality (WHO, 2023).

This study reveals a clear deficiency in awareness and practices related to antibiotic use within the Syrian academic community, both in terms of adherence to treatment and understanding of resistance mechanisms. It also highlights the influence of non-medical sources in shaping health concepts and demonstrates that the misuse of antibiotics contributes to the exacerbation of health problems and the emergence of drug resistance. Significant differences are evident between the most and least aware groups in terms of knowledge and practices. Hence, the necessity of raising health awareness to reduce antibiotic resistance and promote its rational use. These results reflect the importance of research in addressing knowledge and behavioral gaps and strengthening educational and health initiatives to ensure the rational use of antibiotics in confronting the antibiotic resistance crisis. Previous studies indicate that the level of awareness regarding antibiotic use remains uneven across different groups. The results showed that healthcare workers and students in advanced stages of medical education possess higher awareness and more committed practices compared to the general public or those with less education. Previous studies also showed that the uncontrolled use of antibiotics, such as discontinuing treatment, contributes to the problem.

Early or non-prescription use of antibiotics contributes to the exacerbation of bacterial resistance, underscoring that promoting health education is a fundamental step in reducing antibiotic resistance. Therefore, this research aims to bridge this knowledge and behavioral gap and provide a scientific framework that contributes to promoting the rational use of antibiotics and reducing the escalation of resistance.

II. RELATED STUDIES

This section reviews current global trends in antibiotic awareness among higher education cohorts, examines the specific drivers of resistance in the Syrian context, and highlights the educational gaps that necessitate a targeted assessment of both students and their instructors. A study by Safdar (2023) stated that most respondents evidenced adequate knowledge regarding antibiotic use and were aware of the role of misuse in the development of antibiotic resistance. Regardless of generally positive level of awareness, several inappropriate practices were still identified, including the use of antibiotics without medical consultation and the early discontinuation of treatment once symptoms improved. In addition, antibiotic resistance was highlighted as a serious public health concern, reflecting the growing recognition of its impact on community health. However, the study also recognized certain limitations, particularly those related to the confidence on self-reported online data and the restriction of the sample to specific population groups, which may affect the generalizability of the findings.

Further, Abdallah et al. (2025) aimed to understand awareness and assess the impact of antibiotic awareness programs, and to determine the attitudes and practices of mothers towards children under five years of age. A trial was conducted at a primary healthcare center with 375 mothers. This trial included awareness programs using lectures, group discussions, and audio-visual materials. Researchers used a special tool to assess knowledge, attitudes, and practices in order to develop and improve mothers' understanding regarding antibiotic use. Abdallah et al (2025) found that the mothers' knowledge exhibited a substantial increase. Furthermore, the respondents' attitudes witnessed a noteworthy shift, experiencing considerable improvement post-program. Additionally, the reported practices of the mothers displayed positive changes. In conclusion, well-designed awareness programs can help mothers make informed health decisions, which in turn helps control antibiotic misuse and improve childcare.

Lalithabai et al. (2022) also conducted a study to evaluate nurses' attitudes and knowledge about antibiotic usage and antibiotic resistance prevention, with a focus on their vital role in infection control in healthcare systems. In order to enable the development of focused use of a self-administered questionnaire. Nurses, as frontline health workers, have an important role in the prevention of antibiotic resistance. Lalithabi (2022) found 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 favorable attitude among nurses towards the prevention of antibiotic resistance. Tabassum et al. (2024) concluded that there are significant problems in understanding the actual response to antibiotics. Misuse of antibiotics and self-medication are still prevalent among people, although there are many communication networks. However, these platforms are not sufficient to promote adequate awareness. Therefore, the study strongly emphasizes the need for regular awareness campaigns and interactive campaigns on the ground, such as community awareness and school programs to improve use and reduce the increasing resistance to antibiotics.

One of the limitations of this study is that it was conducted on a small scale among some students and employees in one area, which limits the possibility of generalizing the results.

Previous research by Anas Alhur et al. (2024) examined knowledge, attitudes, and practices related to antibiotic resistance among diverse populations in Saudi Arabia using a quantitative online questionnaire targeting adults. Anas reported generally adequate awareness that antibiotic resistance can affect anyone and identified antibiotic overuse as a key contributing factor; however, limited understanding of health consequences and preventive measures was observed. Despite acknowledging the importance of completing treatment, some respondents discontinued antibiotics once symptoms improved, and inappropriate practices such as non-prescription use were noted, alongside reliance on physicians and consultation of reliable information sources.

A study by Thuy Mason et al. (2018) revealed a clear disparity in awareness levels between residents of affluent and disadvantaged areas .It became clear that residents of affluent neighborhoods possessed a higher level of knowledge and awareness than those in impoverished neighborhoods regarding the responsible use of antibiotics, as well as an understanding of the diminishing effectiveness of antibiotics in treating fungal and viral infections. In contrast, residents of impoverished neighborhoods exhibited less knowledge, weaker understanding, and a lower level of awareness. In terms of meaning Antibiotic resistance and the difficulties arising from misuse. Mason also indicated that the awareness and science movement has a small impact on the development of the scope of knowledge, perseverance and adherence to the prescribed medication, while it was proven that the self-dialogues presented by pharmacists were more influential, even though pharmacists were aware of the need for awareness campaigns. However, their contribution to these campaigns was very small, and on a behavioral level, the results showed that some patients insisted on acquiring antibiotics despite the absence of clinical signs or serious medical indications, in addition to the fact that some contributors reported using antibiotics.

A before-and-after study was conducted by (Orok, 2025) with non-matched groups of healthcare students. The study consisted of a 20-minute PowerPoint presentation followed by Q&A sessions, focusing on understanding the prevalence, impact, and prevention of AR. A pre- and post-test questionnaire was administered, and the results indicated that the number of respondents in the pre- and post-intervention were 185 and 157 students with average ages of 17.7 years and 17.8 years respectively. Post-intervention, there was a significant increase in students' AR knowledge, with correct responses regarding spread and impact of AR increased. The proportion of students demonstrating good overall knowledge also increased. Misconceptions, such as misunderstanding that antibiotic resistance does not result from the body becoming resistant to antibiotics, persisted but not statistically significant. Pre-intervention also revealed varied antibiotic use patterns, including the inappropriate use of antibiotics for malaria and common cold. Orok suggests that there are guidelines and instructions that can effectively improve healthcare students' knowledge of antibiotic resistance.

Another study by Valery M. Lekhan et al. (2025) examined the level of knowledge and awareness among primary healthcare physicians regarding challenges associated with antibiotic use and antibiotic resistance. Using a structured survey

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administered to physicians, the study highlighted widespread encounters with antibiotic resistance in clinical practice, largely attributed to non-prescription use, antibiotic overuse, and patient non-adherence to treatment plans. The findings further indicated inconsistent prescribing practices and frequent self-medication among patients, underscoring that antibiotic resistance requires a significant challenge within primary healthcare and emphasizing the need for improved prescribing management and enhanced professional and public awareness.

In order to identify gaps in current training plans, the knowledge, opinions, and actions of undergraduate medical students regarding antibiotic resistance (AR) are of paramount importance (Saksena et al, 2025) distributed a 20-point Likert scale questionnaire testing 3 parts: Knowledge, attitudes, and practices related to antibiotic dependency and resistance, where students enrolled in each academic year in the university medical program were asked to contribute to the study for a week. The levels of understanding, perspectives, and practices for each academic year were compared according to ordinal logistic regression decomposition and the Kruskal-Wallis (KW) test. And the results showed that the current approach lacks the inclusion of antibiotic resistance as a focus area to ensure good antibiotic imaging practices among future practitioners, because the development of knowledge has not been accompanied by the development of personal actions related to antibiotics.

Vonken et al. (2026) aimed to compare the effects of reading a pre-constructed narrative, writing a self-constructed narrative, and reading non-narrative factual information on medical students perceived susceptibility to ABR at three spatial levels (self, own patients, and patients abroad). In a randomized controlled experimental design, 237 Dutch medical students were randomly allocated to one of three conditions, with perceived susceptibility recorded before and after the intervention, and imaginability investigated as a potential mediator. Contrary to predictions, the findings revealed that neither reading nor producing narratives was more successful than non-narrative information in improving perceived susceptibility to ABR over any distance level. Writing a tale was likewise not preferable to reading one. Mediation analyses found that imaginability only mediated the connection between narrative type and perceived susceptibility for the distance level "your patients," and pre-constructed tales elicited higher imaginability than self-constructed ones.

2.1 RESEARCH OBJECTIVES

This study aimed at achieving the following specific objectives:

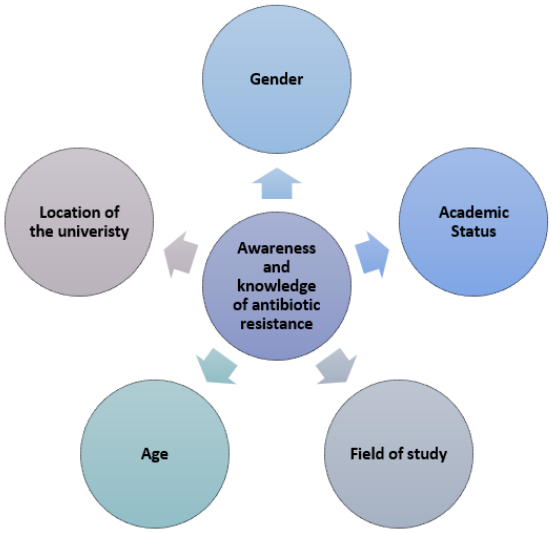
1) To identify the level of knowledge and awareness of antibiotic resistance among university students and academics in Syria.
2) To assess self-reported antibiotic use practices, such as commitment to prescribed courses and the usage of leftover antibiotics.
3) To explore perceptions and misconceptions related to antibiotic use, misuse, roles and responsibilities of individuals, healthcare professionals and governmental institutions in controlling antibiotic resistance and OTC availability of antibiotics in Syria.

2.2 RESEARCH QUESTIONS

This study aims to give answers to the following questions:

1) What is the level of knowledge and awareness of antibiotic resistance among university students and academics in Syria?
2) What are the antibiotic use practices reported by respondents, especially concerning prescription commitment and self-medication?
3) What are the common misconceptions and perceptions regarding antibiotic use and resistance exist in the Syrian academic context?
4) How do respondents perceive responsibility for controlling antibiotic resistance among individuals, healthcare professionals and governmental institutions?

Figure 1. Conceptual framework of the study



Five independent variables (age, gender, academic status, field of study, location of the university) were examined in this study to determine their possible impact on the awareness concerning antibiotics use and practices.

III. METHODOLOGY

This study will involve a quantitative research design with the intention of capturing data at one point in time from a diverse sample of Syrian higher education context.

SETTING AND POPULATION

The study is being undertaken in the context of Syrian higher education, targeting universities in several Syrian locations, such as Idlib, Aleppo, Damascus, Homs, Hama and Lattakia. The study's respondents include undergraduate students, postgraduate students (master's and PhD), and academic staff from variety of fields, including medical sciences, science and engineering, the arts and humanities, social sciences, law, economics, and business. This diverse academic population allows a full assessment of antibiotic resistance awareness across all educational levels and fields of study within the Syrian academic community. Respondents were recruited using a convenience sampling method through online platforms. Eligible respondents included university students and academic staff from selected Syrian higher-education institutions. Students were defined as individuals enrolled in undergraduate or postgraduate programs, while academics included teaching or research staff holding academic ranks such as lecturers and professors. The sample included 200 students and 10 academics. Most students were undergraduates from health-related fields, while academics primarily held lecturer or professor positions.

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3.2 DATA COLLECTION METHODS

Through the questionnaires, the survey was administered in two languages, English and Arabic, using identical questions in each version. The questionnaire consisted of four main domains: knowledge of antibiotics, awareness of antibiotic resistance, attitudes toward antibiotic use, and self- reported practices. The questionnaire was designed according to academic criteria and reviewed by an expert. A quantitative research design method will assist the researchers in determining the respondents' perspectives regarding the antibiotic resistance phenomenon. The questionnaire was comprised of two sections. The first section included demographic information of respondents, which included age, gender, location of university, and academic level. The second section included a 10-item questionnaire that represented the respondents' answers to their knowledge and awareness of the antibiotic resistance. The first 5 items were rated on a 5-point Likert scale, ranging from IV. strongly disagree to strongly agree on matters pertaining to knowledge and perceptions, the other 5 items evaluating the awareness and practices pertaining to antibiotic usage. The questionnaire is adapted in this study since it will be employed in the context of Syrian higher education staff. Data collection will primarily be based on a structured questionnaire. The contents of the questionnaire will be broadly divided into three sections:

A. Demographic Information: Demographics data will be collected about respondents' age, gender, current academic status, location of university, and field of study.
B. Awareness and perceptions: This 5-item Likert scale ranges from strongly disagree to strongly agree on matters pertaining to practices and awareness toward antibiotics usage and antibiotic resistance.
C. Knowledge and practices: Identifying knowledge of the antibiotic resistance phenomenon and usual practices concerning antibiotics.

3.3 DATA ANALYSIS

The data were collected using the designed Google format questionnaire that exported to Microsoft Excel and analyzed using descriptive statistical methods. The survey consisted of 15 items, the first five are demographic questions, and there were five Likert-scale expressions evaluating levels of awareness and practices concerning antibiotic resistance, and five multiple-choice questions assessing real knowledge. Frequencies, percentages, and graphical representations in the form of clustered column charts were used to resume and visualize the answers. Demographic variables were analyzed to describe the characteristics of the study sample, which consisted of university students and academics from diverse academic backgrounds. Responses to the Likert-scale items were examined to evaluate respondents' perceptions and self-reported awareness of antibiotic resistance, permitting for the identification of general practices and levels of agreement or disagreement. The multiple-choice items were analyzed to assess the respondents' general knowledge regarding antibiotic resistance, including appropriate antibiotic use and potential consequences of misuse. Tables and charts improved the clarity of data presentation and made it simpler to compare responses across response categories. Overall, this descriptive analysis gave a general picture of the degree of antibiotic resistance awareness and knowledge among the Syrian students polled. It also served as a basis for analyzing trends and gaps that could guide future public health and education initiatives.

3.4 ETHICAL CONSIDERATIONS

This study corresponds to the core ethical guidelines that govern research involving human respondents. Responding to this survey is fully optional, respondents implicitly give their informed consent. Responses are anonymous and confidential because no personally identifiable information is gathered. Respondents can withdraw at any time without repercussion. Personal identifiers were removed at source, data were stored on encrypted servers accessible only to the research team, and results are reported in aggregate to protect participant confidentiality. The collected data is used only for academic and research reasons, and it is kept safe to avoid unwanted access.

V. FINDINGS

This section presents the comprehensive findings of the study on the awareness of antibiotic resistance among Syrian university students and academics. The results are organized to address each of the research questions, incorporating all available data from the survey of 210 respondents.

Findings of Research Question One (Demographic Information) The study included 210 respondents with the following gender distribution:

Table 1. Percentage of respondents according to gender

	Frequency	**Percent**
Female	154	73.33%
Male	56	26.667%
Total	210	100%

The number of female students outnumbered the number of male students, where 154 female students accounted for 73.33% and 56 male students accounted for 26.667%. The statistics of gender indicate that female students made up an obvious majority of the sample population, with more than three times as many male respondents. Thus, the total number of respondents who took part in this study was 210 Syrian university students and academics who answered the questionnaire.

Table 2. Percentage of respondents according to age

	Frequency	**Percent**
18-22	152	72.38%
23-27	20	9.52%
28-32	11	5.24%
33-37	15	7.14%
Above 37	12	5.71%
Total	210	100%

The age of the students fell within five groups, with the largest group being in the 18- 22 years age bracket, constituting 152 students or 72.38%, followed by the age group of 23-27 years, which made up 20 respondents or 9.52%. Next came the age

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bracket of 28- 32 years, which was composed of 11 respondents or 5.24%, also, the fourth group in this category was for those who were between 33-37 years old which consisted of 15 respondents or 7.14% and finally, the last group in this category, which summed to 12 respondents or 5.71%. Most of the respondents were less than 22 years old. The category consisted of 72.38 % of the total sample of 210 Syrian university students and academics.

	Frequency	Percent
Undergraduate Students	190	90.476%
Postgraduate Students	10	4.761%
Academic Staff	10	4.761%
Total	210	100%

Table 3. Percentage of respondents according to academic status

The highest number was by the undergraduate students with 190 respondents, representing 90.476%, followed by the postgraduate students and the academic staff constituting of 10 respondents each or 4.76% each. Altogether, the total strength of respondents consisted of 210 Syrian university students and academics.

Table 4. University location distribution percentage

	Frequency	Percent
Idlib	130	61.904%
Aleppo	55	26.190%
Damascus	6	2.857%
Lattakia	9	4.285%
Hama	5	2.38%
Homs	5	2.38%

The distribution of survey respondents across different locations reveals a clear regional pattern. The majority of respondents were from Idlib, accounting for 130 respondents, representing 61.904% of the total sample. Aleppo followed with 55 respondents, comprising 26.19% of the respondents. The remaining respondents were from smaller proportions: Lattakia with 9 respondents or 4.285%, Damascus with 6 respondents or 2.857 % and an additional 5 respondents or 2.38% from Hama, and Homs also with 5 respondents or 2.38%. These figures indicate that the survey sample was heavily concentrated on Idlib and Aleppo, while other locations were minimally represented.

Table 5. Distribution of Respondents by field of study

	Frequency	Percent
Humanities & Arts	54	25.71%
Science/Engineering	65	30.95%
Medical Sciences	80	38.09%
Law/Business	11	5.23%

The largest proportion of respondents are enrolled in medical sciences, accounting for 38.09% or 80 respondents of the total sample. This is followed by engineering and sciences, which represent 30.95% or 65 respondents, indicating a strong presence of respondents from scientific and technical backgrounds. Humanities and arts constitute 25.71% or 54 respondents, reflecting a moderate representation compared to the scientific fields. In contrast, law and business are the least represented fields, with only 5.23% or 11 respondents.

RQ1: What is the level of knowledge and awareness of antibiotic resistance among university students and academics in Syria?

The findings revealed the following results concerning the knowledge of antibiotic resistance:

Table 6. respondents' knowledge and perceptions regarding antibiotic

	Response Option	Frequency	Percent
Antibiotic resistance is a major crisis in Syria	Strongly disagree/ Disagree	22	10.47%
	Neutral	62	29.52%
	Strongly agree/ Agree	126	60.00%
The availability of antibiotics without a prescription is a primary driver of resistance	Strongly disagree/ Disagree	61	29.05%
	Neutral	39	18.57%
	Strongly agree/ Agree	110	52.48%
My university curriculum provides adequate education on the risks of antibiotic misuse	Strongly disagree/ Disagree	71	33.81%
	Neutral	42	20.00%
	Strongly agree/ Agree	97	46.19%
I feel confident in my ability to distinguish between viral and bacterial infections	Strongly disagree/ Disagree	75	35.72%
	Neutral	51	24.29%
	Strongly agree/ Agree	84	40.00%
Which of the following describes antibiotic resistance correctly?		100	47.62%
		110	52.38%

The results indicate that the overall level of awareness of antibiotic resistance among Syrian university students and academics is high. A majority of respondents (60%) agreed that antibiotic resistance represents a major public health crisis in Syria. In terms of knowledge, 47.62% correctly identified antibiotic resistance as bacterial changes that render antibiotics effective. However, only 35.72% reported confidence in distinguishing between viral and bacterial infections, and 33.81 % felt that their university curriculum adequately addresses antibiotic misuse, suggesting gaps in formal education despite general awareness.

Figure 2. Antibiotic resistance is currently a major public health crisis in Syria

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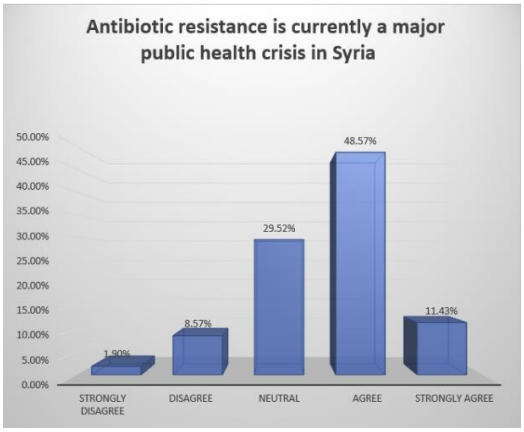
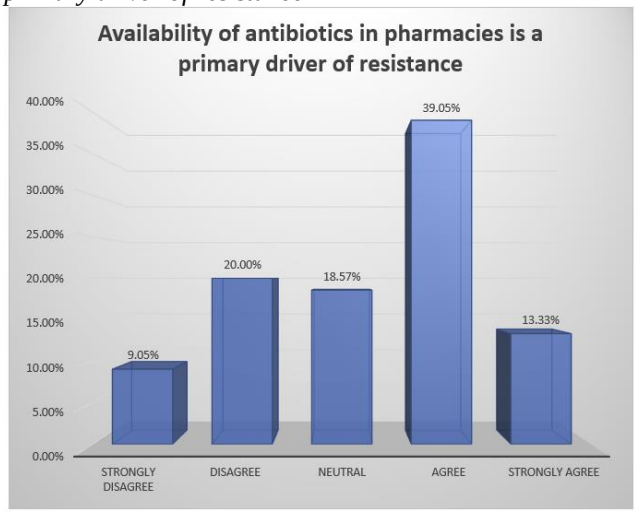


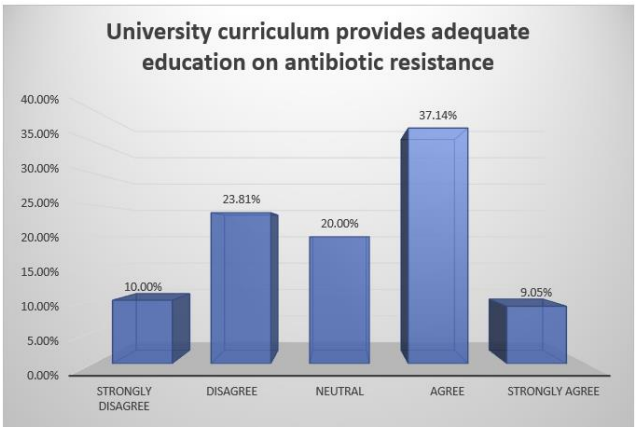
The chart indicates the public perception of antibiotic resistance in Syria, showing that most of the respondents 102 or 48.57% agree it is a major public health crisis, and 11.43% or 24 respondents selected "Strongly Agree." A substantial portion 29.52% or 62 respondents selected neutral, revealing either limited awareness or uncertainty about the issue's seriousness. Only 8.57% or 18 suggested disagreements, indicating minimum general term. These answers show a widespread concern and evaluate the temporary of antibiotic resistance-focused interventions, while the high neutrality rate highlights the need for targeted education to deepen Syrian public and social awareness and knowledge about the matter of antibiotic resistance.

Figure 3. Availability of antibiotics in pharmacies is a primary driver of resistance



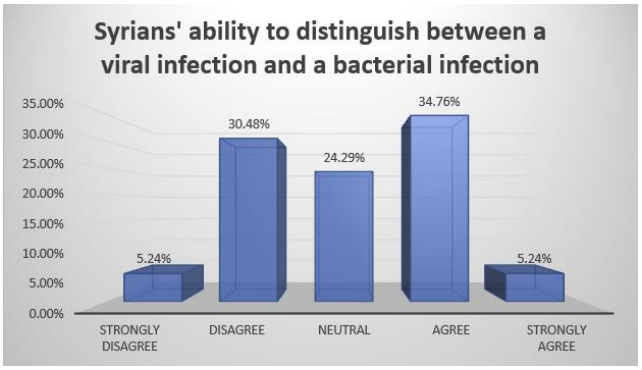
Almost 52.38% of the respondents stated that the availability of antibiotics without a prescription in Syrian Pharmacies is a primary driver of resistance with 39.05% or 82 respondents selected agree and 13.33% selected strongly agree. On the other hand, almost 39.05% stated disagreement, with 20% or 42 respondents selecting disagree and 9.05% or 19 respondents stated strong disagreement. And 18.57% or 39 respondents did not have clear idea about the effect of presence of antibiotics without a prescription being a primary driver of antibiotic resistance, selecting neutral. Indicating a considerable level of uncertainty or limited awareness regarding the mechanisms of resistance.

Figure 4. University curriculum provides adequate education on antibiotic resistance



The graph illustrates that almost 46.19% of the respondents took adequate education about antibiotic resistance in their universities, with 37.14% or 78 respondents stating agreement and 9.05% or 19 respondents stating strong agreement. While almost 33.81% or 71 respondents stated disagreement with 21 respondents or 10% stating strong disagreement and 50 respondents or 23,8% stating disagreement. The other respondents that are 42 student and academic member that are 20% of the sample selected "neutral". Overall, these results indicate that a good number of universities provide an adequate education concerning the antibiotic resistance.

Figure 5. Syrians' ability to distinguish between a viral infection and a bacterial infection



The graph shows respondents' opinions on the Syrian people's ability to differentiate between bacterial and viral infections using a five-point Likert scale. The results show that 34.76% or 73 respondents of respondents agree that the Syrian students and academics are capable of distinguishing between the two, while 5.24% or 11 respondents strongly agree, meaning that approximately 40% of this sample possesses a moderate level of health awareness. Conversely, 30.48% or 64 respondents of respondents disagree with this idea, and 5.24% or 11 respondents strongly disagree, resulting in a negative trend of 35.72%. This indicates a clear lack of doubt and awareness among many respondents regarding the Syrians' ability to differentiate between bacterial and viral infections. The remaining 24.29% or 51 respondents of respondents took a neutral stance, indicating a lack of experience and sufficient awareness on this topic. As we have seen, the results suggest that health awareness regarding the differentiation between viral and bacterial infections is limited.

Figure 6. Syrians' knowledge concerning antibiotic resistance

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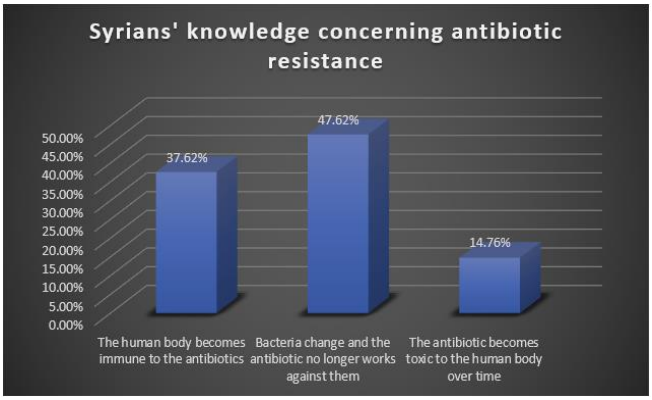


The graph shows that 100 respondents or 47.62%, accurately identified that antibiotic resistance is caused by bacterial changes that reduce the effectiveness of antibiotics, and that 79 respondents or 37.62%, indicated that the human body becomes immune to antibiotics, while only 31 respondents or 14.76% believed that antibiotics become toxic to the human body over time and these results show that despite the presence of knowledge and awareness about antibiotic resistance among the Syrian population, huge misunderstood concepts can still be found, showing the necessity to develop awareness and education concerning the right methods and mechanisms for addressing antibiotic resistance.

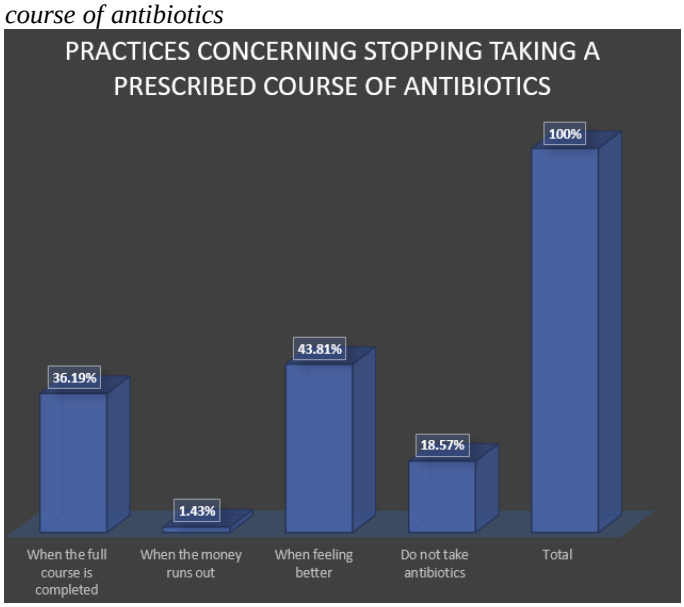
RQ 2: What are the antibiotic use practices reported by respondents, especially concerning prescription commitment and self- medication?

Table 7. patterns of Antibiotic use and information sources

	Response	Frequency	Percent
When do you stop taking antibiotics	Completed full course	76	36.19%
	Stopped before completing the course	134	63.81%
use of leftover antibiotics	Yes (Frequently/occasionally)	123	58.57%
	No	87	41.43%
source of antibiotic information	Medical source	126	60.00%
	Non-medical source	84	40.00%

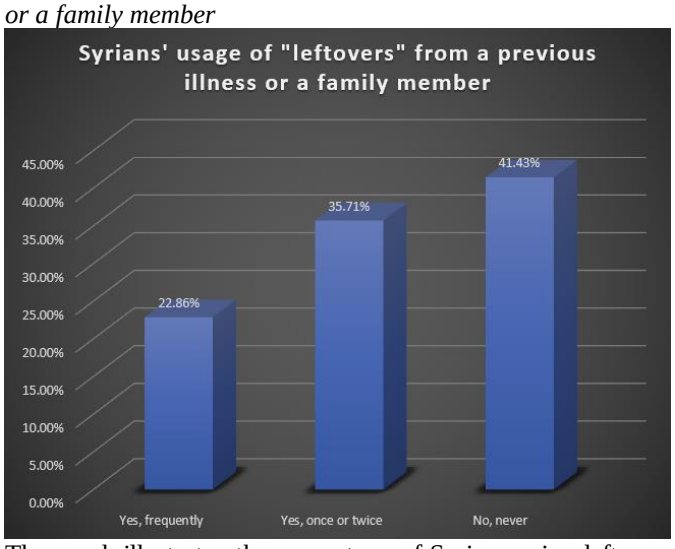
Concerning antibiotic use practices, the findings reveal notable patterns of misuse. While 36.19% of the respondents reported completing the full prescribed antibiotic course, a considerable proportion 63.81% or 134 respondents stated stopping treatment once symptoms improved. Additionally, 58.57% admitted using leftover antibiotics, reflecting a prevalence of self- medication practices. These behaviors highlight gaps between knowledge and actual antibiotic use practices among the academic population.

Figure 7. Practices concerning stopping taking a prescribed course of antibiotics



The chart indicates behaviors on the use of antibiotics. 43.81% or 92 respondents of the sample stop using antibiotics when they start to feel better, representing the highest percentage and corresponding to non-awareness about appropriate treatment. Whereas 36.19% or 76 respondents do use full course of antibiotics which is the recommended medical practice. In addition, 18.57% of respondents or 39 respondents do not take antibiotics and very few, 1.43% or 3 respondents, stop the treatment just because they have no money to buy further medication.

Figure 8. Syrians' usage of "leftovers" from a previous illness or a family member



The graph illustrates the percentage of Syrians using leftover medications from previous illnesses or from family members. The results indicate that 58.57% of respondents had used these medications before, 22.86% of them used them frequently, and 35.71% used them only once or twice. On the other hand, 41.43% of respondents never used them. These data reflect the widespread behavior of drug reuse, highlighting the need to focus on health awareness and implement safer pharmaceutical practices in Syrian society.

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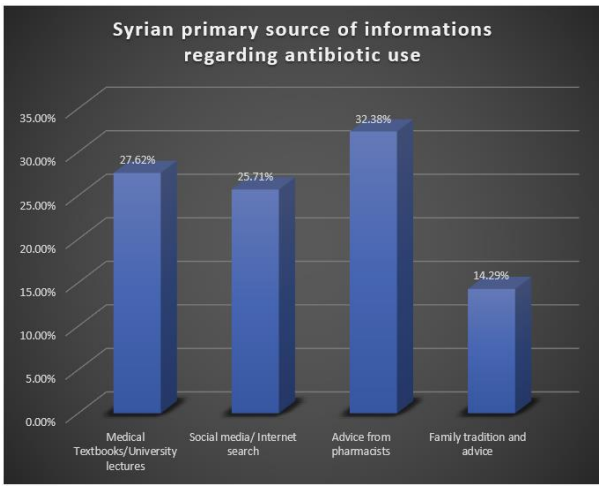
Figure 9. Syrian primary source of information regarding antibiotic use



The figure illustrates the sources of information related to antibiotic use in Syria, where informal advice provided the most widespread source at 32.38% or 68 respondents, followed by medical sources at 27.62% or 58 respondents, then social media at 25.71% or 54 respondents, while family traditions came in the lowest percentage at 14.29% or 30 respondents. These results indicate a clear reliance on informal sources compared to specialized medical sources, which may negatively affect the wise use of antibiotics and double the risk of antibiotic resistance progress. This highlights the need to encourage health awareness and promote reliance on approved medical sources.

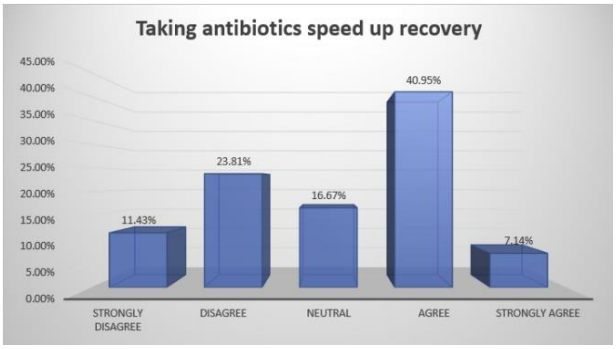
RQ3: What are the common misconceptions and perceptions regarding antibiotic use and resistance exist in the Syrian academic context?

Table 8. Attitudes and beliefs toward antibiotic use

	Agree	Neutral	Disagree
Taking antibiotics for cold or flu speeds recovery	101 (48.09%)	35 (16.67%)	74 (35.24%)
Confidence in distinguishing viral vs bacterial infections	84 (40%)	51 (24.29%)	75 (35.72%)

Several misconceptions regarding antibiotic use were identified. Notably, 48.09% of respondents believed that antibiotics could accelerate recovery from viral infections such as colds or flu. While 40% express confidence, the nearly equal proportion of disagreement and neutrality underscores a substantial educational gap. Academically, this points to the need of systematic health literacy programs to reduce antibiotic misuse and strengthen public understanding of infectious disease distinctions.

Figure 10. Taking antibiotics speed up recovery



The following graph shows the respondents' opinion of the statement "Using antibiotics speeds up recovery." A large percentage of respondents agreed with this statement, with 40.95% or 86 respondents agreeing and 7.14% or 15 respondents strongly agreeing. This indicates that many respondents believed antibiotics help speed up recovery. On the other hand, 23.81% or 50 respondents disagreed with this statement, and 11.43% or 24 respondents strongly disagreed, indicating some awareness among respondents regarding the effectiveness of antibiotics. The graph also shows that 16.67% or 35 respondents of respondents selected “neutral” in the responses, suggesting a lack of experience and knowledge on the subject. However, these results reflect the overall agreement that antibiotics speed up recovery, highlighting the need for increased knowledge and awareness about the proper use of antibiotics.

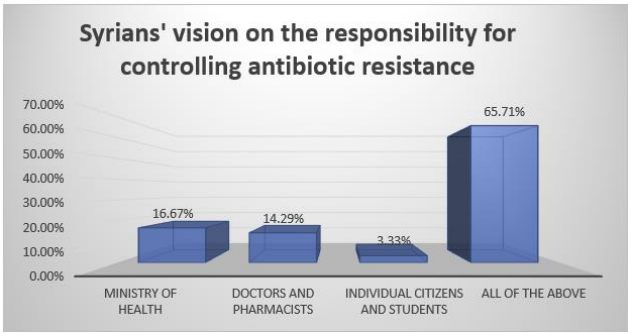
RQ 4: How do respondents perceive responsibility for controlling antibiotic resistance among individuals, healthcare professionals and governmental institutions?

Table 9. Perceptions of responsibility in antibiotic resistance prevention

Responsible entity	Frequency	Percent
Ministry of health	35	16.67%
Doctors and pharmacists	30	14.29%
Individuals	7	3.33%
All of the above	138	65.71%

When assessing perceptions of responsibility, most respondents (65.71%) or 138 respondents identified antibiotic resistance control as a shared responsibility among governmental institutions, healthcare professionals, and individuals. This reflects a comprehensive understanding of the multifactorial nature of antibiotic resistance and the need for coordinated interventions.

Figure 11. Syrians' vision on the responsibility for controlling antibiotic resistance



The figure illustrates Syrian perceptions regarding responsibility for combating antibiotic resistance. The majority of respondents fell into one of the aforementioned categories, representing approximately two-thirds of the respondents. This indicates a strong and widespread awareness that antibiotic resistance is a multifactorial problem requiring significant coordination and effort from the government and health centers. Conversely, a smaller but similar percentage of respondents placed individual and specific responsibility on doctors, pharmacists, and other medical professionals to establish sound laws and practices for prescribing and dispensing medications. An even smaller percentage assigned responsibility to citizens and students, demonstrating that while personal responsibility is acknowledged, it is

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insufficient in isolation. This distribution of responsibility was prevalent in Syria and relied on procedures and laws applicable to all entities, including institutions.

IV. DISCUSSION

This study reveals a clear deficiency in awareness and practices related to antibiotic use within the Syrian academic community, both in terms of adherence to treatment and understanding of resistance mechanisms. It also highlights the influence of non-medical sources in shaping health concepts and demonstrates that the misuse of antibiotics contributes to the exacerbation of health problems and the emergence of drug resistance. Significant differences are evident between the most and least aware groups in terms of knowledge and practices. Hence, the necessity of raising health awareness to reduce antibiotic resistance and promote its rational use. These results reflect the importance of research in addressing knowledge and behavioral gaps and strengthening educational and health initiatives to ensure the rational use of antibiotics in confronting the antibiotic resistance crisis. Previous studies indicate that the level of awareness regarding antibiotic use remains uneven across different groups. The results showed that healthcare workers and students in advanced stages of medical education possess higher awareness and more committed practices compared to the general public or those with less education. Previous studies also showed that the uncontrolled use of antibiotics, such as discontinuing treatment, contributes to the problem. Early or non-prescription use of antibiotics contributes to the exacerbation of bacterial resistance, underscoring that promoting health education is a fundamental step in reducing antibiotic resistance. Therefore, this research aims to bridge this knowledge and behavioral gap and provide a scientific framework that contributes to promoting the rational use of antibiotics and reducing the escalation of resistance. A survey conducted among Syrian university students and academics revealed a significant gap between academic knowledge and practices regarding antibiotic resistance. Despite their academic understanding, only 47.6% correctly identified bacterial mutation as the mechanism of resistance. Many believed that the human body develops immunity to antibiotics, and approximately 40.1% of respondents thought that antibiotics accelerate recovery from viral infections. This misconception was prevalent among the population, leading to the widespread practice of discontinuing antibiotic use once symptoms improved. This latter view was held by approximately 63.8% of respondents. Furthermore, 46% felt that antibiotic resistance was adequately covered in university curricula. While antibiotic resistance is a shared concern among the government, healthcare professionals, and the general public, this lack of awareness suggests a critical deficiency in understanding its nature. These results indicate that Syrian university students and academics possess a high level of awareness regarding antibiotic resistance. It has social influence, but on the other hand, it lacks the competence and knowledge necessary for the proper use of antibiotics. However, comparative pharmacovigilance evidence showed similar patterns in Saudi Arabia. (Lalithabai et al, 2022) found that 29% of nurses had accurate knowledge about antibiotic resistance, despite a high level of awareness about the importance of proper antibiotic use and infection control. (Alhur et al, 2024) indicated that the Saudi population had a high level of self-reported awareness, but their understanding of the public health implications remained limited. Antibiotic use for viral infections was also common in deprived areas of London (Mason et al, 2018). This is broadly similar to the findings in Syria. In various contexts, misuse and inappropriate practices such as premature discontinuation of treatment, holding onto unused medication, and self-medication persisted, despite varying levels of awareness. Also, studies conducted on healthcare workers and intervention-based research have confirmed that knowledge and understanding alone are insufficient to eliminate the misuse of antibiotics. In contrast, structured educational interventions in Nigeria (Orok et al, 2025) and Egypt (Abdullah et al, 2025) have led to clear and significant improvements in knowledge and practices, demonstrating the potential for correcting misconceptions through interactive learning. The findings of this survey, conducted on Syrian university students and academics, generally align with global evidence showing that general education and awareness are insufficient to change behavior. Social norms, weak oversight, and easy access to antibiotics significantly contribute to their misuse. Therefore, effective control measures are urgently needed to address antibiotic resistance. This includes reforming curricula and the consultations provided by pharmacists, as well as developing and expanding the healthcare system. It is becoming increasingly clear that awareness alone is inadequate to ensure the proper and rational use of antibiotics.

V. CONCLUSIONS

The results of this study reveal a clear difference in awareness and knowledge about antibiotic resistance among university students and academics in Syria. The data showed that a large percentage of respondents stopped taking antibiotics when they felt better, and that more than half used leftover medications from previous illnesses or from family members, indicating widespread misuse of antibiotics. The results also revealed the prevalence of inaccurate concepts about antibiotic resistance, with some believing that the body becomes immune to the antibiotic, while others correctly understood that bacteria mutate and become resistant. Conversely, the study revealed that the availability of antibiotics in pharmacies without a prescription is seen by the majority of respondents as a major factor in exacerbating resistance. Additionally, a large percentage of respondents lacked a clear opinion or sufficient knowledge, indicating the need to strengthen health education. The results also showed that a percentage of respondents believe that university curriculum provides an adequate amount of knowledge about antibiotic resistance, although a significant portion expressed neutrality or dissatisfaction. The scientific value of this study lies in highlighting the knowledge and behavioral gaps related to antibiotic use within the Syrian academic community and providing a knowledge base upon which targeted educational and awareness strategies can be developed.

VI. LIMITATIONS AND SUGGESTIONS

This study has various limitations that must be addressed when evaluating the results. The sample included 210 respondents, with a significant gender imbalance, with females making up the majority of respondents (154 female respondents) compared to males (56 male respondents), which may restrict the results' generalizability across genders. Although respondents were recruited from various locations of Syria, the geographic distribution was uneven, with the majority of replies coming

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from Idlib (61.9%) and Aleppo (26.19%), while other regions were under-represented. The majority of respondents (n = 152) were between the ages of 18 and 22. Older age groups were under-represented, which may have influenced the overall level of knowledge and awareness seen. Furthermore, the sample was primarily made up of undergraduate students (nearly 90%), with very little participation from postgraduate students and academics (each accounting for roughly 4.76%). This disparity limits the capacity to make robust comparisons between academic levels and the extent to which the findings can be applied to Syria's larger higher-education population. The study was primarily descriptive in nature; therefore, inferential comparisons between groups were beyond its intended scope. The study was limited to responses from academics in northern Syria, as responses in other regions were few and incomplete. Furthermore, the number of male respondents was small compared to the number of female respondents. Based on these findings, it becomes necessary to conduct future qualitative and comparative research that includes broader societal segments and examines the effectiveness of educational content and awareness interventions in reducing inappropriate behaviors associated with antibiotic use, in addition to studying the efficiency of health policies and drug control tools in reducing resistance rates

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This paper does not involve human participants.

Originality Note

The authors confirm that the manuscript is their original work, and if others' works are used, they are properly cited/quoted.

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