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Digital Health Literacy and Antibiotic Self-Medication among Faculty of Nursing Students in Surman, Libya

Rabyah B. Ali [1, *], Rabyah@sabu.edu.ly, Mustafa A. Ben Hkoma[2], m_hkoma2017@yahoo.com ,
[1] Nursing Department, Faculty of Nursing Surman, Sabratha University, Sabratha, Libya.
[2] Sustainable Development Researches Centre

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Abstract

Background: Antibiotic resistance (AR) is a pressing global public health crisis driven by systemic misuse and self-medication (SM). In the digital era, nursing students increasingly rely on online health information, highlighting "Digital Health Literacy" (DHL) as a critical determinant of pharmaceutical behavior. **Objective:** This study aimed to assess the level of Digital Health Literacy and its relationship with antibiotic self-medication and misuse among nursing students at the Faculty of Nursing in Surman, Libya. **Methodology:** A descriptive-analytical cross-sectional design was utilized. Data were collected via an electronic survey distributed to a convenience sample of 60 nursing students at the Faculty of Nursing in Surman. The study utilized a 5-item DHLS (5-point Likert scale) and a 4-item WHO scale (3-point Likert scale). **Results:** The findings indicated an acceptable level of awareness regarding AR, and 71.66% of students expressed a strong sense of professional responsibility toward patient education. However, a significant training gap was identified; participation in specialized workshops recorded the lowest mean (1.27 on a 3-point Likert scale). Descriptively, age and gender showed variations in medication behaviors, which serve as baseline factors for future predictive modeling. **Conclusion:** The study concludes that integrating Antimicrobial Stewardship and health informatics into the Libyan nursing curriculum is an essential requirement to bridge the gap between digital skills and safe clinical practice

الثقافة الصحية الرقمية والتداوي الذاتي بالمضادات الحيوية لدى طلبة كلية التمريض في صرمان، ليبيا

ربيعة بلقاسم علي [1،*]، مصطفى أحمد بن حكومة [2]
[1]قسم التمريض العام، كلية التمريض صرمان، جامعة صبراتة، صبراتة، ليبيا، Rabyah@sabu.edu.ly
[2]مركز أبحاث التنمية المستدامة، m_hkoma2017@yahoo.com

الكلمات المفتاحية
الثقافة الصحية الرقمية، التداوي الذاتي، مقاومة المضادات الحيوية، طلبة كلية التمريض، صرمان، ليبيا، الدراسة المقطعية.

الملخص

خلفية الدراسة: تعد مقاومة المضادات الحيوية أزمة عالمية ملحة في مجال الصحة العامة، تنجم عن سوء استخدام المضادات الحيوية وممارسات التداوي الذاتي بصورة واسعة. وفي العصر الرقمي يعتمد طلبة التمريض بشكل متزايد على مصادر المعلومات الصحية المتاحة عبر الإنترنت، مما يجعل الثقافة الصحية الرقمية عاملا حاسمًا في توجيه السلوكيات الدوائية. الهدف: هدفت هذه الدراسة إلى تقييم مستوى الثقافة الصحية الرقمية وعلاقتها بالتداوي الذاتي بالمضادات الحيوية وسوء استخدامها لدى كلية التمريض في صرمان، ليبيا. المنهجية: استخدم المنهج الوصفي التحليلي ذو التصميم المقطعي وجمعت البيانات من خلال استبيان إلكتروني وزع على عينة قصدية مكونة من 60 طالب وطالبة من كلية التمريض في صرمان. اعتمدت الدراسة على مقياس الثقافة الصحية الرقمية المكون من خمسة بنود باستخدام مقياس ليكرت الخماسي، بالإضافة إلى مقياس منظمة الصحة العالمية المكون من أربعة بنود باستخدام مقياس ليكرت الثلاثي. النتائج: أظهرت النتائج وجود مستوى مقبول من الوعي بمقاومة المضادات الحيوية، كما عبر 71.66 % من الطلبة عن شعور قوي بالمسؤولية المهنية تجاه تثقيف المرضى. ومع ذلك، كشفت النتائج وجود فجوة تدريبية واضحة، إذ سجلت المشاركة في ورش العمل المتخصصة أدنى متوسط حسابي (1.27) على مقياس ليكرت الثلاثي. كما أظهرت النتائج الوصفية وجود اختلافات مرتبطة بالعمر والجنس في السلوكيات المتعلقة باستخدام الأدوية، وهو ما يمكن أن يشكل أساسًا للدراسات المستقبلية التي تعتمد على النماذج التنبوئية. الخلاصة: خلصت الدراسة إلى أن برامج ترشيد استخدام المضادات الحيوية والمعلوماتية الصحية في مناهج التمريض الليبية يعد متطلبًا أساسيًا لسد الفجوة بين المهارات الرقمية والممارسة السريرية الآمنة.

1- INTRODUCTION

Antibiotic resistance (AR) is widely recognized as one of the most serious public health challenges worldwide. It occurs when microorganisms develop the ability to survive exposure to antimicrobial agents that were previously effective against them (FDA, 2023; WHO, 2020). According to the World Health Organization, antimicrobial resistance contributes substantially to global morbidity and mortality, emphasizing the urgent need for effective

interventions aimed at promoting the rational use of antibiotics.

Nurses play a central role in healthcare systems through their responsibilities in medication administration, patient education, and the promotion of evidence-based practices (WHO, 2019). Consequently, nursing students represent an important target population because their future professional practices may directly influence the effectiveness of antimicrobial stewardship programs (Dagameen, 2025; Rana et al., 2024).

The rapid expansion of digital technologies has fundamentally transformed the way health information is accessed and utilized. Digital health literacy (DHL) refers to an individual's ability to obtain, understand, evaluate, and apply health information from digital sources in order to make appropriate health decisions (Kühn et al., 2022; Jianvitayakij et al., 2024). Adequate levels of DHL are essential for healthcare professionals, particularly in environments characterized by the increasing use of telehealth services and artificial intelligence applications.

Self-medication is one of the most important consequences of inadequate health literacy. This practice involves the use of medications without appropriate professional consultation and has become increasingly common among university students (Elmahi et al., 2020). Previous studies have shown that self-medication is frequently associated with overconfidence in personal knowledge and the widespread availability of pharmaceutical products (Shitindi et al., 2024).

Recent advances in artificial intelligence have introduced new opportunities and challenges in healthcare education. Artificial intelligence applications, including ChatGPT, are increasingly used to obtain health-related information and support self-assessment practices. Nevertheless, excessive dependence on such technologies may expose individuals to misinformation and inappropriate treatment decisions (Mahdi et al., 2026).

Previous studies have demonstrated that, despite relatively high levels of digital competence, misconceptions regarding the appropriate use of antibiotics remain common among nursing students (Jianvitayakij et al., 2024). Similarly, demographic factors such as age, gender, and academic level have been associated with differences in medication-related behaviors (Elmahi et al., 2020).

In Libya, the ongoing expansion of digital healthcare services has increased the need to improve the digital competencies of future healthcare professionals. However, evidence regarding the relationship between digital health literacy and antibiotic self-medication among Libyan nursing students remains limited. Therefore, this study was conducted to examine this relationship among students at the Faculty of Nursing in Surman and to provide evidence that may support the development of future educational interventions and public health strategies

2- RESEARCH PROBLEM

Antibiotic resistance has become a major public health concern in Libya owing to the widespread practice of self-medication and the inappropriate use of antibiotics without medical supervision (Jianvitayakij et al., 2024). Although nursing students represent future healthcare professionals and play an essential role in promoting patient safety, previous studies have demonstrated the existence of important gaps in knowledge regarding antimicrobial resistance and the rational use of antibiotics (Shitindi et al., 2024; Dagameen, 2025).

Furthermore, the increasing reliance on digital platforms and artificial intelligence applications for obtaining health information may influence medication-related behaviors, particularly in the absence of adequate critical appraisal skills (Mahdi et al., 2026). Despite the growing importance of digital health literacy, limited evidence is available regarding its relationship with antibiotic self-medication among nursing students in Libya. Therefore, this study seeks to address this research gap and provide evidence that may contribute to the development of educational interventions aimed at promoting the rational use of antibiotics.

3- RESEARCH OBJECTIVES

1. To assess the level of digital health literacy among students at the Faculty of Nursing in Surman.
2. To determine the prevalence of antibiotic self-medication practices among the participants.
3. To examine the relationship between digital health literacy and the frequency of antibiotic self-medication practices.
4. To explore the influence of selected sociodemographic and academic characteristics on participants' medication-related behaviors.

4- RESEARCH QUESTIONS

1. What is the current level of digital health literacy among nursing students at the Faculty of Nursing in Surman?
2. What is the prevalence of antibiotic self-medication practices among the participants?
3. Is there a relationship between digital health literacy and antibiotic self-medication practices?
4. How do selected sociodemographic and academic factors influence medication-related behaviors among nursing students?

5- RESEARCH HYPOTHESES

1- Hypothesis 1: There is an association between digital health literacy and antibiotic self-medication practices among nursing students.
2- Hypothesis 2: Selected demographic and academic characteristics are associated with variations in medication-related behaviors among nursing students.

6- Literature Review: Previous Studies

The existing literature demonstrates a close relationship between digital health literacy, self-medication practices, and antibiotic resistance among university students worldwide. Kühn et al. (2022) reported that university students generally exhibit lower levels of health literacy than expected. The study further indicated that health literacy is influenced by several demographic and educational factors, including age, gender, academic level, and educational background. These findings suggest that enrollment in health-related programs does not necessarily ensure adequate health literacy skills.

Alharbi et al. (2026) investigated digital health literacy among Saudi nursing students and found that a considerable proportion of participants demonstrated satisfactory levels of digital competence. The study emphasized the importance of integrating digital health technologies into nursing education and highlighted the need for improving students' ability to evaluate the credibility of digital information sources.

Similarly, Jianvitayakij et al. (2024) examined antibiotic-related knowledge among Thai nursing students and found that, despite relatively high levels of digital literacy, important misconceptions regarding the use of antibiotics persisted. A considerable proportion of participants incorrectly believed that antibiotics could be used to treat viral infections such as influenza and the common cold.

The increasing use of digital platforms and artificial intelligence applications has also attracted significant attention. Mahdi et al. (2026) reported that many university students relied on online resources for symptom assessment and treatment-related decisions. Likewise, Shitindi et al. (2024) demonstrated that self-medication practices were highly prevalent among university students, particularly among those with limited access to healthcare services.

Social and economic factors have also been identified as important determinants of medication-related behaviors. Elmahi et al. (2020) found that limited access to health insurance increased the likelihood of self-medication practices, whereas Dagameen (2025) emphasized the need for educational interventions aimed at improving awareness of antimicrobial resistance among healthcare professionals.

Finally, Rana et al. (2024) reported that substantial gaps continue to exist between theoretical knowledge and practical behavior regarding antimicrobial stewardship. Their findings emphasized the importance of strengthening educational strategies aimed at improving awareness and encouraging the rational use of antibiotics.

Overall, the available evidence demonstrates the importance of examining the relationship between digital health literacy and antibiotic self-medication among nursing students. Nevertheless, limited evidence is available within the Libyan context, highlighting the need for further investigation in this area.

7- The Distinction between Previous Studies and the Current Study

Table1. The Distinction between Previous Studies and the Current Study

No	Aspect	Previous Studies	Current Study
1	Study setting	Thailand, Saudi Arabia, Tanzania, Sudan, and India	Surman, Libya
2	Population	Mixed healthcare disciplines	Nursing students only
3	Main focus	Digital literacy, antimicrobial resistance, or self-medication	Relationship among all variables
4	AI applications	Limited investigation	Focus on AI-assisted health information seeking
5	Practical implications	General recommendations	Recommendations for nursing education in Libya

8- METHODOLOGY

1- Study Design: A descriptive cross-sectional study design was employed to investigate the relationship between digital health literacy, antibiotic self-medication, and awareness of antimicrobial resistance among nursing students at a single point in time (Alharbi et al., 2026; Jianvitayakij et al., 2024).
2- Population and Sample: The study targeted a convenience sample of 60 undergraduate nursing students enrolled at the Faculty of Nursing in Surman, Libya. Participants were recruited voluntarily through an electronic survey distributed during the study period.
3- Instruments: Data were collected using an electronic questionnaire consisting of three sections*:*

- Sociodemographic characteristics (age, gender, academic year, previous training, and sources of health information).
- The Digital Health Literacy Scale (DHLS), which evaluated participants' ability to obtain, understand, evaluate, and apply health information from digital sources.
- The World Health Organization Antibiotic Resistance Awareness Scale, which assessed participants' knowledge, attitudes, and practices related to antibiotic use and antimicrobial resistance.

Each scale was scored using a Likert response format. Internal consistency was evaluated using Cronbach's alpha coefficients.

4- Statistical Analysis: The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 28. Descriptive statistical methods, including frequencies, percentages, means, and standard deviations, were employed to summarize the collected data and describe the characteristics of the study participants.

9- Results

1. Demographic and Professional Data

Table 2. Demographic Characteristics of the Participants (n = 60)

No.	Variable	Category	Frequency	Percentage
1	Gender	Male	27	45.00%
		Female	33	55.00%
2	Age	Less than 20 years	10	16.67%
		20–25 years	45	75.00%
		More than 25 years	5	8.33%
3	Academic Year	First Year	19	31.67%
		Second Year	16	26.67%
		Third Year	12	20.00%
		Fourth Year	13	21.66%
4	Have you taken a course in nursing informatics or digital health?	Yes	32	53.33%
		No	28	46.67%
5	Have you ever read articles or guidelines about antibiotic resistance?	Yes	41	68.33%
		No	19	31.67%
6	Have you previously attended any workshops or training sessions on the appropriate use of antibiotics?	Yes	16	26.67%
		No	44	73.33%

The findings revealed that female participants represented a slightly higher proportion of the study sample (55%) than male participants (45%). This distribution reflects the common gender pattern observed in nursing colleges, where female students frequently constitute the majority of the student population.

Regarding age distribution, most participants (75%) were between 20 and 25 years of age, whereas 16.67% were younger than 20 years and 8.33% were older than 25 years. These findings indicate that the majority of participants belonged to a young age group that is generally more familiar with digital technologies and online health resources.

With respect to academic level, first-year students constituted the largest proportion of the sample (31.67%), followed by second-year students (26.67%), fourth-year students (21.66%), and third-year students (20%). This distribution ensured adequate representation of students from different academic levels.

The results also demonstrated that 53.33% of the participants had previously completed courses related to nursing informatics or digital health. Furthermore, 68.33% reported having read articles or guidelines concerning antibiotic resistance. However, a considerable proportion of participants (73.33%) indicated that they had never attended workshops or training sessions concerning the appropriate use of antibiotics.

These findings highlight the importance of strengthening educational initiatives related to digital health literacy, antimicrobial stewardship, and the rational use of antibiotics among nursing students.

2. Digital Health Literacy Skills

Table 3. Distribution of Participants' Responses Regarding Digital Health Literacy Skills

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
		Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)	Freq. (%)
1	I can independently use digital applications and platforms to search for medical information.	0 (0%)	4 (6.67%)	15 (25.00%)	36 (60.00%)	5 (8.33%)
2	I can troubleshoot simple technical issues encountered during digital searches for treatment-related information.	0 (0%)	8 (13.33%)	21 (35.00%)	29 (48.33%)	2 (3.33%)
3	I can distinguish between trustworthy and untrustworthy online sources of information.	2 (3.33%)	12 (20.00%)	19 (31.66%)	26 (43.33%)	1 (1.66%)
4	I use artificial intelligence tools (such as ChatGPT) to understand my health symptoms and identify appropriate medications.	2 (3.33%)	13 (21.66%)	13 (21.66%)	28 (46.66%)	4 (6.66%)
5	I trust the accuracy of the health information I obtain from social media platforms.	5 (8.33%)	25 (41.66%)	21 (35.00%)	8 (13.33%)	1 (1.66%)

Table 3 presents the distribution of participants' responses regarding digital health literacy skills. The findings revealed that 68.33% of the participants agreed or strongly agreed that they could independently use digital applications and platforms to search for medical information. Similarly, 51.66% reported being able to solve simple technical problems encountered during digital searches.

Furthermore, 45% of the participants stated that they were able to distinguish between reliable and unreliable online sources of information, whereas 53.32% reported using artificial intelligence tools, such as ChatGPT, to

understand health symptoms and identify appropriate medications.

In contrast, only 15% of the participants expressed confidence in the accuracy of health information obtained from social media platforms, whereas 49.99% either disagreed or strongly disagreed with this statement. These findings indicate that participants demonstrated a relatively high level of awareness regarding the potential risks associated with unreliable online health information.

Table 4. Descriptive Analysis of Participants' Responses Regarding Digital Health Literacy Skills

No.	Item	Mean	SD	Rank
1	Independent use of digital applications and platforms	3.70	0.71	1
2	Ability to solve technical problems	3.42	0.76	2
3	Ability to distinguish trustworthy sources	3.20	0.89	4
4	Use of artificial intelligence tools	3.32	0.99	3
5	Trust in information obtained from social media platforms	2.58	0.88	5
Overall Mean		**3.24**	**0.85**	—

Table 4 presents the descriptive statistical analysis of participants' digital health literacy skills. The overall mean score was 3.24 ± 0.85, indicating a moderate-to-high level of digital health literacy among the participants.

The highest mean score (3.70 ± 0.71) was recorded for the participants' ability to use digital applications independently to search for medical information. The second-highest score (3.42 ± 0.76) was related to participants' ability to solve simple technical problems encountered during online searches.

The use of artificial intelligence applications, including ChatGPT, ranked third, with a mean score of 3.32 ± 0.99, whereas the ability to distinguish between reliable and unreliable sources ranked fourth, with a mean score of 3.20 ± 0.89. Trust in health information obtained from social media platforms ranked last, with a mean score of 2.58 ± 0.88.

Overall, these findings suggest that nursing students possessed satisfactory digital health literacy skills. Nevertheless, further educational interventions are required to strengthen critical appraisal skills and encourage the responsible use of digital health technologies.

3- SELF-MEDICATION PRACTICES AND ANTIBIOTIC MISUSE

Table 5. Participants' Self-Medication Practices and Antibiotic Misuse Patterns (n = 60)

No.	Question	Category	Frequency	Percentage
1	Have you taken an antibiotic without a prescription during the past six months?	Yes	20	33.33%
		No	40	66.67%
2	What symptoms prompted you to use antibiotics without medical supervision? *	Diarrhea	1	1.67%
		Sore throat	13	21.67%
		Common cold and influenza	18	30.00%
		Fever	10	16.67%
		Body aches	9	15.00%
		Other symptoms	9	15.00%
3	Where did you obtain the antibiotic without a prescription? *	Directly from a pharmacy	40	66.67%
		Leftover antibiotics at home	17	28.33%
		From a friend or relative	3	5.00%
4	What was the main reason for taking the medication without consulting a doctor? *	Previous academic knowledge	33	55.00%
		Lack of time	11	18.33%
		High cost of medical consultation	6	10.00%
		Reliance on online self-diagnosis	5	8.33%

*All participants (n = 60) responded to these questions.

Table 5 presents the participants' self-medication practices and patterns of antibiotic misuse. The findings revealed that 33.33% of the participants reported taking antibiotics without a prescription during the previous six months, whereas 66.67% reported not engaging in this behavior.

Regarding the symptoms that prompted antibiotic use without medical supervision, the common cold and influenza represented the most frequently reported conditions (30%), followed by sore throat (21.67%), fever (16.67%), body aches (15%), diarrhea (1.67%), and other symptoms (15%). These findings indicate that antibiotics were frequently used to treat conditions that may not require antimicrobial therapy.

With respect to the sources of antibiotics, most participants reported obtaining medications directly from pharmacies (66.67%), whereas others relied on leftover antibiotics available at home (28.33%) or medications obtained from friends or relatives (5%). This finding highlights the ease of access to antibiotics without professional supervision.

The findings also demonstrated that previous academic knowledge represented the most frequently reported reason for self-medication (55%), followed by lack of time (18.33%), the high cost of medical consultations (10%), and reliance on online self-diagnosis (8.33%). These findings suggest that personal beliefs regarding medical knowledge and unrestricted access to online information may contribute to inappropriate antibiotic use among nursing students.

4. KNOWLEDGE AND ATTITUDES TOWARD ANTIBIOTIC RESISTANCE

4.1 KNOWLEDGE

Table 6. Participants' Knowledge Regarding Antibiotic Resistance

No.	Item	Category	Frequency	Percentage

1	Antibiotics are effective against viral infections.	Yes	30	50.00%
		No	21	35.00%
		Do not know	9	15.00%
2	It is acceptable to stop taking antibiotics once symptoms improve.	Yes	24	40.00%
		No	28	46.67%
		Do not know	5	8.33%
3	Antibiotic resistance means that the body becomes resistant to the medication.	Yes	35	58.33%
		No	12	20.00%
		Do not know	13	21.67%
4	The misuse of antibiotics increases the risks associated with future surgical procedures.	Yes	42	70.00%
		No	3	5.00%
		Do not know	14	23.33%

Table 6 presents the participants' level of knowledge regarding antibiotic resistance. The findings showed that 50% of the participants believed that antibiotics are effective against viral infections, whereas 35% correctly disagreed with this statement and 15% reported uncertainty.

Regarding the second statement, 46.67% of the participants disagreed with the idea that antibiotic treatment could be discontinued once symptoms improved, whereas 40% agreed with this statement. This finding suggests that a considerable proportion of participants lacked sufficient knowledge regarding the importance of completing the prescribed course of treatment.

Concerning the concept of antibiotic resistance, 58.33% of the participants incorrectly believed that antibiotic resistance occurs when the human body becomes resistant to medications rather than microorganisms. This result highlights the need for additional educational interventions aimed at improving understanding of antimicrobial resistance mechanisms.

Furthermore, 70% of the participants agreed that the misuse of antibiotics increases the risks associated with future surgical procedures, indicating an acceptable level of awareness regarding the consequences of inappropriate antibiotic use.

Overall, the findings indicate a moderate level of knowledge regarding antibiotic resistance, together with the presence of several misconceptions requiring further educational attention.

Table 7. Descriptive Analysis of Knowledge Regarding Antibiotic Resistance

No.	Item	Mean	SD	Rank
1	Antibiotics are effective against viral infections.	1.65	0.69	3
2	It is acceptable to stop taking antibiotics once symptoms improve.	1.60	0.64	4
3	Antibiotic resistance means that the body becomes resistant to the medication.	1.63	0.77	2
4	The misuse of antibiotics increases the risks associated with future surgical procedures.	1.86	0.55	1
Overall Mean		1.75	0.66	—

Table 7 presents the descriptive statistical analysis of participants' knowledge regarding antibiotic resistance. The overall mean score was 1.75 ± 0.66, indicating a moderate level of knowledge among the participants.

The statement concerning the relationship between antibiotic misuse and increased risks associated with future surgical procedures ranked first, with a mean score of 1.86 ± 0.55. The statement related to the definition of antibiotic resistance ranked second, with a mean score of 1.63 ± 0.77.

The statement claiming that antibiotics are effective against viral infections ranked third, with a mean score of 1.65 ± 0.69, whereas the statement concerning discontinuation of antibiotic treatment after symptom improvement ranked fourth, with a mean score of 1.60 ± 0.64.

Overall, these findings indicate that participants demonstrated an acceptable level of awareness regarding antibiotic resistance; however, additional educational interventions remain necessary to address persistent knowledge gaps.

4.2 Attitudes

Table 8. Participants' Attitudes Toward Antibiotic Resistance and Practices

No.	Item	Category	Frequency	Percentage
1	I believe that antimicrobial resistance represents a major public health challenge in Libya.	Never	3	5.00%
		Sometimes	40	66.67%
		Always	17	28.33%
2	As a future nurse, I believe I have a significant responsibility to educate patients about the risks associated with self-medication.	Never	1	1.67%
		Sometimes	16	26.67%
		Always	43	71.67%
3	I carefully read and understand the instructions provided with the medication before taking it.	Never	2	3.33%
		Sometimes	15	25.00%
		Always	43	71.67%

Table 8 presents the participants' attitudes toward antibiotic resistance and related practices. The findings revealed that 66.67% of the participants sometimes considered antimicrobial resistance to be a major public health challenge in Libya, whereas 28.33% always considered it an important issue.

Regarding the second statement, 71.67% of participants indicated that they always believed they had a responsibility to educate patients about the risks associated with self-medication. Likewise, 71.67% reported that they consistently read and understood medication instructions before use.

Overall, the results indicate that the participants demonstrated positive attitudes toward antibiotic resistance and showed a strong commitment to promoting the rational use of antibiotics and preventing inappropriate self-medication practices.

Table 9. Descriptive Analysis of Attitudes Toward Antibiotic Resistance and Practices

No.	Item	Mean	SD	Rank
1	Antimicrobial resistance as a public health challenge	2.23	0.54	3
2	Responsibility for patient education	2.70	0.50	1
3	Reading and understanding medication instructions	2.68	0.54	2
Overall Mean		**2.54**	**0.53**	—

Table 9 presents the descriptive statistical analysis of participants' attitudes toward antibiotic resistance and related practices. The overall mean score was 2.54 ± 0.53, indicating a relatively high level of positive attitudes among the participants.

The statement concerning professional responsibility for patient education ranked first (2.70 ± 0.50), followed by the statement related to reading and understanding medication instructions (2.68 ± 0.54). The statement addressing antimicrobial resistance as a major public health challenge ranked third (2.23 ± 0.54).

Overall, these findings indicate that the participants demonstrated favorable attitudes toward antibiotic stewardship and recognized the importance of responsible antibiotic use in clinical practice.

10- DISCUSSION

The findings of the present study indicate that nursing students at the Faculty of Nursing in Surman possess an acceptable level of awareness regarding antibiotic resistance (AR). Nevertheless, several knowledge gaps remain evident. Although most participants recognized AR as an important public health concern, the results revealed a substantial deficiency in formal training, as participation in workshops related to the appropriate use of antibiotics recorded the lowest mean score (1.27). This finding is consistent with the observations reported by Alharbi et al. (2026), who emphasized the importance of structured educational programs in strengthening digital health literacy and promoting evidence-based clinical decision-making.

The findings also demonstrated that nursing students showed a strong sense of professional responsibility. More than two-thirds of the participants (71.66%) reported that they consistently believed in their responsibility to educate patients regarding the risks associated with self-medication. This finding differs from the results reported by Dagameen (2025), in which participants demonstrated less favorable attitudes toward antimicrobial resistance prevention. Furthermore, the positive attitudes observed among students in Surman provide a strong foundation for implementing antimicrobial stewardship programs in educational and clinical settings.

Another important finding concerns the increasing dependence on digital resources for obtaining health-related information. More than half of the participants reported using artificial intelligence tools, such as ChatGPT, to obtain information regarding symptoms and medications. Similar findings have been reported by Mahdi et al. (2026), who observed extensive use of online resources among university students. This reliance on digital platforms may increase the risk of inappropriate self-medication practices, particularly in environments where antibiotics remain easily accessible without prescriptions.

Finally, descriptive differences were observed across demographic characteristics, including age and gender. However, the present study did not employ inferential statistical analyses, such as multiple regression analysis or analysis of variance, to determine whether these variables significantly predicted self-medication behavior. Consequently, further studies are needed to examine these relationships in greater detail.

11- CONCLUSION

This study demonstrated that nursing students in Surman exhibited an acceptable level of knowledge regarding antibiotic resistance and a strong sense of professional responsibility toward patient education. Despite these positive findings, substantial gaps remain in formal training and practical application, particularly concerning the critical evaluation of online health information and the appropriate use of antibiotics.

The results also highlighted the growing influence of digital technologies and artificial intelligence applications on health-related decision-making among students. Consequently, the current nursing curriculum in Libya requires urgent revision to ensure that future healthcare professionals are equipped with the knowledge and skills necessary to promote rational antibiotic use and implement effective antimicrobial stewardship strategies.

12- RECOMMENDATIONS

1. **Academic Integration:** Educational institutions should incorporate specialized courses in nursing informatics, digital health literacy, and antimicrobial stewardship into undergraduate nursing programs.
2. **Continuous Professional Development:** Colleges and healthcare institutions should organize mandatory quarterly workshops focusing on the critical evaluation of online health information sources and the consequences of inappropriate antibiotic use.
3. **Legislative Enforcement:** Health authorities should strengthen policies and regulations aimed at preventing the dispensing of antibiotics without a valid medical prescription.
4. **Public Awareness Campaigns:** Nursing students should be encouraged to participate in community-based educational initiatives

designed to increase awareness of antimicrobial resistance and the risks associated with self-medication.

5. **Future Research:** Additional longitudinal and interventional studies should be conducted to evaluate the effectiveness of antimicrobial stewardship programs and monitor changes in self-medication practices over time.

13. REFERENCES

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