

## ORIGINAL ARTICLE

# The Prevalence of Antibiotic Misuse and its Associated Factors among Women of Reproductive Age in Jordan

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### Abstract

**Background:** Misuse of antibiotics is a global health challenge that accelerates antibiotic resistance and interferes with effective disease management. This study focuses on determining the prevalence of antibiotic misuse among Jordanian women of reproductive age and examines the sociodemographic factors associated with this behavior.

**Methods:** A cross-sectional approach was adopted, utilizing structured questionnaires to collect data on socioeconomic characteristics, antibiotic usage behaviors, and related factors. A total of 238 participants were recruited; however, only 226 met the eligibility criteria. The data was analyzed using descriptive and multivariate analysis by SPSS 28.

**Results:** The findings indicated a prevalence rate of 25.7% for antibiotic misuse within the study sample (n = 238). There were weak associations between misuse and higher family income and larger family sizes. On the other hand, higher academic level slightly reduced the likelihood of obtaining antibiotics without a prescription. No statistically significant correlations were identified between demographic variables such as age, education, or income and antibiotic misuse.

**Conclusion:** This study found that antibiotic misuse is common among Jordanian women of reproductive age. The findings underscore the need for targeted context sensitive awareness interventions about antibiotic resistance and call for further research into cultural and systemic influences on antibiotic use.

**Keywords:** Misuse of antibiotic misuse, antibiotic resistance, women, reproductive age, Jordan.

## INTRODUCTION

Antibiotics are among the most frequently prescribed medications globally; however, their effectiveness is increasingly threatened by the emergence of antibiotic resistance. Antibiotic resistance refers to the ability of bacteria to survive

and proliferate despite the presence of antibiotics that would normally inhibit or kill them [1]. This phenomenon, known as antimicrobial resistance (AMR), has emerged as a serious global public health challenge with far-reaching implications [2]. It is projected that if current trends continue,

AMR could result in up to 10 million deaths annually by 2050 [3]. AMR is a multifaceted issue that requires action at the individual, national, and international levels [4]. Inappropriate antibiotic use, such as overprescribing, self-medication, and premature discontinuation of treatment, has been identified as a major contributor to the acceleration of resistance [5]. In many low- and middle-income countries, including India, China, and Kenya, nearly half of all antibiotic prescriptions are considered unnecessary, often due to incorrect diagnoses and a preference for broad-spectrum agents [5]. The problem is further compounded by the easy availability of antibiotics as over the counter (OTC) medications in many countries, including Jordan [6]. In addition, poor adherence to prescribed regimens, including skipping doses or combining antibiotics with herbal treatments, undermines the efficacy of treatment and promotes resistance [6]. While AMR is a recognized concern in high-income nations, the impact is often more pronounced in developing countries due to weaker regulatory systems and lower levels of public health awareness. Jordan, a middle-income country in the Middle East with a population of approximately 11 million, faces growing concerns over the inappropriate use of antibiotics, despite having a relatively well-educated population [7]. Recent efforts to address the issue in Jordan include collaborations between the World Health Organization (WHO), academic institutions, and the Ministry of Health to launch public education campaigns promoting responsible antibiotic use [8]. Several studies have explored antibiotic-related knowledge and behaviors among the Jordanian public. For instance, Suaifan et al [9] assessed awareness among university students, while Haddadin et al. [10] investigated dispensing practices in community pharmacies. However, limited research has focused specifically on women of reproductive age, a demographic that plays a central role in family healthcare decisions and may

influence household medication practices. Understanding patterns of antibiotic use and misuse within this group is essential for developing targeted interventions. This study aimed to investigate the prevalence, sources, and duration of antibiotic use among Jordanian women of reproductive age. It also seeks to identify factors contributing to misuse and to examine associations with demographic and socioeconomic variables such as education level, household income, and family size.

### Background

Antibiotics are medications that are used to both treat and prevent bacterial infections. They accomplish this by eliminating bacteria inside the host's body or inhibiting their growth and spread [11]. The overuse of antibiotics for self-limiting illnesses including colds and influenza, sore throats and diarrhea is a major contributor to the rise in AMR [12]. Inappropriate doses and overuse of antibiotics are the main cause of the expanding problem of antibiotic resistance [13,14]. AMR is growing at an alarming rate across the world, in comparison to all underlying death causes in 2019, AMR would have ranked as the fourth leading cause of death in 2019 [15] based on the assumption of a study that uses statistical predictive models based on a comprehensive systematic review estimated 4.95 million deaths were related to AMR [14]. This rising resistance has reached a critical level, where it is posing a latent pandemic threat to public health and demanding immediate intervention [16].

Infections caused by resistant bacteria have few therapeutic options, leading to high rates of morbidity, mortality, and financial burdens [17].

While antibiotic misuse is a global concern, it is particularly prevalent in low- and middle-income countries, where weaker regulations and limited public awareness exacerbate the issue [18]. Self-medication with antibiotics is

widespread due to easy availability, lack of pharmacy oversight, and misconceptions regarding their usage. In eastern regions like Jordan, cultural and economic factors exacerbate the problem [18]. Self-medication has serious risks, especially for women who are pregnant and their babies, including those who are pregnant and of reproductive age [19,20]. Advice from friends and family, and the influence of pharmacists without medical oversight also drives antibiotic misuse [21]. Some studies also point to ineffective policies causing these behaviors [22]. A review in Iraq showed multi-drug resistance to be highly prevalent in public and healthcare settings. There is a common empirical use of antibiotics by physicians in acutely ill patients in the absence of cultures and sensitivity tests. Furthermore, community pharmacists frequently diagnose and provide antibiotics without prescription [23]. A study conducted in Saudi Arabia also revealed that in cases where participants abused antibiotics (58.1%) and overused (51%), the majority were not prescribed. These practices have resulted in significant financial expenses as well as the development of antibiotic resistance [24].

Studies show that extensive antibiotic abuse occurs in Jordan, reflecting global patterns. For instance, a study found that approximately one in three antibiotics in Jordan was purchased without prescription, with improper doses and durations being highly common [25]. A different study indicated that over (74%) of Jordanian pharmacies provided antibiotics without prescription, primarily without providing adequate usage instructions [26]. A study conducted during the COVID-19 Pandemic reported participants in Jordan used antibiotics incorrectly, believing that antibiotics could be used to treat colds/flu and sore throats. These practices highlight how urgently stronger regulations and public education are needed [27]. In a study conducted in Jordan, it was reported

that out of the total participants, almost (30.0%) took antibiotics without prescription; the majority of these individuals obtained these antibiotics from pharmacies [22]. This issue is not exclusive to Jordan; similar studies from Ethiopia and Europe have also reported high rates of self-medication with antibiotics [28,29].

## STUDY MATERIALS AND METHODS

### Study Design

This study was part of a research project for third year medical students at the University of Jordan. The study adopted a quantitative, cross-sectional design to assess the prevalence of antibiotic misuse, and related behaviors.

### Research Setting

This study was held at the Ain Al-Basha community area and healthcare center to capture diversity and gain deeper insights into potential patterns contributing to antibiotic resistance. The location was strategically chosen for its accessibility, facilitating smooth data collection. To encourage participation, data was collected on two Saturdays, November 9 and 16, 2024, from 11:00 AM to 1:00 PM. These timings were selected to align with the availability of the target population.

### Sampling Strategy and Participants

The study employed a convenience sampling method to recruit participants from Ain Al-Basha, a town located within the Balqa governorate in Jordan, where participants were approached and recruited based on their availability during the data collection. Women aged 15-49 with at least one child were the target population, as this group is relevant to assessing antibiotic misuse in community settings, especially during pregnancy and lactation [22]. Eligibility criteria included female residents of Ain Al-Basha within the specified age range who consented to participate in the study.

A total of 238 participants were recruited; however, only 226 met the eligibility criteria.

This selection aimed to provide a diverse representation of the town's population and ensure the inclusion of various socio-demographic backgrounds.

### **Recruitment and Participation**

The data collectors were divided into teams, each consisting of a male and a female student. Participants were recruited through community outreach efforts, including household (door-to-door) surveys. Data collectors introduced themselves, and individuals who expressed interest in the study were briefed on the objectives, methods, and voluntary nature of their participation. After obtaining their consent, participants were invited to complete the questionnaire.

### **Research Tool**

Data was collected using a systematic questionnaire consisting of 100 questions covering various health-related topics, including immunization, antibiotic use, smoking cessation, maternal health, diabetes, breast cancer, and respiratory health. These questions were closed-ended, allowing participants to select from predefined response options.

The questionnaire was developed by faculty of medicine professors based on a review of relevant literature to ensure content validity.

The questionnaire was administered in person by a female and male researcher from each team to ensure comfort and accessibility for participants.

### **Statistical Analysis**

Data cleaning was performed using Microsoft Excel 2016 and IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA) [30]. The initial data review in Excel involved identifying and removing duplicates, resolving formatting inconsistencies, and preparing the dataset for further analysis. In SPSS, additional data cleaning steps included managing missing responses, transforming variables, and ensuring data completeness and

accuracy. Twelve responses were excluded due to incomplete data and lack of consent to participate.

Descriptive statistics—frequencies, percentages, means, medians, and standard deviations—were calculated to summarize key study variables. Since the continuous variables were not normally distributed, the Pearson Chi-Square test was used to examine associations between socioeconomic factors (such as education level and family income) and antibiotic misuse. However, no statistically significant associations were found.

To further explore potential predictive relationships, a logistic regression analysis was conducted to assess the association between antibiotic misuse and demographic factors such as family size and age. The significance level ( $\alpha$ ) was set at  $p \leq 0.05$  for a two-tailed test. The underlying hypothesis was that certain demographic characteristics, particularly larger family size and younger age, would be significantly associated with increased odds of antibiotic misuse.

### **Ethical Considerations**

Ethical approval for this study was obtained from the Ethics Committee of the University of Jordan. Participants were informed about the study objectives, and their voluntary participation was ensured through verbal consent. Maximum anonymity was maintained, as no identifying information was collected, ensuring confidentiality throughout the study.

## **RESULTS**

### **Descriptive Statistics**

A total of 226 women were included in the final analysis. Most participants were aged between 40–50 years, with 49 (21.7%) aged 40–44 years and another 49 (21.7%) aged 45–50 years. Most participants were married (94.2%), while 3.1% were divorced, 2.7% were widowed, and no participants were single. Regarding

income, 48.2% reported a monthly income of 201–400 JOD, 25.2% had an income of 401–700 JOD, 12.8% earned more than 700 JOD, and 5.3% reported less than 200 JOD. Educational level varied: 42.0% had completed high school, 19.5% had basic education, 18.6% held an undergraduate degree, 15.5% had a diploma, 2.2% were illiterate, and 2.2% had postgraduate education.

Table 1 presents an overview of the dependent variable, antibiotic misuse. Initially, antibiotic misuse was recorded as a detailed categorical

variable, capturing various forms of misuse such as self-medication and inappropriate dosing. For the purposes of analysis, this variable was recoded into a dichotomous format in SPSS, with responses categorized as either "Yes" (indicating any form of misuse) or "No" (indicating no misuse). This recoding was done to facilitate clearer evaluation of the prevalence and associated factors of antibiotic misuse. The overall prevalence of antibiotic misuse among the participants was 25.7%.

**Table 1. Socio-Economic Characteristics of the Study Population.**

		n	%
Age	20-24 years	11	4.9%
	25-29 years	33	14.6%
	30-34 years	43	19.0%
	35-39 years	41	18.1%
	40-44 years	49	21.7%
	45-50 years	49	21.7%
Marital status	Single	0	0.0%
	Married	213	94.2%
	Divorced	7	3.1%
	Widowed	6	2.7%
Income	Not provided	19	8.4%
	Less than 200 JOD	12	5.3%
	201-400 JOD	109	48.2%
	401-700 JOD	57	25.2%
	More than 700 JOD	29	12.8%
Education level	Illiterate	5	2.2%
	Basic	44	19.5%
	High school	95	42.0%
	Diploma	35	15.5%
	Undergraduate	42	18.6%
	Postgraduate	5	2.2%

Abbreviations: JOD, Jordanian Dinar; n, number of respondents.

The study results show that most people (68.1%) obtained antibiotics with a prescription, mainly from pharmacies (71.2%). Although a smaller portion, (25.0%) still obtained antibiotics without a prescription, also often from

pharmacies (21.7%). On a positive note, most people (76.1%) were given advice on how to use antibiotics correctly, but some (18.1%) were not. Very few participants said they had never taken antibiotics or could not remember details about

access, advice, and where they got them from.

The present study systematically investigated the prevalence and determinants of antibiotic misuse among 226 women of reproductive age in Jordan. The prevalence of the reported misuse was (25.7%), indicating a major issue within the sampled population. Relationship examinations between antibiotic misuse and demographic

variables included statistical analyses, such as Chi-Square and logistic regression on education, income, age, and family size. As shown in Table 2, None of these analyses showed statistically significant associations, as the p-values are greater than the commonly used threshold for significance ( $p > 0.05$ ).

**Table 2. The association between antibiotics misuse and sociodemographic characteristics.**

Independent variable	Statistical test	Result	p-value
Education	Chi-Square Test	$\chi^2 = 10.17$	$p = 0.94$
Income	Chi-Square Test	$\chi^2 = 0.78$	$p = 0.07$
Age	Logistic Regression	Positive Influence	$p = 0.132$
Family Size	Logistic Regression	Positive Influence	$P = 0.142$

Although no strong or significant correlations were observed, logistic regression analysis identified income and family size as weak positive predictors, which may indicate that higher-income earners with larger families are more likely to engage in non-prescribed antibiotic use. These findings underscore the nuanced interplay between socioeconomic factors and antibiotic misuse.

## DISCUSSION

This study investigated the prevalence and determinants of antibiotic misuse among Jordanian women of reproductive age, reporting a misuse rate of 25.7%. Although socio-demographic variables such as education, income, age, and family size were hypothesized to significantly influence misuse, statistical analyses showed no strong or significant associations (all  $p > 0.05$ ). The tests showed a weak negative correlation between education and antibiotic misuse, indicating that higher education promotes awareness of appropriate antibiotic use. A survey conducted in Jordan found that self-medication with antibiotics was significantly associated with age and income, suggesting that education alone may be insufficient to counteract misuse [31]. The study found that

income has a minimal positive effect on antibiotic misuse, which may reflect easier access to antibiotics in higher-income households. This aligns with findings from a systematic review and meta-analysis, which showed that income did not have a strong link to overall misuse, but people with medium incomes were more likely to keep leftover antibiotics, while those with higher incomes were less likely to skip doses or stop treatment early [32]. This pattern suggests that income may facilitate misuse by increasing the ease of acquiring antibiotics, especially in settings where regulatory systems are ineffective. Age and family size demonstrated a slight positive influence on antibiotic misuse, though not statistically significant. Younger women may be more prone to self-medication, as supported by a study in Southern Jordan, which found that younger age groups had higher rates of self-medication with antibiotics [33]. Contributing factors include the use of informal sources for antibiotics and financial pressures that can compromise adherence to appropriate antibiotic therapy [34].

This study provides useful understanding into the multi-dimensional problems associated with antibiotic misuse among women of reproductive age in Jordan. Although the misuse prevalence of

25.7% was not statistically significant, the findings reveal important behavioral trends that warrant further investigation, particularly when considered within a broader public health context. A key result is that the abuse of antibiotics is not limited to individuals with less education or those who are economically disadvantaged, as might be supposed. Indeed, weak positive associations with both income and family size suggest that individuals with more resources or responsibilities are more inclined to self-medicate. This could be due to easier access to antibiotics from private pharmacies, where enforcement of prescription policies is often inconsistent. Similar trends have been observed in other middle-income countries, where regulatory frameworks exist but lack the strength or consistency needed for true impact [35]. Clinically, this underscores the significant role the pharmacists and pharmacy regulations must play. Since most participants reported getting antibiotics from pharmacies, regardless of whether a prescription was presented, pharmacists are clearly a first point of access to antibiotics. This puts them in a powerful position to influence public behaviors. A study indicates that pharmacists' attitudes can significantly influence antibiotic dispensing practices. Therefore, educational interventions targeting these attitudes and improving pharmacist-patient communication are recommended to prevent the dispensing of antibiotics without a prescription [36]. Over 76.1% of the surveyed women reported that they had received some form of guidance on how to use antibiotics. However, the persistence of misuse, even among those who received advice, points to a more fundamental issue. Advice, particularly when brief or inconsistently delivered, may not be enough. Public awareness campaigns tailored to the local context and grounded in behavioral science have been more successful at achieving long-term change. Huttner and colleagues demonstrated that

well-designed, multi-channel campaigns are far more effective than isolated interventions at the point of care [37]. Theoretically, the research adds to the knowledge of antibiotic misuse in the context of Middle Eastern environments. Rather than attributing inappropriate use solely to ignorance or poor access to healthcare, the findings suggest a need to examine structural and cultural norms. Widespread access to antibiotics, coupled with lenient regulation and social acceptance of self-medication, creates an environment where misuse can thrive. This aligns with the World Health Organization's 2023 assessment of AMR in the Eastern Mediterranean Region, which points to regulatory gaps and weak enforcement as major obstacles [38]. In light of this, future antimicrobial stewardship strategies must look beyond the individual to address the systemic factors driving misuse. That includes revisiting existing legislation, engaging pharmacists as frontline educators, and reshaping public perceptions around antibiotics. By framing antibiotic misuse not just as a medical issue but also a social one, this study offers a basis for more targeted and pervasive interventions.

Although this study contributes valuable insights into antibiotic use behaviors, it has several limitations that must be acknowledged. First, as with most cross-sectional designs limits the ability to establish causality. While associations—such as those involving income and family size—were observed, they cannot be interpreted as cause-and-effect relationships. Longitudinal studies would better capture behavioral changes over time and in response to interventions. Some participants may have underreported misuse—either because they forgot or wanted to present themselves more favorably. The study also focused only on women of reproductive age. While this group plays a major role in household health decisions, the findings may not apply to other populations such as men, adolescents, older adults, or rural

residents, who may have different experiences with antibiotics. Sample size is another factor. Although the 226 participants offer a good basis for analysis, a larger sample may have revealed statistically significant associations or enabled subgroup analysis (e.g., urban vs. Rural, education levels). Psychological and attitudinal factors were not explored either—for example how much participants trust healthcare providers or understand antibiotic resistance. These factors often play a significant role in shaping behavior, especially where antibiotics are easily accessible and self-medication is common [39]. Lastly, the findings reflect a moment in time. With healthcare behaviors constantly shifting—especially after events like the COVID-19 pandemic—ongoing research is needed to stay updated and guide effective policy.

## CONCLUSION

This study highlights the ongoing challenge of antibiotic misuse among women of reproductive age in Jordan, with a reported prevalence of 25.7%. Although no statistically significant associations were found between misuse and

demographic factors such as age, income, education, or family size, weak trends suggest that higher income and larger family size may slightly increase the likelihood of misuse, while higher education may offer some protective effect. These findings reinforce the complex and multifactorial nature of antibiotic misuse, emphasizing that it is not confined to low-income or less-educated groups. The study also underscores the critical role of pharmacies as primary sources of antibiotics, often dispensed with limited regulatory oversight. Given the significant influence pharmacists may exert on public behavior, policy efforts should focus on enhancing pharmacy regulations and professional accountability. Moreover, public health campaigns tailored to the sociocultural context of Jordan are essential to address persistent misconceptions and promote responsible antibiotic use. Further qualitative and longitudinal studies are recommended to explore underlying attitudes, cultural norms, and systemic factors driving misuse, thereby informing more effective and targeted interventions.

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## سوء استخدام المضادات الحيوية والعوامل المرتبطة به بين النساء في سن الإنجاب في الأردن: دراسة مقطعية

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### الملخص

**المقدمة:** يُعد سوء استخدام المضادات الحيوية تحديًا صحيًا عالميًا يُسرّع من مقاومة المضادات الحيوية ويهدد فعالية إدارة الأمراض. تهدف هذه الدراسة إلى تحديد مدى انتشار سوء استخدام المضادات الحيوية بين النساء الأردنيات في سن الإنجاب، بالإضافة إلى التعرف على العوامل الاجتماعية والديموغرافية المرتبطة بهذا السلوك.

**المنهج والأجراءات:** تم اعتماد نهج مقطعي، حيث استُخدم استبيان منظم لجمع البيانات المتعلقة بالخصائص الاجتماعية والاقتصادية، وسلوكيات استخدام المضادات الحيوية، والعوامل المرتبطة بها. تم استقطاب 238 مشاركة، إلا أن 226 منهن استوفين معايير الأهلية. تم تحليل البيانات باستخدام التحليل الوصفي والمتعدد المتغيرات بواسطة برنامج SPSS 28.

**النتائج:** أشارت النتائج إلى أن معدل انتشار سوء استخدام المضادات الحيوية بين الفئة المستهدفة بلغ 25.7%، وأشارت النتائج إلى وجود ارتباطات ضعيفة بينه وبين ارتفاع دخل الأسرة وحجم الأسرة الأكبر. من ناحية أخرى، لوحظ أن المستويات التعليمية الأعلى تقلل بشكل طفيف من احتمالية الحصول على المضادات الحيوية دون وصفة طبية. لم يتم تحديد أي ارتباطات ذات دلالة إحصائية بين المتغيرات الديموغرافية، مثل العمر أو التعليم أو الدخل، وسوء استخدام المضادات الحيوية.

**الخلاصة:** إن سوء استخدام المضادات الحيوية. يتطلب تطبيق تدابير صحية موجهة تركز على التوعية باستخدام الصحيح للمضادات الحيوية. تؤكد هذه الدراسة الحاجة إلى استراتيجيات شاملة للحد من سوء استخدام المضادات الحيوية، مما يساهم في تحسين النتائج الصحية على المستوى المحلي ومكافحة مقاومة المضادات الحيوية.

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