

Public Perceptions of Antibiotic Resistance: A Quantitative Analysis of Knowledge and Behavior in Eswatini kingdom

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Abstract

Background: Antibiotics are crucial in medicine, agriculture, and livestock for treating bacterial infections. However, their misuse contributes to antibiotic resistance, a growing global concern. **Aim:** To identify gaps in understanding and behavior that contribute to antibiotic misuse and resistance in the Kingdom of ESwatini. **Methods:** A quantitative cross-sectional survey was conducted among 400 participants from diverse demographic backgrounds. The survey assessed public awareness, attitudes, knowledge, and practices regarding antibiotic resistance. **Results:** The study found that 72% of respondents trust traditional healers, with many preferring them over hospitals. Only 36% reported local efforts to educate about antibiotic resistance. Regarding solutions, 34% supported promoting new antibiotics, while 46% were unsure about the discovery of new antibiotics annually. About 44% believed in alternatives to antibiotics, and 47% were unsure if antibiotic resistance leads to death. Self-medication was common, with 68% reporting receiving antibiotics from family or friends and 72% accepting them. Additionally, 46% stopped taking antibiotics early due to cost or feeling better, and only 46% completed the full course. **Conclusion:** There is a significant gap between awareness and understanding of antibiotics and antibiotic resistance. Self-medication practices are widespread; hence, there is a critical need to increase awareness of antibiotic resistance.

Key words: Antibiotic; Eswatini; Behavior.

Introduction

Antibiotics are essential in modern medicine, agriculture, and livestock industries. They are used to prevent and treat bacterial infections in humans, plants, and animals or to enhance feed efficiency as growth promoters. However, their widespread use and environmental release result in chemical pollution and promote the generation and spread of antibiotic resistance genes (ARGs) and antibiotic-resistant bacteria (ARB) (1).

Antimicrobial resistance (AMR) is a major global health problem that results in significant morbidity and mortality on a global scale. The development of new strategies to treat infectious illness may be facilitated by an understanding of the

molecular mechanisms that underlie resistance. Bacteria utilize a variety of mechanisms to resist antibiotics. Some of these mechanisms are "intrinsic," which allows the cell to utilize genes that it already possesses to survive antibiotic exposure. Others are "acquired," which involves the gain of new genetic material that provides new capacities that mediate in survival (2).

The annual cause of hundreds of thousands of fatalities is the widespread resistance to antibiotics among bacteria. The most serious problem is the constant increasing number of bacteria that are resistant to antibiotics that are commonly utilized, including medications of last resort (vancomycin). The alarming increase in a global public health problem necessitating

international collaboration is further confirmed by the rapidity with which resistance genes spread (3).

Antibiotic resistance arises when bacteria undergo alterations due to antibiotic administration, becoming unresponsive to treatments. This increases the risks of disease spread, severe illness, and mortality, making infections harder to treat (4).

Antibiotic resistance is a worldwide problem that is escalating, resulting in the ineffectiveness of antibiotics in treating infectious illnesses for which they were specifically developed. The World Health Organization (WHO) has recently issued a warning that the world is "running out of antibiotics," which has heightened concerns about the potential for global antibiotic resistance to reach new heights. The treatment of clinical infectious illnesses has been significantly impacted by the emergence of drug-resistant bacteria, which has led to a gradual elevation in the incidence of nosocomial infections (5).

The objective of this investigation was to identify gaps in understanding and behavior that contribute to antibiotic misuse and resistance.

Methods

This investigation utilized a quantitative cross-sectional survey design to evaluate the public's awareness, attitudes, knowledge, and practices regarding antibiotic resistance in the Kingdom of Eswatini, targeted a diverse sample of 400 participants from various demographic backgrounds, including different age groups, educational levels, and occupations. This ensured a representative sample of the population. Participants were recruited through random stratified sampling, ensuring balanced representation across key demographic variable.

Study setting: The survey on the awareness level of antibiotic resistance was conducted in the outpatient departments of healthcare

facilities in Eswatini. Specifically, the study took place at RFM Hospital, Manzini Clinic, and Mbabane Hospital. These outpatient settings were selected to assess the knowledge and attitudes of individuals towards antibiotics and antibiotic resistance.

Inclusion Criteria: Individuals aged 18 years and above, residing in Eswatini, and willing to participate voluntarily.

Exclusion Criteria: Individuals below 18 years, non-residents, or those unwilling to provide informed consent.

Data Collection

Data collection was conducted over a four-week period through both online surveys and face-to-face interviews to maximize response rates. Trained data collectors ensured consistency in administering the questionnaire and addressed any queries from participants. A structured questionnaire was developed based on previous validated surveys and tailored to the cultural and social context of Eswatini. The questionnaire was divided into six main sections: demographic Data: Age, gender, education, and occupation. General Awareness: Questions assessing the participants' awareness levels about antibiotic resistance. Knowledge Assessment: Focused on understanding the proper use of antibiotics and identifying misconceptions. Attitudes and Beliefs: Examined trust in healthcare systems versus traditional healers and views on antibiotic resistance. Practices: Investigated self-medication behaviors, adherence to prescriptions, and sources of antibiotics. Information Sources: Determined where participants primarily obtained information on antibiotic use and resistance.

Pilot Testing: Before full implementation, the questionnaire was pilot-tested on a small group (n=30) to assess clarity, reliability, and cultural relevance. Adjustments were made based on feedback to ensure the

questions were easily understood and accurately captured the intended data.

Data analysis

Quantitative data has been analyzed utilizing SPSS version 26.0. Descriptive statistics (frequencies, percentages, and means) have

been utilized to summarize the data. Chi-square tests and ANOVA were conducted to identify significant associations between demographic variables and levels of awareness, attitudes, and practices

Result

Table (1): Distribution of demographic information in the studied group.

		Studied group N= 400	
		N	%
Age group	18-24	127	31.75%
	25-34	94	23.5%
	35-44	56	14%
	45-54	62	15.5%
	55-64	39	9.75%
	65 and older	22	5.5%
Gender	Male	228	57%
	Female	172	43%
Educational Level			
	Less than high school	79	19.75%
	High school diploma or equivalent	103	25.75%
	Bachelor's degree	218	54.5%
Occupation			
	Healthcare professional	68	17%
	Student	122	30.5%
	Educator	92	23%
	Other	118	29.5%

Table 1 show that, the majority of the participants fall within the (18-24) age group, accounting for 31.75% of the sample, the (25-34) age group is the second largest, with 23.5% and smallest portion of the sample come from (65 and older) age group with 5.5%. The majority of sample were males (57%), while 43% were females. the majority of the studied group 54.5% have Bachelor's degree, while smallest portion of the studied group have a Graduate degree (14%). The largest group of participants are students (30.5%), while healthcare professionals account for (17%)

Table (2): Distribution of general awareness in the studied group.

		Studied group N= 400	
		N	%
How would you rate your overall awareness of antibiotic resistance?			
	High	0	0%
	Moderate	0	0%
	Low	400	100%
Have you heard of antibiotic resistance before this survey?			
	YES	88	22%
	NO	312	78%
Are you satisfied with the level of awareness of antibiotic resistance among your community			
	satisfied	0	0%
	Neutral	48	12%

Dissatisfied	352	88%
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Table 2 shows that a large proportion of participants (100%) report a low level of awareness of antibiotic resistance. The majority (78%) of respondents have not heard of antibiotic resistance. The majority (88%) are dissatisfied of awareness of antibiotic resistance among their community, while, only 12% of respondents feel neutral, and no respondents report being satisfied.

Table (3): Distribution of knowledge assessment in the studied group.

	Studied group N= 400	
	N	%
Can viral infections lead to antibiotic resistance?		
Yes	40	10%
No	108	27%
Not sure	252	63%
Have you ever taken antibiotics from the shelf when you had the flu?		
Yes	276	69%
No	124	31%
Do you believe antibiotics can treat the flu?		
Yes	192	48%
No	44	11%
Not sure	164	41%
Can antibiotics treat the majority of viral infections?		
Yes	176	44%
No	28	7%
Not sure	196	49%
Can antibiotics weaken your immune system?		
Yes	140	35%
No	36	9%
Not sure	224	56%
Do you believe that herbal medicine is much safer than antibiotics because it is free of side effects?		
Agree	304	76%
Neutral	60	15%
Disagree	36	9%

Table 3 shows that a significant share of respondents (63%) report that they were not sure whether viral infections can lead to antibiotic resistance. The large proportion of participants (69%) report that they have taken antibiotics from the shelf when they had the flu. The large number of respondents (48%) report that they believe antibiotics can treat the flu. A large proportion of participants (49%) report that they were not sure whether antibiotics can treat the majority of viral infections. A significant share of respondents (56%) report that they were not sure whether antibiotics can weaken your immune system. Finally, a significant proportion (76%) report that they agree that herbal medicine is much safer than antibiotics.

Table (4): Distribution of attitudes and beliefs in the studied group.

	Studied group N= 400	
	N	%
Do you trust traditional healers?		
Yes	288	72%
no	112	28%
How often do you go to a traditional healer rather than a hospital when you feel unwell?		

Always	175	43.75%
Sometimes	185	46.25%
Never	40	10%
Have you seen efforts from local authorities to educate the community about antibiotic resistance?		
Yes	144	36%
no	256	64%
Do you think the best way to overcome antibiotic resistance is to promote pharmaceutical companies to discover new antibiotics?		
Agree	156	39%
Neutral	98	24.5%
Disagree	146	36.5%
Do you believe that many antibiotics are discovered every year?		
Yes	154	38.5%
no	61	15.25%
Not sure	185	46.25%
Do you think there are effective alternatives to antibiotics that can be used?		
Yes	174	43.5%
no	65	16.25%
Not sure	161	40.25%
Do you think antibiotic resistance lead to death?		
Yes	68	17%
no	143	35.75%
Not sure	189	47.25%

Table 4 shows that, 72% of the sample report trusting traditional healers, indicating a strong reliance on non-conventional healthcare practices. Majority of the studied group sometimes prefer traditional healers over hospitals (46.25%). (64%) report no such efforts from local authorities to educate the community about antibiotic resistance. 39% agree that promoting pharmaceutical companies to discover new antibiotics is the best way to overcome antibiotic resistance and 36.5% disagree. Majority of the studied group are unsure that many antibiotics are discovered every year (46.25%). 43.5% believe that effective alternatives to antibiotics exist and a large portion, 40.25% are unsure. Majority of the studied group are unsure that antibiotic resistance led to death (47.25%) and 17% are believed that antibiotic resistance led to death.

Table (5): Distribution of behavior and practices in the studied group.

	Studied group N= 400	
	N	%
Have you ever been offered antibiotics by a family member or friend when you felt sick?		
Yes	272	68%
No	128	32%
If you were offered antibiotics by a family member or friend, did you accept it?		
Yes	288	72%
No	112	28%
How often do you discontinue taking antibiotics before the prescribed period for financial reasons?		
Always	112	28%
Often	172	43%
Sometimes	72	18%
Rarely	24	6%
Never	20	5%
How often did you stop the course of antibiotic treatment because you felt improvement after just two doses?		
Always	184	46%
Often	88	22%

Sometimes	60	15%
Rarely	40	10%
Never	28	7%
When prescribed antibiotics, how often do you complete the entire course?		
Always	32	8%
Often	44	11%
Sometimes	60	15%
Rarely	184	46%
Never	80	20%
Have you ever self-medicated with antibiotics?		
Yes	272	68%
No	128	32%

Table 5 shows that 68% of respondents report that they have been offered antibiotics by a family member or friend when they felt sick. Additionally, 72% of participants have accepted the antibiotics offered to them. Furthermore, 43% of those surveyed often discontinue taking antibiotics before the prescribed period due to financial reasons. Nearly half of respondents (46%) report that they always stop the course of antibiotic treatment after feeling improvement after just two doses. Moreover, 46% of individuals rarely complete the entire course of antibiotics as prescribed. Finally, 68% of participants report that they have self-medicated with antibiotics.

Table (6): Distribution of information sources in the studied group.

	Studied group N= 400	
	N	%
Where do you primarily get your information about antibiotics and antibiotic resistance?		
Healthcare providers	67	16.75%
Social media	148	37%
News articles	26	6.5%
Educational institutions	44	11%
Family and friends	115	28.75%
How reliable do you consider the sources you use for information on antibiotic resistance?		
Very reliable	55	13.75%
Reliable	172	43%
Somewhat reliable	134	33.5%
Not reliable	39	9.75%

Table 6 showed that social media is the most common source of information, with 37%, family and friends are the second most cited source, with 28.75%, then healthcare providers with 16.75%. 43% consider the sources they use for information on antibiotic resistance to be reliable, 33.5% think their information sources are somewhat reliable.

Discussion

In our study showed that, regarding to demographic data, we reported that the majority of the participants fall within the (18-24) age group, accounting for 31.75% of the sample, the (25-34) age group is the second largest, with 23.5% and smallest portion of the sample come from (65 and older) age group with 5.5%. The majority of sample were males (57%), while 43% were females. 25.75% of the studied group have a

high school diploma or equivalent, followed by 22.5% have attended some college, while smallest portion of the studied group have a Graduate degree (14%). The largest group of participants are students (30.5%), educators make up 23% of the sample, while healthcare professionals account for (17%).

Khan et al., (6) who aimed to explore the relationship between the education level and the role and potential of technology/digital media/social media in propagating and

publicizing antibiotic resistance awareness, they found that among the 400 participants, 62% (249) were females and 38% (151) were males. The responses were categorized into three age groups, Group I (18-35 years), Group II (36-53 years), and Group III (above 53 years). The majority of the participants i.e., 76% (304) belonged to Group I, 18% (72) belonged to Group II and 6% (24) belonged to Group III. The distribution of the sample population based on their education was as such: 0.75% (3) were educated up to middle school, 2.5% (10) were educated up to higher secondary school, 90.5% (362) were undergraduates (perusing bachelors or master's degree) and 6.25% (25) were graduates (completed master's degree).

Aslam et al., (7) who sought to create a questionnaire to assess the general public's awareness and practices regarding SMA in the Malaysian population, discovered that the 100 participants were adults between the ages of 21 and 60 (mean = 32.89 $\pm$ 8.61; 48 percent were men and 52 percent were women). The majority of participants were Malay (40 percent), and the majority of them had a secondary school degree (39 percent).

In our study revealed that, regarding the distribution of general awareness in the studied group, 53% of respondents reported having a very low level of awareness about antibiotic resistance."

The majority (78%) of respondents have not heard of antibiotic resistance (52%) are very dissatisfied of awareness of antibiotic resistance among their community, and 36% are dissatisfied of awareness of antibiotic resistance among their community. Only 12% of respondents feel neutral, and no respondents report being satisfied or very satisfied. Recent research in Eswatini has begun to shed light on public perceptions of antibiotic resistance and the behaviors associated with antibiotic use. A study by **Mthethwa et al. (8)** assessed knowledge

and attitudes regarding antibiotic use among university students in Eswatini. They found that while students demonstrated a moderate level of awareness about antibiotic resistance, many still believed that antibiotics were effective against viral infections. This misunderstanding can lead to misuse and self-medication.

Khan et al., (6) they found that there was 92.75% of the population claimed to be aware of "what antibiotics are" whereas, 7.25% were unaware of antibiotics. In the case of awareness of antibiotic resistance, there was 72% of the sample population was unaware.

Michaelidou et al. (9) found that 21.2% of respondents had never heard of the terms antimicrobial resistance, antibiotic resistance, or antibiotic-resistant bacteria with regards to their fundamental knowledge of antibiotic resistance terms. Antibiotic-resistant bacteria was the most commonly recognized term by 72.3 percent of respondents, with antibiotic resistance (55.6 percent) and antimicrobial resistance (33.7 percent) following closely behind.

AK AK et al., (10) they reported that the majority, 88 percent respondents were aware that if antibiotics were taken too often, they are less likely to work in the future. Only 77.3 percent of the respondents were aware that bacteria weren't responsible for causing flu and colds, while the remaining 22.7 % were not knowledgeable about this fact.

In our study revealed that, regarding the distribution of knowledge assessment in the studied group, 63% of respondents were unsure whether viral infections can lead to antibiotic resistance. 69% of participants admitted to taking antibiotics from the shelf when they had the flu. 48% of respondents believed that antibiotics can treat the flu. Additionally, 49% of those surveyed were uncertain whether antibiotics can treat the majority of viral infections. 56% of respondents were unsure whether antibiotics can weaken the immune system. Finally,

49% of participants agreed that herbal medicine is much safer than antibiotics.

Ortega et al., (11) stated that over sixty percent of respondents correlated antibiotics with UTI (urinary tract infection) and skin/wound infection. Additionally, about forty percent of respondents linked antibiotics

with sore throat, diarrhea, gonorrhea, flu, and cold. Approximately thirty percent of the respondents believed that antibacterial medications may be used to treat traumatic injury as well as fever. Although twelve percent of respondents selected the "Do not know" alternative, just seven percent of respondents agreed that it is acceptable to administer antibiotics to another individual as long as they are used to treat the same illness.

In our study showed that, accordance distribution of attitudes and beliefs in the studied group, we found that 72% of the sample report trusting traditional healers, indicating a strong reliance on non-conventional healthcare practices. Majority of the studied group sometimes prefer traditional healers over hospitals (46.25%) and 34.75% of them often go to traditional healers. A vast majority (64%) report no such efforts from local authorities to educate the community about antibiotic resistance. 34.25% agree that promoting pharmaceutical companies to discover new antibiotics is the best way to overcome antibiotic resistance, 24.5% (98 individuals) are neutral, 32.25% disagree, and 4.25% strongly disagree. Majority of the studied group are unsure that many antibiotics are discovered every year (46.25%), 38.5% are believed that many antibiotics are discovered every year and 15.25% were disagree. 43.5% believe that effective alternatives to antibiotics exist, while 16.25% (65 individuals) disagree and a large portion, 40.25% are unsure. Majority of the studied group are unsure that antibiotic resistance led to death (47.25%), 17% are

believed that antibiotic resistance led to death and 35.75% were disagree.

In their study, **Michaelidou et al., (9)** discovered that 52.3 percent of respondents were optimistic that medical professionals would resolve the problem of antibiotic resistance before it escalated, and as few as 63.4 percent identified antibiotic resistance as one of the most important global problems. Respondents also hold the belief that antibiotic resistance will not be a concern for them if they utilize antibiotics appropriately (47.6 percent), and that there is not much that individuals may do to stop antibiotic resistance (42.5 percent).

In our study showed that, regarding the distribution of behaviors and practices in the studied group, 68% of respondents reported being offered antibiotics by a family member or friend when they felt sick. Additionally, 72% of participants accepted the antibiotics offered to them. Furthermore, 43% of those surveyed often discontinued taking antibiotics before the prescribed period due to financial reasons. A notable portion (46%) stated that they always stopped the course of antibiotic treatment after feeling better following just two doses. Moreover, a considerable share of respondents (46%) rarely completed the entire course of antibiotics as prescribed. Finally, 68% of participants reported self-medicating with antibiotics.

Khan et al., (6) they found that there was 53.5% of the population had self-medicating antibiotics, while 46.5% of the sample population avoided self-medicating the antibiotics. There was 57% of the participants use of antibiotics during cold/flu/cough, 68% participants were positively responded to statements regarding completing the prescribed antibiotic course.

Mhlongo et al. (12) focused on the patterns of antibiotic use among the general population in Eswatini. Their findings indicated that a significant number of

participants reported using antibiotics without prescriptions, often based on peer recommendations or past experiences. The study highlighted the urgent need for targeted educational campaigns to address misconceptions about antibiotics and promote responsible usage.

In our study showed that, regarding to distribution of information sources in the studied group, our results showed that social media is the most common source of information, with 37%, family and friends are the second most cited source, with 28.75%, then healthcare providers with 16.75%. 43% consider the sources they use for information on antibiotic resistance to be reliable, 33.5% think their information sources are somewhat reliable.

According to **Michaelidou et al., (9)** one-third of respondents who had encountered these terms previously reported that they heard them from a doctor/nurse or from social media.

A qualitative study by **Hlatshwayo et al. (13)** explored healthcare providers' perspectives on antibiotic resistance in Eswatini. Healthcare workers expressed concerns about the increasing prevalence of ABR and acknowledged the lack of public awareness as a contributing factor. They emphasized the importance of community education in changing perceptions and behaviors related to antibiotic use.

Integrate Traditional Healers into Education Initiatives: To effectively tackle antibiotic resistance, collaboration with traditional healers is essential. Through the provision of evidence-based training on antibiotic resistance, wise usage, and the optimal times to refer patients to hospitals, traditional healers can become valuable allies. Workshops, could explain the hazards of self-medication and emphasize the importance of completing prescribed antibiotic courses. This approach not only empowers healers with scientific knowledge but also helps bridge the gap between

traditional practices and modern medicine. Moreover, it is crucial to create co-designed messaging that honors traditional practices while highlighting scientific data. Healers may promote herbal cures for non-bacterial ailments while acknowledging the essential use of antibiotics in some situations **(14)**.

Community-Based Education Campaigns: An additional efficacious strategy involves launching community-based education campaigns. Using multiple channels, such as social media, radio, and local languages, can help disseminate accurate information to a broader audience. It is essential to customize social media content to dispel prevalent inaccuracies such as the fallacy that antibiotics are useful against influenza, and to advocate for ethical usage **(15)**.

Conclusion

We concluded from our study that there is a significant gap between awareness and understanding of antibiotics and antibiotic resistance within the community. Self-medication practices are widespread, and our survey also revealed that local traditions and cultural beliefs significantly influence attitudes towards antibiotic use. These traditions often shape individuals' perceptions and practices concerning antibiotics, contributing to improper usage. Therefore, raising awareness through targeted campaigns is crucial to address both the knowledge gap and the cultural factors that influence antibiotic use. Such campaigns should focus on educating the community about the dangers of antibiotic resistance and the importance of responsible antibiotic use, while also being sensitive to local cultural practices.

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