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Clinical history, knowledge, and antibiotic use practices among adult patients with cellulitis attending clinical services at Kiruddu Referral Hospital in Kampala. A cross-sectional study.

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Abstract

Background:

Cellulitis is a common bacterial skin infection with a high recurrence rate. Patient knowledge, clinical history, and antibiotic use practices are critical factors influencing treatment outcomes and the development of antimicrobial resistance (AMR). This study aimed to describe the clinical characteristics, history, and knowledge of AMR among adult patients with cellulitis at Kiruddu Referral Hospital, Kampala.

Methods:

A descriptive cross-sectional study was conducted from February to June 2025. A structured questionnaire was administered to 279 consecutively enrolled adult patients with a clinical diagnosis of cellulitis. Data on socio-demographics, clinical history of cellulitis, self-medication practices, and knowledge of AMR were collected. Descriptive statistics were computed using Microsoft Excel and presented in frequencies, percentages, and figures.

Results:

The majority of participants were female (56.3%) and aged 36-45 years (31.5%). A significant proportion (57.7%) had a history of cellulitis, with nearly half (48.4%) experiencing a recurrence within the past year. The lower limbs were the most affected site (62.0%). While 36.9% reported self-medication with antibiotics before hospitalization, 63.1% had not. Although 55.2% had heard of AMR and 69.2% understood that incomplete treatment causes resistance, a concerning 51.3% admitted to not always completing their antibiotic courses. Pharmacies and drug shops were a common source of antibiotics outside formal healthcare settings.

Conclusion:

There is a high recurrence of cellulitis and a significant gap between knowledge of appropriate antibiotic use and actual practices, including self-medication and non-adherence.

Recommendation:

The urgent need for targeted patient education and strengthened antimicrobial stewardship programs to bridge this knowledge-practice gap and combat AMR.

Keywords: *Cellulitis, Antimicrobial Resistance, Self-Medication, Patient Knowledge, Clinical History*
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Introduction

Cellulitis is a prevalent bacterial skin infection of the deep dermis and subcutaneous tissue, clinically presenting as a poorly demarcated, warm, erythematous area accompanied by edema and tenderness (Brown & Hood Watson, 2025). It is a significant cause of global morbidity, contributing to substantial healthcare costs and hospitalizations annually (Yakut et al., 2024). The pathogenesis of cellulitis often involves a compromise in the skin barrier due to factors such as wounds, surgical incisions, or underlying comorbidities like diabetes mellitus and venous insufficiency, which facilitate bacterial entry (Brown & Hood Watson, 2025; Collazos et al., 2018).

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Globally, Staphylococcus aureus and beta-hemolytic streptococci are the predominant pathogens responsible for cellulitis (Brown & Hood Watson, 2025; Theos et al., 2019). The treatment landscape, however, is increasingly complicated by the rapid emergence and spread of antimicrobial resistance (AMR), particularly methicillin-resistant Staphylococcus aureus(MRSA) (Pius et al., 2023; Tadesse et al., 2018). This rise in multidrug-resistant organisms leads to prolonged antibiotic therapy, extended hospital stays, and increased treatment costs, posing a major clinical challenge (Theos et al., 2019; Yakut et al., 2024). In Uganda, studies have documented a high prevalence of MRSA among patients with skin infections, underscoring the severity of the local AMR burden (Nyesiga et al., 2022). The effective management of cellulitis is not solely dependent on microbial factors but is profoundly influenced by patient-related elements. Clinical history, including the recurrence of infection and the presence of comorbid conditions, is a critical determinant of treatment outcomes (Collazos et al., 2018; Long & Gottlieb, 2022). Furthermore, patient knowledge, attitudes, and practices regarding antibiotics are recognized as major drivers of AMR (Keenan et al., 2023; Makeri et al., 2025). Inappropriate practices such as self-medication, failure to complete prescribed antibiotic courses, and sourcing antibiotics from informal outlets are significant contributors to treatment failure and the development of resistance (Keenan et al., 2023; Makeri et al., 2025; Popoola et al., 2024). Studies in Uganda highlight alarming trends in self-medication, a behavior linked to factors like drug shop access and long clinic wait times (Makeri et al., 2025; Nakato et al., 2023).

Despite the known impact of these factors, there is a recognized gap in local data regarding the clinical profile of cellulitis patients and their understanding of AMR at Kiruddu Referral Hospital. Understanding the interplay between clinical history, patient knowledge, and antibiotic use practices is essential for developing targeted interventions, such as robust antimicrobial stewardship programs and patient education initiatives, which are vital for improving treatment outcomes and combating AMR (Keenan et al., 2023; Kidayi et al., 2025). This study aimed to assess the clinical history, knowledge of antimicrobial resistance, and antibiotic use practices among adult patients diagnosed with cellulitis at Kiruddu Referral Hospital, Kampala.

Methodology

Study Design and Setting

A hospital-based descriptive cross-sectional study to describe the clinical characteristics, history, and knowledge of AMR among adult patients with cellulitis at Kiruddu Referral Hospital was conducted over five months (February to June 2025) at Kiruddu Referral Hospital in Kampala, Uganda.

Study Population

The study population consisted of adult patients (aged ≥18 years) presenting to the hospital with a clinician-confirmed diagnosis of cellulitis.

Sample size determination

A sample size of 279 participants was determined using Krejcie and Morgan's formula.

Given the population size (N) of 1,014, the sample size (S) would be calculated as follows:

$S = X\ 2 \cdot N \cdot P \cdot (1 - P)/d\ 2 \cdot (N - 1) + X\ 2 \cdot P \cdot (1 - P)$

Where:

X 2 = Chi-square value (3.841 for 1 degree of freedom at 0.05 confidence level)

N = Population size (1,014)

P = Population proportion (assumed to be 0.5 for maximum sample size); therefore, the prevalence used was P = 0.5, which was a standard assumption used when the true prevalence was unknown. d = Degree of accuracy (0.05)

Calculation: $S = 3.841 \cdot 1014 \cdot 0.5 \cdot 0.5/\ 0.0025 \cdot 1013 + 3.841 \cdot 0.25$

S= 0.0025·1013+3.841·0.25/3.841·1014·0.5·0.5

$S = 973.545/3.4925$

S≈279

Thus, the sample size was determined to be approximately 279 hospitalized patients.

Inclusion criteria

The study included adult patients diagnosed with cellulitis at Liruddu referral hospital who provided informed consent.

Exclusion criteria

The study excluded patients who were critically ill and unable to respond to the interview.

Data Collection Methods

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Quantitative data were collected through face-to-face interviews using a pre-tested, structured questionnaire (See Appendix II). The questionnaire was administered by trained research assistants in the local language (Luganda) or English, based on the participant's preference.

Data Collection Tools and Variables

The questionnaire captured data on:
Socio-demographic characteristics: age, sex, marital status, education level, occupation.
Clinical history: previous episodes of cellulitis, frequency of recurrence, current site of infection, history of antibiotic use before presentation, and presence of underlying comorbidities (e.g., diabetes, HIV).
Knowledge and practices: awareness of antimicrobial resistance (AMR), belief in the consequences of incomplete treatment, self-medication practices, adherence to prescribed antibiotic courses, and common sources of antibiotics.

Data Management and Analysis

Data were cleaned and coded before analysis. Descriptive statistical analysis was performed using Microsoft Excel 2016. Categorical variables were summarized using frequencies and percentages and presented in tables and figures (bar charts and pie charts).

Ethical Considerations

Ethical approval was obtained from the University of Kisubi Research Ethics and Review Committee. Written informed consent was sought from all participants before enrollment. Confidentiality was maintained by using unique identification numbers instead of names on all data collection tools.
Of course. Here is the introduction for your second article, written in the correct citation style as per your original paper.

Results:

Socio-demographic Characteristics of Respondents

Table 1: Socio-demographic Characteristics of Respondents (n = 279)

Variable	Category	Frequency (n)	Percentage (%)
Sex of Respondent	Male	122	43.7%
	Female	157	56.3%
Age Bracket	18–25 years	38	13.6%
	26–35 years	72	25.8%
	36–45 years	88	31.5%
	46 years and above	81	29.1%
Marital Status	Single	86	30.8%
	Married	141	50.5%
	Divorced/Separated	28	10.0%
	Widowed	24	8.7%
Education Level	No formal education	41	14.7%
	Primary	76	27.2%
	Secondary	85	30.5%
	Tertiary	45	16.1%
	University Degree	32	11.5%
Occupation	Civil servant	36	12.9%
	Peasant	79	28.3%
	Self-employed	71	25.5%
	Unemployed	49	17.6%
	Student	44	15.8%

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Table 1 indicates that gender representation of the respondents consisted of more females at 56.3% (n=157) and slightly fewer males at 43.7% (n=122). This seems to suggest that the sampling method influenced the study sample demographics towards women, and the study subject had greater relevance to, or interest from, female respondents.

The respondents aged 36–45 years also represented the majority of the sample (31.5%, n=88), suggesting that some middle-aged individuals occupy their time with the issues being considered in this study. Of note, the lowest number of respondents for this study was collected from individuals aged 18–25 years (13.6%, n=38); this may suggest concern with these issues, or there may be limited access to these issues due to the ages of respondents.

In addition, nearly half of the respondents (50.5%, n=141) identified themselves as married, again suggesting that marital status may have some relevance to the issues being examined in conjunction with the study. In contrast, the fewest number of respondents (8.7%, n=24) identified themselves as widowed, suggesting there was very little presence of widowed respondents who participated in the study.

Also, the highest level of educational attainment was secondary education, reported by 30.5% (n=85) of respondents. This indicates that most people in the study reported some level of basic formal education. The lowest proportion was people with a university degree, representing 11.5% (n=32), which implies fewer participants reported having advanced forms of academic qualifications.

Finally, for occupation, the largest occupational grouping was peasant, who comprised 28.3% (n=79) of the respondents. This indicates a strong representation from those involved in informal or subsistence farming. The smallest occupational group was civil servants, making up only 12.9% (n=36), which suggests either a smaller population presence or poorer participation in the study.

Clinical Characteristics and History

This section provides the clinical background and medical history of adult patients with cellulitis attending Kiruddu Referral Hospital. The analysis of the background focuses on previous episodes of cellulitis, the anatomical site affected, previous antibiotics, and their backgrounds with comorbidities. These characteristics help establish important clinical circumstances for identifying potential risk factors and management concerns associated with cellulitis, particularly related to antibiotics and the presence of underlying immunocompromising conditions.

Figure 1: Showing the distribution of respondents according to whether they had ever heard of cellulitis before, n=279

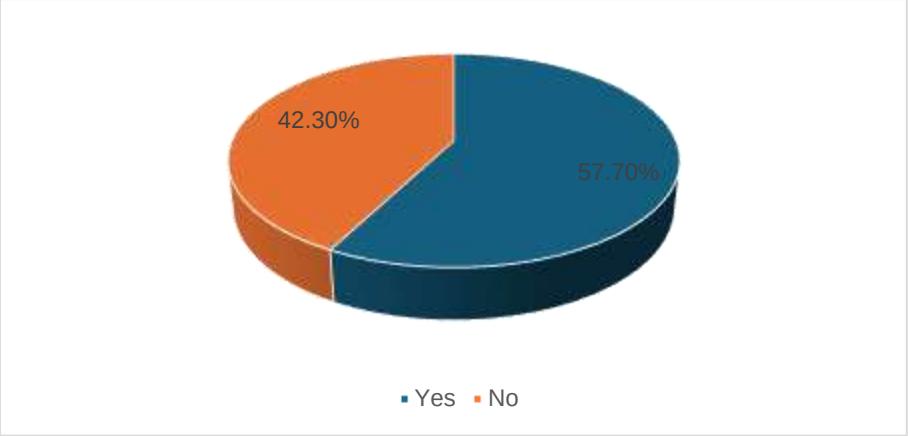

Figure 1, showing that most respondents indicated they had at least one time before, 57.7% (n=161). This high rate indicates the sample may have recurrence or some degree of susceptibility. A lower number, 42.3% (n=118) stated they had never experienced cellulitis, which might suggest there is a reasonable portion of the population who have never had cellulitis.

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Figure 2: Showing the distribution of respondents according to Times they had cellulitis, n=279

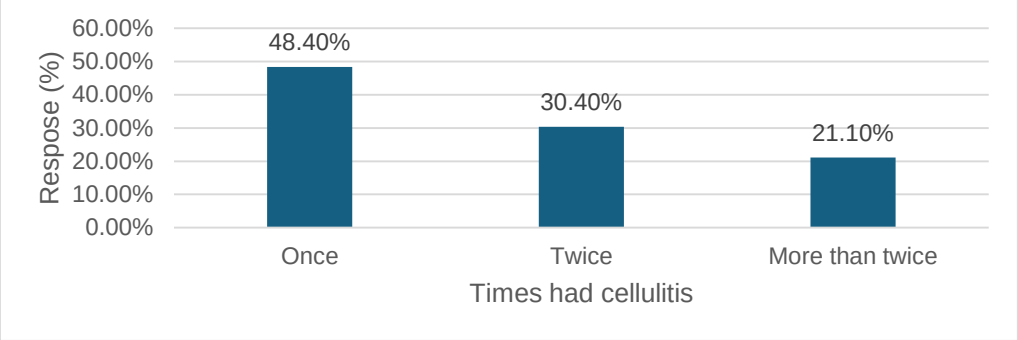

Figure 2 showed that almost half, 48.4% (n=78) of the respondents, who have had cellulitis before (n=161), indicated they have had it at least once in the last year. In contrast, 21.1% (n=34) suggest they have had it twice or more, which indicates a group of patients with recurrent or chronic episodes.

Figure 3: Showing the distribution of respondents according to current site of cellulitis, n=279

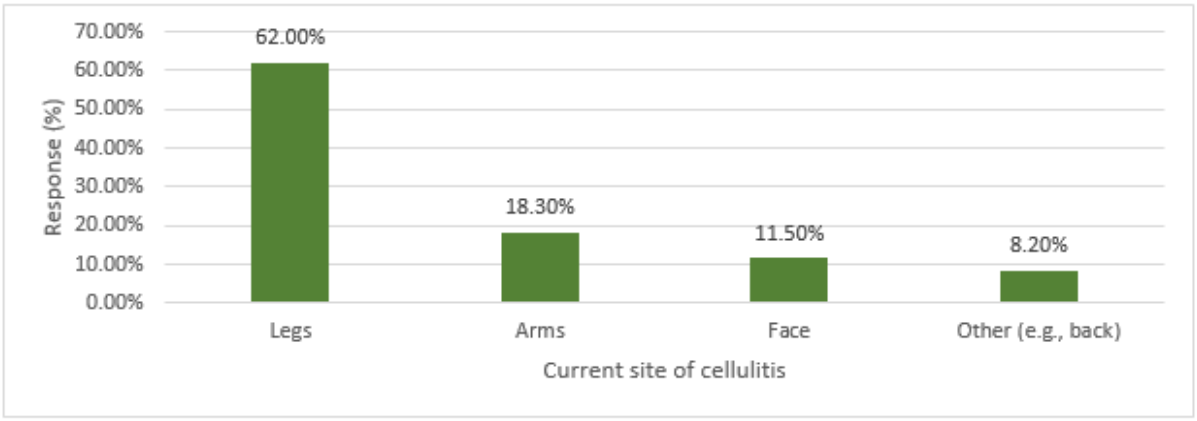

Figure 3, showing that the legs were overwhelmingly the most common site of cellulitis as reported by 62.0% (n=173) of respondents. This suggests a considerable portion of the patients who have had cellulitis were affected in the lower extremities, with the least affected site classified as 'other' (i.e., the back), identified by only 8.2% (n=23) of respondents.

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Figure 4: Showing the distribution of respondents according to whether they took antibiotics before hospital, n=279

Figure 4 showed that most participants did not indicate using antibiotics before visiting the hospital. The majority, 63.1% (n=176), reported not having taken any antibiotics before their hospital visit. This may be due to delayed treatment or not having access to the medication already prescribed. A smaller proportion, 36.9% (n=103), indicated that they had taken antibiotics before admission to the hospital.

Figure 5: Showing the distribution of respondents according to the Underlying conditions, n=279

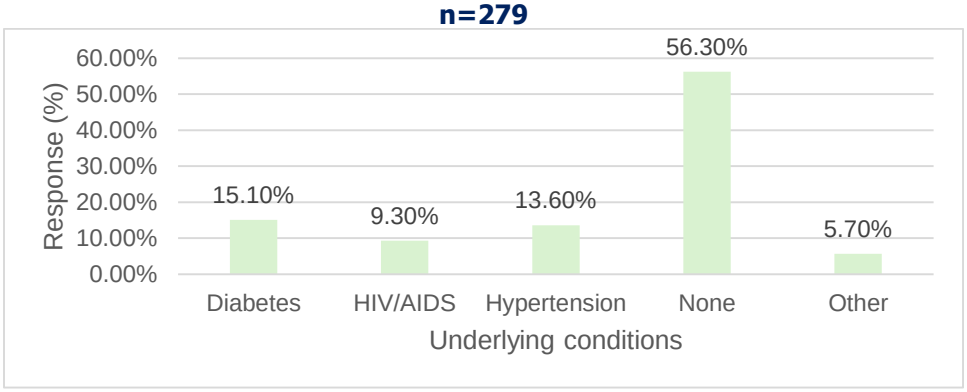

Figure 5 documented that when looking at underlying conditions (which included multiple responses), the most frequently reported response was categorically stated as "none," 56.3% (n=157); so this group appears to have a primary concern being cellulitis. Amongst those who reported having an underlying condition, the most common condition described was diabetes at 15.1% (n=41), while the "other" condition includes the smallest proportion at 5.7% (n=16), so diabetes appears to be a common comorbidity situation among patients who are being treated for cellulitis.

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Figure 6: Showing the distribution of respondents according to whether they heard of AMR, n=279

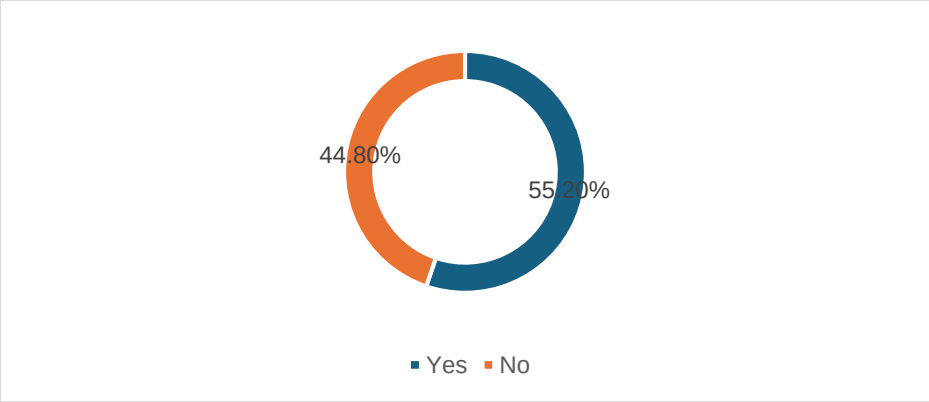

Figure 6 indicates a slight majority (55.2%; n=154) reported they had heard of antibiotic resistance, indicating a moderate knowledge level. However, 44.8% (n=125) had never heard of it, indicating a sizeable knowledge gap that could hamper effective antimicrobial stewardship.

Figure 7: Showing the distribution of respondents according to whether they had an incomplete treatment causes resistance, n=279

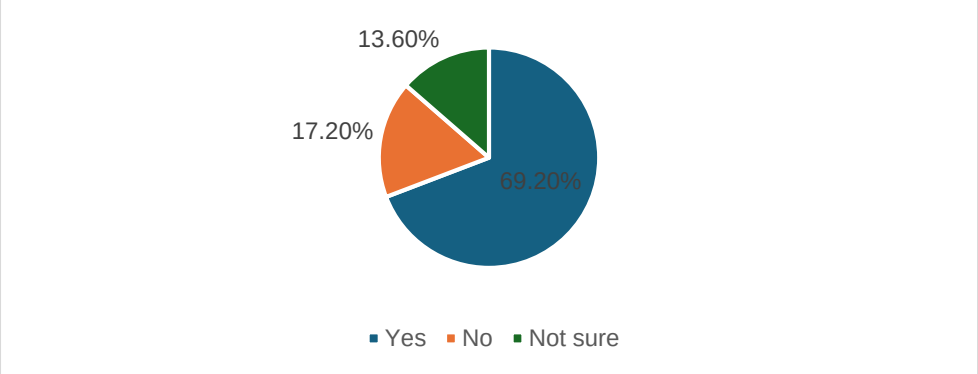

Figure 7 showed 69.2% (n=193) believed that not completing a full course of antibiotics leads to resistance, demonstrating a relatively good understanding of this important concept. Only 17.2% (n=48) rejected this belief, while 13.6% (n=38) did not know, demonstrating aspects of knowledge that require further education.

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Figure 8: Showing the distribution of respondents according to whether they used antibiotics without prescription, n=279

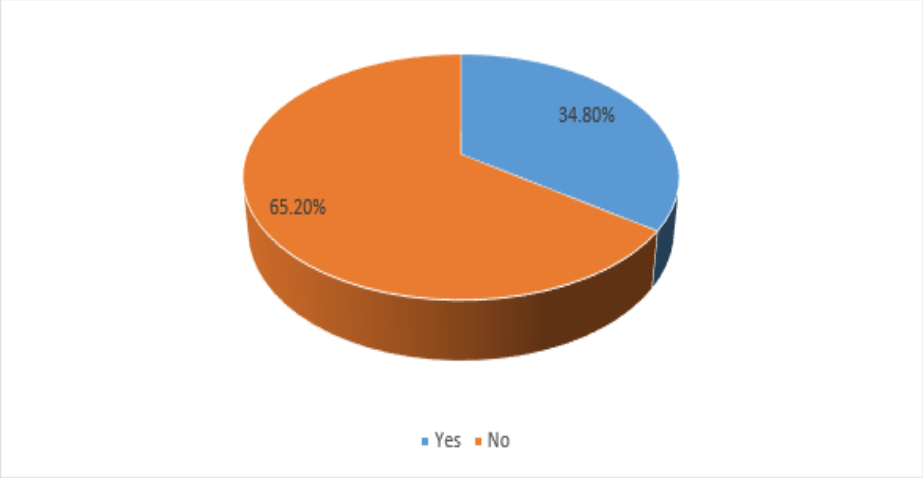
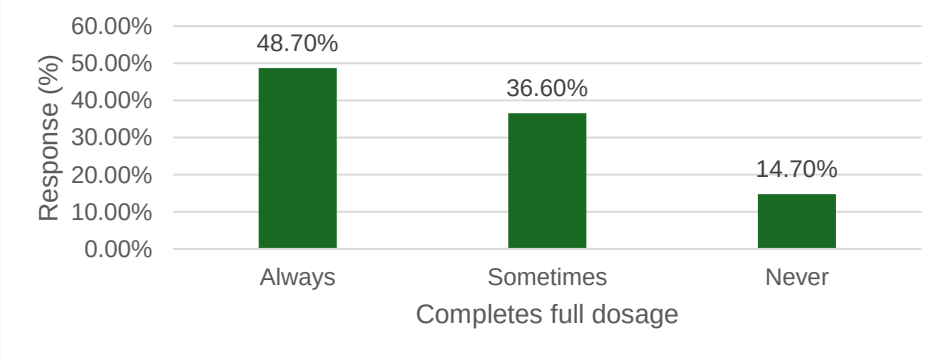


Figure 8 showed that most respondents (65.2%; n=182) did not report the use of antibiotics without a prescription, suggesting appropriate adherence to the appropriate medical direction. Conversely, 34.8% (n=97) reported using antibiotics without a prescription, a number that raises public health concerns about misuse and self-medication.

Figure 9: Showing the distribution of respondents according to whether they completed the full dosage, n=279



In terms of completing their full dosing of antibiotics, 48.7% (n=136) of respondents said they 'always do', making it the most common response. However, 14.7% (n=41) admitted to 'never' completing the full dose, which is an unfortunate practice that could lead to treatment failures and antibiotic-resistant strains of bacteria. A further 36.6% (n=102) reported they only do this 'sometimes', which again suggests inappropriate and unreliable adherence.

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Figure 10: Showing the distribution of respondents according to the Source of antibiotics, n=279

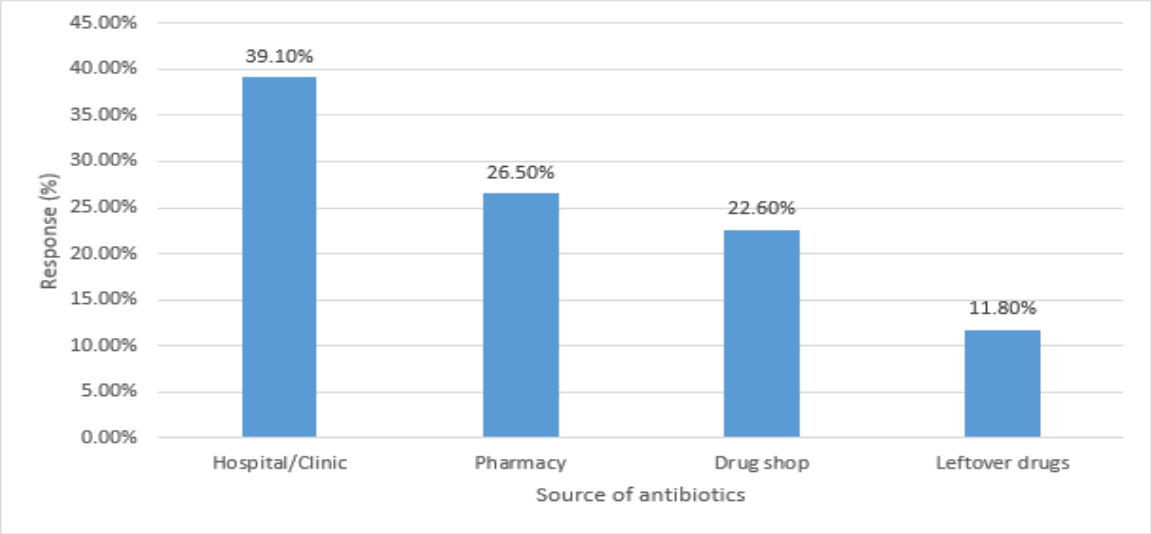

Figure 10 indicates that the most common source of antibiotics was hospitals or clinics, cited by 39.1% (n=109) of respondents, which is positive in terms of indicating access to formal healthcare services. The least common source was leftover drugs, as reported by 11.8% (n=33) respondents, but likely still a bad practice, as this still allows for the possibility of inappropriate self-doings and resistance development.

Discussion

Socio-Demographic Characteristics of Respondents

This study documented that the females constituted 56.3% (n = 157) of the patient cohort and were more represented than males. This pattern likely reflects vulnerabilities related to gender, which stemmed from risk behaviors associated with household roles and caregiving in their communities. It can theoretically expose females to skin breaches and environmental hazards. Similar surveys in East Africa, including Uganda and Tanzania, report a female predominance of 79% of clinic populations for various infections, including skin and soft tissue infections (Keenan et al., 2023). A national AMR surveillance program in Uganda, this study noted, also found S. aureus derived from females having higher resistance rates, not only indicating higher prevalence, but potentially also suggesting differences in antimicrobial exposure or antimicrobial usage (Bazira et al., 2025). These accounts warrant thinking about gender-responsive public health approaches that address equitable access for sick women and productive messaging about early detection, wound care, and antibiotic responsibility.

Most respondents were in the age range of 36–45 years (31.5%, n = 88), with significant proportions falling in the 26–35 and 46+ year ranges. People in these age ranges are economically active and likely to be fulfilling household, work, or caring responsibilities—all of which often include injury, heavy lifting, and repetitive strain exposure that may amplify their risk of cellulitis. The age distribution was similar when comparing data from African cellulitis studies; for example, the patient profiles in Kenyan cellulitis studies have mean ages close to those of this outbreak efficacy study (Nyasinga et al., 2020). The active and responsible stage of life reinforces the need for integrated community approaches (e.g., education on routine foot and skin care, occupational community coverage, and community-based disease screening) during these age ranges.

About half of the respondents reported secondary education (30.5%, n = 85), 27.2% primary education, 16.1% post-secondary education, and 11.5% university-level education. Education levels influence health-seeking behavior and health literacy, often leading to heightened awareness—but

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they may also be associated with increased self-medication and improper antibiotic use related to confidence (Popoola et al., 2024). In Uganda, higher education does not necessarily lead to prudent antibiotic use, with students of a tertiary education status being less likely to self-medicate (Keenan et al., 2023). When compared with graduates in Nigeria, who were self-medicating at a prevalence of 47.7% despite a tertiary level of education (Popoola et al., 2024). These inconsistencies may further highlight the need for educational interventions that are targeted not only to increase knowledge but also to address confidence-based misuse, reinforce adherence to the prescription course, and advocate for cautious antibiotic use regardless of level of education.

Clinical Characteristics and History

A notable 57.7% (n = 161) of respondents indicated past cellulitis, with almost half of this figure (48.4%, n = 78) having experienced at least one case within the past year. This highlights a serious rate of recurring cellulitis that likely reflects an unknown clinical potential, like chronic wounds, diabetes, or edema, causing habitual bacterial entry (Brown & Hood Watson, 2025), with a systematic review pointing to the link between cellulitis relapse and disruption of the skin. In addition to the associations between cellulitis and chronic wounds, the proportion of respondents who had cellulitis in the leg (62.0%, n = 173) provides a hint that these respondents may have had some reduced leg circulation, a known characteristic that predisposes to relapse with infection (Turton et al., 2021). Although the majority of participants (56.3%, n = 157) indicated that they had no underlying conditions, 43.7% of participants demonstrated comorbidities like diabetes, hypertension, or HIV, which are known to cause prolonged wound healing and increased susceptibility to infection, particularly in East Africa. In addition, 63.1% (n = 176) of respondents did not have access to or self-medicated with antibiotics before this hospital visit for cellulitis, perhaps due to restrictions, fear, or prior unsuccessful attempts at self-medication. Self-medication reported by 36.9% of the cohort likely promotes incomplete treatment, which heightens the risk of recurrent cellulitis episodes and fosters resistance patterns (Makeri et al., 2025). Overall, this demonstrates the need for whole-of-person, whole-of-practice interventions that consider the whole lived experience of chronic disease, the management of wounds, and patient education.

Knowledge and Awareness of Cellulitis and Antimicrobial Resistance

According to the survey data, more than half of the participants(n=154,55.2%) indicated they were aware of antimicrobial resistance (AMR) before the study. The implication here is not that awareness is 100% established in the community, but rather that awareness is being built. The survey data revealed that 69.2% (n = 193) of participants were aware that non-adherence to a full antibiotic course is a driver of resistance, suggesting a positive trend in public understanding. Infectionally, though, there were alarming rates of 77. 1) Only 48.7% (n = 136) of respondents reported that they always finished their prescribed dosage of antibiotics, and 14.7% (n = 41) of respondents indicated they did not complete an antibiotic treatment course at all. While none of the role confusion barriers indicated any significant role confusion barrier, there was a clear gap between knowledge and action. The survey results align with prior regional studies; for instance, comparable shortcomings in practical knowledge application were reported in research conducted in Tanzania (Kidayi et al., 2025). So, overall, some basic elements of awareness exist to AMR, but there is an inadequate behaviour change uptake. In the absence of an educational intervention, the existing barriers to accessibility, trust, and continuity of care would need to be addressed in educational interventions to influence either behaviour or beliefs.

The results showed that 34.8% (n = 97) of participants had self-medicated with antibiotics, which coincided with the national statistics of unsupervised antibiotic use. Makeri et al. (2025) reported a pooled prevalence of self-medication in Uganda of 55.6%. Self-medication was reported as the most prevalent form of use of antibiotics (Makeri et al., 2025). In university populations, the prevalence can be even higher, with studies reporting up to 93.8% identified to be self-medicating because of presumed minor illness and previous antibiotic experiences (Nakato et al., 2023). The factors are complex in epidemiology and include system-level factors of drug shop access, poverty, and long wait times at clinics, which all contribute to the continuing self-medication and associated antimicrobial resistance, since these are all linked to self-medication. Public health approaches should harmonize regulating sales of antibiotics with community education that informs pharmacists and patients on self-medication, while considering structural and culturally relevant factors that reinforce self-medication.

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Conclusion

The findings of this study reveal a critical disconnect between knowledge and practice in the management of cellulitis among patients at Kiruddu Referral Hospital. The patient profile is predominantly that of middle-aged women, a demographic whose domestic and occupational roles may predispose them to skin injuries and subsequent infection. A high recurrence rate of cellulitis, particularly in the lower limbs, signals underlying vulnerabilities and potential gaps in the management of chronic wound care and comorbid conditions.

Although a reasonable level of awareness about antimicrobial resistance (AMR) exists, with a majority of patients understanding that incomplete treatment drives resistance, this knowledge does not translate into prudent behavior. A significant proportion of patients engage in self-medication and fail to complete prescribed antibiotic courses. This knowledge-practice gap is exacerbated by systemic factors such as the easy availability of antibiotics from drug shops and pharmacies without a prescription. These practices contribute to treatment failures, recurrent infections, and the burgeoning crisis of AMR, presenting a major obstacle to effective cellulitis management in this setting.

Recommendations

For the Ministry of Health and Policymakers

Strengthen Regulatory Enforcement: Enforce existing policies that prohibit the sale of antibiotics without a prescription. This should involve regular monitoring and stringent penalties for pharmacies and drug shops that violate these regulations.

Launch National Public Health Campaigns: Develop and disseminate clear, multilingual public health messages focused on the appropriate use of antibiotics, the dangers of self-medication, and the importance of completing prescribed courses. These campaigns should utilize radio, community workshops, and posters in healthcare facilities.

For Healthcare Facilities

Integrate Patient Education into Clinical Care: Implement structured patient education sessions during consultations for cellulitis and other infectious diseases. Healthcare providers should clearly explain the diagnosis, the importance of adherence to the full antibiotic course, and the risks of AMR.

Develop and Display Information, Education, and Communication (IEC) Materials: Create simple posters and leaflets for waiting areas and wards that visually communicate key messages about completing antibiotic treatment and avoiding self-medication.

For Community Engagement

Train Community Health Workers (CHWs): Equip CHWs to educate communities on basic wound care, the identification of early signs of cellulitis, and the importance of seeking formal healthcare promptly instead of self-medicating.

Establish Peer Support Groups: Facilitate the creation of support groups for patients with recurrent cellulitis or chronic conditions like diabetes. These groups can provide a platform for sharing experiences and promoting best practices in self-care and treatment adherence.

For Future Research

Conduct qualitative studies to explore the deep-seated reasons behind self-medication and non-adherence in this population to inform more targeted interventions.

Implement longitudinal studies to track the impact of these recommended interventions on self-medication practices and adherence rates over time.

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God's blessings upon you all!

List of abbreviations:

MRSA: Methicillin-Resistant Staphylococcus aureus
HIV: Human Immunodeficiency Virus
AMR: Antimicrobial Resistance
SSTI: Skin and Soft Tissue Infection

Data availability

Data was available upon request.

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Conflict of interest

The author declares no conflict of interest.

Author Biography

Jorome Nteziyaremye is a student at the University of Kisubi, pursuing a degree in biomedical laboratory technology.

Author contributions

Jorome Nteziyaremye was the author, Mr. Habert Mabonga and Mr.James Kasozi were the supervisors, at Kisubi University.

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