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RESEARCH

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Knowledge, attitude, and practices regarding antibiotic use and antimicrobial resistance among urban slum dwellers in Uganda

Regina Ndagire[1,3*], Ekwaro A. Obuku[1,5,6], Ivan Segawa[4], Fiona Atim[3], Catherine Nassozi Lwanira[3], Rachel Nante Wangi[1] and Moses Ocan[1,2]

Abstract

Background Antimicrobial resistance (AMR) remains a public health threat especially in low-and-middle-income countries (LMICs). Urban slum dwellers are at higher risk of developing AMR than the general population. The aim of this study was to assess the knowledge, attitude and practices (KAP) regarding antibiotic use and AMR and the associated socio-demographic determinants among urban slum dwellers in Uganda.

Methods A cross sectional study was conducted among 371 adults of Bwaise slum in Uganda selected through multi-stage cluster sampling techniques. An interviewer administered questionnaire was used to collect data on participants' socio-demographics, KAP regarding antibiotic use and AMR. The responses to the KAP were aggregated into scores for each participant which were later dichotomized by the mean to form the predictors variables. Analysis was done in STATA 17.0. A modified Poisson regression model was used to determine predictors of each of KAP, while considering a 5% significance level.

Results The study enrolled 371 participants of which 238(64.2%) were females. The median (IQR) age of the participants was 31 [24, 40] years. Over half of the respondents, 205(55.3%) were married and 157(42.3%) had primary level education. Of all participants, 177 (47.7%), 184 (49.6%) and 205 (55.3%) had good knowledge, a positive attitude and good practices regarding antibiotic use and AMR respectively. Being single (aPR = 0.75, p-value = 0.040) was negatively associated with good knowledge of antibiotic use and resistance, while having acquired tertiary education level (aPR = 1.88, p-value < 0.001) and self-employed (aPR = 1.36, $p = 0.017$) were associated with good knowledge of antibiotic use and resistance. Male gender (aPR = 1.25, p-value = 0.036) and monthly income < 300,000 UGX (aPR = 1.42, p-value = 0.003) were associated with a positive attitude towards antibiotic use and resistance. Likewise tertiary level of education (aPR = 0.64, p-value = 0.033) was negatively associated with good practices of antibiotic use and resistance.

Conclusion and recommendations Residents of urban slums have limited knowledge of antibiotic use and AMR with minimal understanding of AMR concepts. Education level, gender, occupational status are key players in people's understanding and practices of antibiotic use and AMR. There's need for context specific health education

*Correspondence:
Regina Ndagire
ndaginar@gmail.com
Full list of author information is available at the end of the article

programs. Health promotion messaging should emphasize AMR concepts and dangers of drug misuse. Antimicrobial stewardship initiatives should trickle down to the local citizen.

Keywords Knowledge, Attitude and practices (KAP), Antibiotic use, Antimicrobial resistance, Uganda

Introduction

Antimicrobial resistance (AMR) is an emerging global public health threat. It is estimated that in 2019, nearly 5 million deaths globally were attributed to bacterial AMR [1] and this is projected to increase to 10 million by 2050 [2, 3] if not addressed. In Sub-Saharan Africa, 1.27 million people in 2019 died of antibiotic resistant infections [1, 4]. Uganda has also reported of diminishing effectiveness of commonly prescribed antibiotics with some drugs at or near 100% resistance [5, 6] due to a high rate of antibacterial consumption and misuse [7], and low awareness about proper antibiotic use and AMR [8, 9]. Although communities in Uganda have not been well studied regarding understanding of antibiotic use and AMR, studies elsewhere indicate low levels of awareness [10] and antibiotic misuse [11] in the general population. The nature of slums predisposes residents to communicable diseases [12–14] yet they are less likely to afford proper medical care [13–15]. People resort to using antibiotics to prevent recurrent illnesses like diarrhea [15] which puts them at risk of antibiotic overuse [16] hence risk developing AMR [8]. Consequently, this could lead to morbidity, increased medical costs treating resistant infections, increased resource utilization and sometimes mortality [17, 18].

In 2018, Uganda prioritized AMR among its public health threats [19]. However, the 2023 National Action Plan for Health Security (NAPHS) assessment showed that Uganda does not yet have capacity to prevent multidrug resistant organisms (score 1) and has limited capacity in the optimal use of antimicrobial medicines in humans (score 2) [20]. It is therefore important to study AMR to understand why Uganda is not meeting the bench marks. Research in Uganda has investigated knowledge, attitude and practices of antibiotic use and AMR among medical students [21, 22], and health care providers [21, 23]. Studies have also been done on AMR in patients [24–27]. The country has also embarked on Antimicrobial stewardship (AMS) measures including JEE [20], trainings, policy documentation [28, 29] and health facility level AMS programs. However, antimicrobial use in informal settlements remains less understood. In this study therefore, we investigated the knowledge, attitude and practices about antibiotic use and AMR and associated factors among people in an urban slum in Uganda.

Methods

Study design and setting

A cross sectional survey was conducted between June and August 2023 among households in Bwaise slum. Bwaise slum is located in Kawempe division, Kampala capital city. Bwaise is the largest slum in Kampala and is made up of three [3] parishes – Bwaise I, II and III. The slum is bordered by Makerere village to the south, Mulago the southeast, Kasubi to the southwest, Kyebando to the east, and Kawempe village to the north. The three parishes have an estimated population of over 50,000 people with about 12,500 households [30]. Residents engage in small scale retail businesses for a source of livelihood. The slum is characterized with poor infrastructure, poor drainage and housing [12, 13] which predispose residents to flooding, water borne diseases especially after heavy rains, and other communicable diseases.

Study population and sample size estimation

The study included adult residents (≥ 18 years) of Bwaise slum who were present in their homes at the time of data collection, reported to have heard about a type of medicine called antibiotics and were able to give written informed consent. Eligible participants who couldn't comprehend English or Luganda (local language), or who were too ill to respond to the study questionnaire were excluded. The sample size was calculated using Kish-Leslie's formula [31] of sample size calculation using Zα corresponding to 95% level of confidence (z) of 1.96, and assuming a proportion of knowledge of antibiotic use among slum dwellers (p) of 83% [32]. A sample size of 371 was generated after adjusting for 14% non-response and a design effect of 1.5 to adjust for clustering.

Sampling procedure

Participants were selected through a multi-stage cluster sampling method. First, three parishes of Kawempe division that make up Bwaise slum were purposively selected based on their characteristics as urban informal settlements [13]. The three parishes are made up of 23 wards (villages) however three were inaccessible due to insecurity. The sample size was divided equally among the 20 villages to give us 18–19 respondents per village. We used the village LC chairperson's home as a starting point and spread in opposite directions while consecutively selecting all eligible households in each direction until the required number in each village was obtained. Only one adult was selected per household. If a house had more than one adult, simple random sampling using a table of random numbers was used to select one adult. Households with no adult at the time of data collection were skipped to the next in line.

Study instrument and data collection

The study tool was adapted from similar studies [10, 33, 34] and was pre-tested on 13 randomly selected participants in Katanga slum and thereafter adjusted accordingly to suit the study objectives. The reliability of the final questionnaire was determined using Cronbach's alpha; knowledge (0.84), attitude (0.65) and practices (0.48). The study used an interviewer administered questionnaire to collect information on demographics, knowledge of antibiotics and AMR, people's attitude and practices of antibiotic use. The interviews were conducted by three research assistants (RAs) working under supervision of the Principal Investigator (PI). The RAs were trained on the study protocol, data collection tools and ethical conduct of research prior to field data collection. The study questionnaire was administered in either English or Luganda (local language) depending on the participants' preference.

Data management and statistical analysis

The data entry screen with checks was developed in Epi-Data Manager version 4.6.0.6 (EpiData Association, Odense, Denmark), and data was entered in duplicate. The data sets were then exported to STATA 17 (StataCorp, College Station, TX, USA) for cleaning and analysis. Means (and standard deviations [SD]) were used for summarising normally distributed numerical data and medians (and interquartile ranges [IQR]) for skewed data. Frequencies and percentages were used for summarizing categorical variables.

The primary outcomes were knowledge, attitude and practices. Knowledge and attitude were assessed by a set of questions each on a five-point Likert scale. The responses were merged into three categories; "strongly disagree" and "disagree" were collapsed into "No"; "Uncertain" into "Don't know" while "agree" and "strongly agree" were merged into "Yes" [35, 36]. The responses were given a score of "2" for a correct response and "0" for a wrong or uncertain response. The scores on each question were aggregated for each respondent into a knowledge and attitude score. Practices, on the other hand, were assessed using a five-point Likert scale of "almost always", "often", "sometimes", "seldom" and "never". The responses to practice questions were given a score on the 5-point Likert scale ranging from "5" for the most appropriate response to "1" for the least appropriate response. The scores on each question were also aggregated for each respondent into a practice score. The mean score for each of knowledge, attitude and practice scores were obtained and used as a cut-off to dichotomize these continuous variables into categorical variables which served as the dependent variables. Participants with scores higher than the mean were considered to have "good knowledge", "positive attitudes" and "good practices" relating to antibiotic use and AMR [10].

Spearman rank order correlation coefficient (ρ) was used to assess the strength and direction of the relationship between each pair of knowledge, attitude, and practices scores of the participants. A modified Poisson regression model with robust standard errors was used to assess for socio-demographic factors associated with knowledge, attitudes, and practices. The regression models reported prevalence ratios (PR) along with the corresponding 95% confidence intervals (CI). The study used a significance level (α) of 5%. We however found the design effect (DE) of the study to be one hence did not require adjusting for clustering in the analysis. Demographic factors with a $p < 0.2$ at bivariate analysis were considered for multivariable analysis. Interaction was assessed using a chunk test. Variables were assessed for confounding considering a 10% change in prevalence ratios (PR) between the crude and adjusted models. However, we found no interaction or confounding. The variables that remained significant after multivariable analysis ($p < 0.05$) were considered as the factors associated with knowledge, attitudes, and practices.

Results

Socio-demographic characteristics of study participants

A total of 371 participants were recruited into the study of which 238 (64.2%) were females. The median (IQR) age of study participants was 31 [24, 40] years. Over half of the respondents, 205(55.3%) were married and 157(42.3%) had primary education. The median (IQR) monthly income level was 300,000(150,000, 600,000) UGX and 151(40.7%) were self-employed (Table 1).

Knowledge of antibiotic use and antimicrobial resistance

The respondents' mean (SD) knowledge score was 15.0(± 4.0) out of the possible 26 points. Slightly over half, 194(52.3%) of the participants scored below the average knowledge score. We found that 321(86.5%) correctly identified Amoxicillin as an antibiotic and 288(77.6%) knew that Paracetamol is not an antibiotic. Nearly half, 179 (48.3%) did not answer correctly to the statement *"antibiotics are not often needed for cold and flu illness"* and 136 (36.7%) did not know that *"diarrhea does not always need antibiotics."* Of all participants, 270(72.8%) did not answer correctly that *"antibiotics can cause allergic reactions"*. Few respondents 91(24.5%) knew that *"antibiotics can cause infections after killing good bacteria present in our bodies"* while only, 96(25.9%) correctly responded that *"antibiotics can kill 'good bacteria' present in our bodies".* On the antibiotic resistance domain,

Table 1 Demographic characteristics of study participants (*n*=371)

Characteristic	Frequency	Percentage
Median age in years (IQR) 31(24,40)		
<31	183	49.3
≥31	188	50.7
Sex		
Male	133	35.9
Female	238	64.2
Marital status		
Single	114	30.7
Married	205	55.3
Divorced/separated/widowed	52	14.0
Education		
None	51	13.8
Primary	157	42.3
Secondary	121	32.6
Tertiary (university/technical institute)	42	11.3
Type of family		
Nuclear	280	75.5
Extended	91	24.5
Median household size (IQR) 4(3,6)		
<4	138	37.2
≥4	233	62.8
Median monthly income in UGX (IQR) 300,000(150,000-600,000)		
<300,000	124	33.4
≥300,000	150	40.4
Missing	97	26.2
Occupation		
Self employed	151	40.7
Employed	157	42.3
Unemployed	63	17.0

Missing – # of participants missing data

IQR – interquartile range

348(93.8%) knew that *“misuse of antibiotics can lead to antibiotic resistance”* (Fig. 1).

Attitude towards antibiotic use and antimicrobial resistance

The mean (SD) attitude score was 9.2(± 2.9) on a scale of 16 points. Over half of the respondents, 198(53.4%) had attitude scores above the mean. We found that, 298(80.3%) responded appropriately that, *“antibiotics would not help them to get better more quickly if they had a fever.”* Almost half of the respondents, 174(46.9%) thought that taking antibiotics for a common cold would prevent them from getting a more serious illness. Likewise, 186(50.1%) perceived that, *“I would rather take an antibiotic that may not be needed than wait to see if I get better without it.”* In this study, 262(71.0%) thought antibiotics can be commonly used while 260(70.1%) of the participants didn’t think that skipping antibiotic doses contributes to the development of antibiotic resistance. Additionally, 204(55.0%) said that they get dissatisfied with a doctor’s visit if they do not receive an antibiotic when they expected it. Less than half of the respondents, 171 (46.1%) indicated that they seek a second opinion from another doctor if a doctor does not prescribe an antibiotic when they think it is needed (Fig. 2).

Practices towards antibiotic use and antimicrobial resistance

The participants’ average (SD) practice score was 24.9(± 4.0) out of the possible score of 35 with majority of the participants, 205(55.3%) scoring above the average. Of all participants, 223(60.1%) reported that they always complete the full treatment course of antibiotics even if they feel better. Nearly half, 177(47.7%) of the participants consult a doctor before starting an antibiotic, and 209(56.3%) don’t use antibiotics as prophylaxis. Some participants, 133(35.9%) said they prefer to obtain antibiotics from the pharmacy rather than a doctor/health worker if you have an illness, and 155(41.8%) always prefer to take an antibiotic when they have cough and sore throat (Fig. 3).

Relationship between knowledge, attitude, and practices of antibiotic use

We found a correlation of − 0.039 (p-value = 0.457) between knowledge and practices. Knowledge – attitude

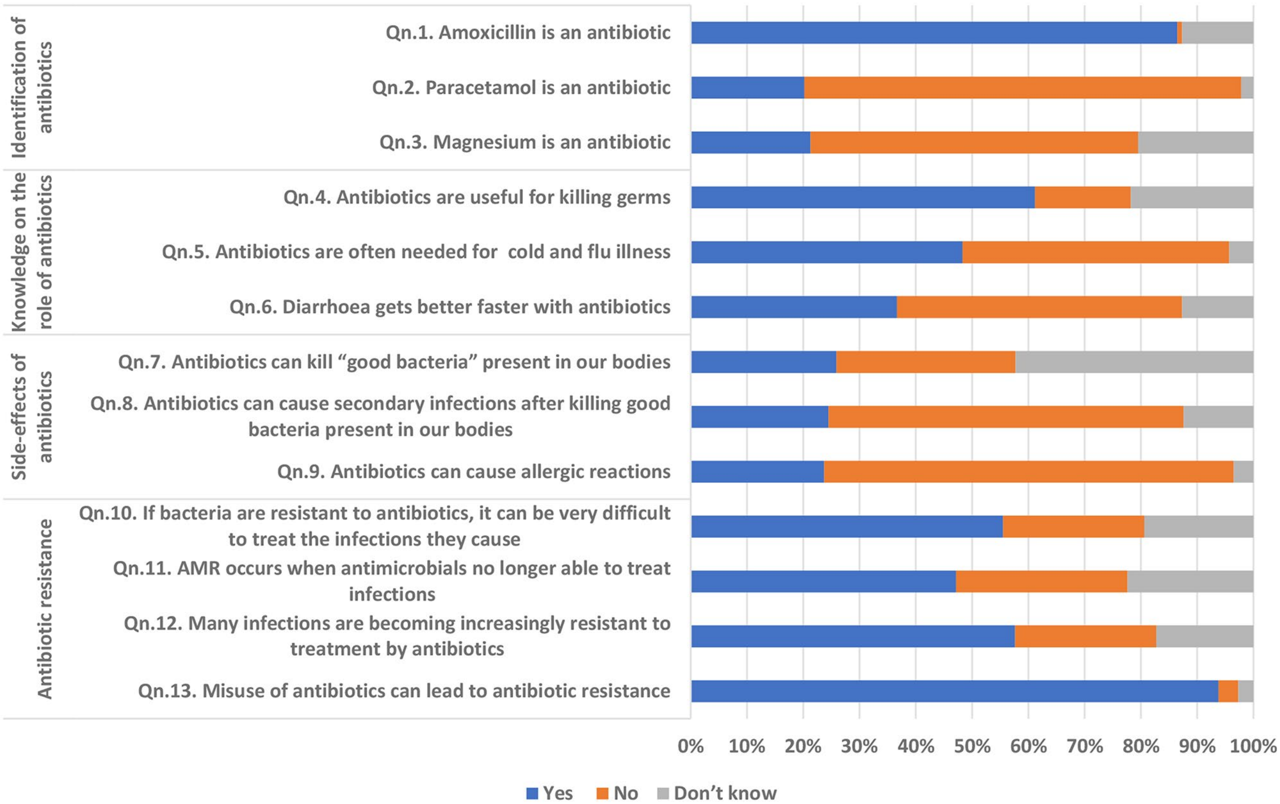

Fig. 1 Responses to questions related to knowledge of antibiotic use and AMR

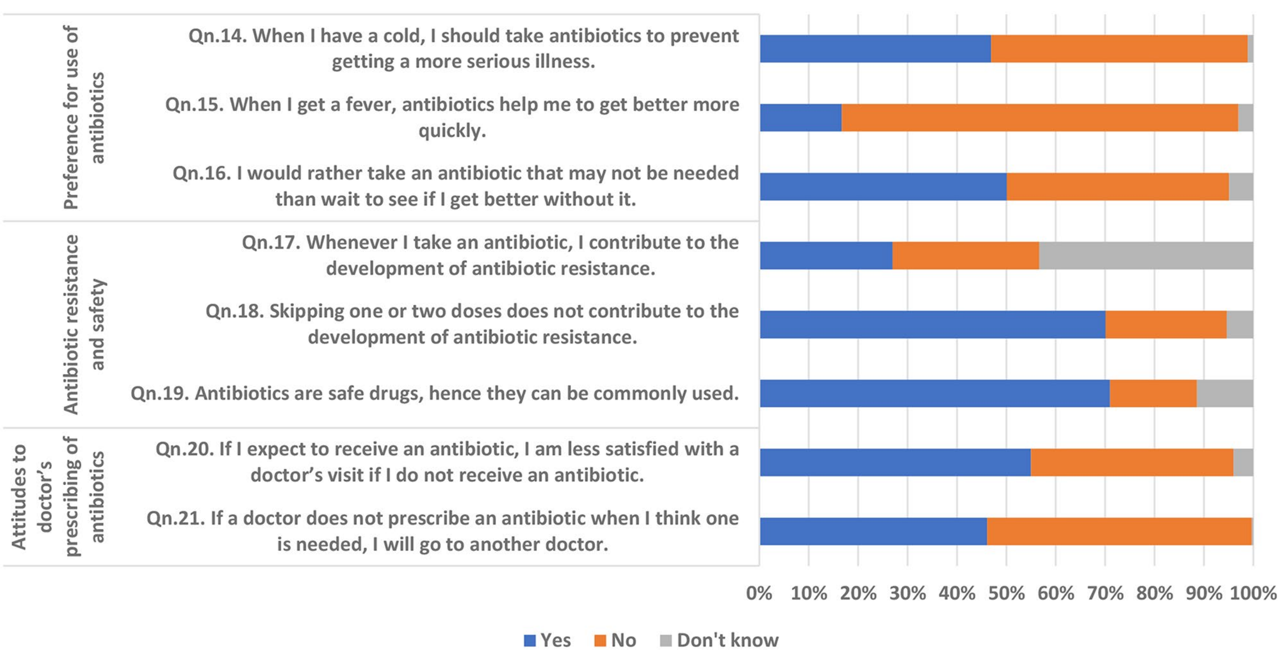

Fig. 2 Responses to questions related to attitude towards antibiotic use and AMR

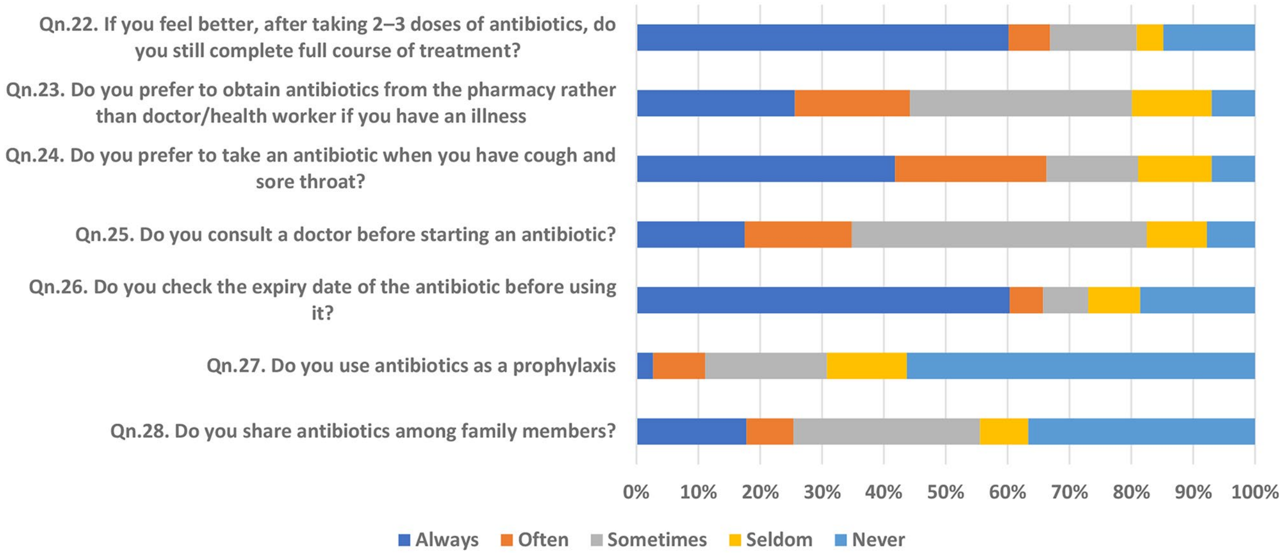

Fig. 3 Responses to questions related to practices towards antibiotic use and AMR

Table 2 Correlation between knowledge, attitude, and practices of antibiotic use

Variable	Correlation coefficient (ρ)	*p*-value
Knowledge – Attitude	+0.0079	0.8789
Knowledge – Practices	-0.0388	0.4567
Attitude – Practices	+0.2383	<0.001

and attitude – practices pairs had + 0.008 (p-value = 0.879) and + 0.238 (p-value < 0.001) respectively (Table 2).

Predictors of knowledge, attitude and practices of antibiotic use and antimicrobial resistance

We found that being single (aPR = 0.69, 95%CI = 0.53–0.91, p-value = 0.040) was negatively associated with good knowledge of antibiotic use and AMR. Having tertiary education level (aPR = 1.70, 95%CI = 1.33–2.17, p-value < 0.001) and being self-employed (aPR = 1.36, 95%CI = 1.06–1.75, p-value = 0.017) were significantly associated with good knowledge of antibiotic use and AMR (Table 3). For attitude towards antibiotic use and antimicrobial resistance, being male (aPR = 1.25, 95%CI = 1.02–1.54, p-value = 0.036) and having an average income < 300,000 UGX (aPR = 1.42, 95%CI = 1.13–1.79, p-value = 0.003) were significant at multivariable analysis (Table 3) . Additionally, tertiary education level was negatively associated with practices of antibiotic use and antimicrobial resistance (PR = 0.64, 95%CI = 0.41–0.98, p-value = 0.033) (Table 3).

Discussion

This study assessed knowledge, attitudes and practices regarding antibiotic use and AMR among urban slum dwellers in Uganda and the associated factors. The study found that nearly half of the respondents had good knowledge, a positive attitude and good practices of antibiotic use and AMR. Additionally, people with tertiary level of education and those who were self-employed were more likely to be knowledgeable about antibiotic use and AMR. People who were single people were more likely to have low knowledge scores. Male respondents and participants with a monthly income below 300,000 UGX were more likely to score above the mean attitude score. Additionally, people with tertiary education level were more likely to have poor practices of antibiotic use.

We found suboptimal knowledge of antibiotic use and AMR among slum dwellers, similar to findings elsewhere [35, 37]. This may allude to limited information access opportunities available for residents in informal settlements [38, 39]. This low knowledge could be contributing to the country's low scores in the JEE. AMS programs in Uganda including infection prevention and control strategies, commemoration of the World AMR Awareness Week, education and training mainly target the formal sector especially the healthcare system and health professionals' training institutions [28, 29, 40]. Health education and awareness campaigns among other AMS initiatives should trickle down to the local citizen and aim to incorporate informal settlements. The current study, however, reports a much lower knowledge level compared to other previous studies from similar settings [32, 41] with 83% and 78.6% respectively. This disparity could be due to differences in tools used to measure knowledge. The current study adopted a standard tool from previous similar studies [10, 33, 34] and used the mean score as a cut off while the previous studies developed their tools and used varied cut offs.

Consistent with a previous study [42], it was noted that participants mostly responded with "don't know"

Table 3 Bivariate and multivariable analysis of factors associated with knowledge of antibiotic use and antimicrobial resistance

Variable	Knowledge			Attitude			Practices		
	Good n (%)	Crude PR (95%CI)	Adjusted PR (95%CI)	Positive n (%)	Crude PR (95%CI)	Adjusted PR (95%CI)	Good n (%)	Crude PR (95%CI)	Adjusted PR (95%CI)
Age in years									
< 31	82 (44.8)	0.88 (0.72–1.09)		91 (49.7)	0.87 (0.72–1.06)		93 (50.8)	0.85 (0.71–1.03)	
≥ 31	95 (50.5)	1		107 (56.9)	1		112 (59.6)	1	
Sex									
Male	61 (45.9)	0.94 (0.75–1.18)		77 (57.9)	1.15 (0.94–1.38)	1.25 (1.02–1.54)*	74 (55.6)	1.01 (0.84–1.22)	
Female	116 (48.7)	1		121 (50.8)	1		131 (55.0)	1	
Marital status									
Single	41 (36.0)	0.67 (0.51–0.88)**	0.75 (0.57–0.99)*	57 (50.0)	0.90 (0.72–1.12)		56 (49.1)	0.87 (0.70–1.08)	
Married	110 (53.7)	1	1	114 (55.6)	1		116 (56.6)	1	
Separated	26 (50.0)	0.93 (0.69–1.26)	1.01 (0.74–1.40)	27 (51.9)	0.93 (0.70–1.25)		33 (63.5)	1.12 (0.88–1.42)	
Education									
None	19 (37.3)	0.82 (0.55–1.22)	0.80 (0.54–1.18)	34 (66.7)	1.31 (1.02–1.68)*		25 (49.0)	0.83 (0.61–1.14)	0.81 (0.60–1.10)
Primary	71 (45.2)	1	1	80 (51.0)	1		92 (58.6)	1	1
Secondary	56 (46.3)	1.02 (0.79–1.32)	1.11 (0.86–1.44)	62 (51.2)	1.01 (0.80–1.27)		73 (60.3)	1.03 (0.85–1.25)	1.06 (0.87–1.29)
Tertiary	31 (73.8)	1.63 (1.27–2.09)**	1.88 (1.44–2.45)**	22 (52.4)	1.03 (0.74–1.43)		15 (35.7)	0.61 (0.40–0.93)*	0.64 (0.41–0.98)*
Type of family									
Nuclear	129 (46.1)	1		144 (51.4)	1		156 (55.7)	1	
Extended	48 (52.8)	1.14 (0.91–1.44)		54 (59.3)	1.15 (0.94–1.42)		49 (53.9)	0.97 (0.78–1.20)	
Household size									
< 4	70 (50.7)	1.10 (0.89–1.37)		60 (43.5)	1.07 (0.89–1.30)		80 (58.0)	1.08 (0.90–1.30)	
≥ 4	107 (45.9)	1		124 (53.2)	1		125 (53.7)	1	
Monthly income									
< 300,000ugx	48 (52.0)	0.74 (0.57–0.98)*	–	75 (60.5)	1.37 (1.09–1.73)**	1.42 (1.13–1.79)**	69 (55.7)	1.02 (0.82–1.26)	
≥ 300,000ugx	78 (21.0)	1		66 (44.0)	1		82 (54.7)	1	
Missing	51 (52.6)	1.01 (0.79–1.29)		57 (58.8)	1.33 (1.04–1.71)*	1.39 (1.07–1.81)*	54 (55.7)	1.02 (0.81–1.28)	
Occupation									
Self-employed	79 (52.3)	1.26 (0.99–1.61)	1.36 (1.06–1.75)*	86 (57.0)	0.86 (0.70–1.06)		82 (54.3)	0.94 (0.77–1.14)	
Employed	65 (41.4)	1		77 (49.0)	1		91 (58.0)	1	
Unemployed	33 (52.4)	1.27 (0.94–1.71)	1.31 (0.93–1.84)	35 (55.6)	0.98 (0.75–1.27)		32 (50.8)	0.88 (0.66–1.16)	

PR – prevalence ratio; CI – confidence interval to side-effects and AMR related questions. This is not uncommon since knowledge of AMR is reportedly generally low [35, 43]. This depicts a gap that could be addressed through AMS awareness campaigns. Respondents were considerably knowledgeable when it came to identification of antibiotics like findings from a similar setting [44]. However, the finding contradicts results from Nepal [35] where less than 30% of the participants could rightfully identify antibiotics. This could be because majority of the respondents in Nepal were from a rural area. There is a potential ease of access to antibiotics in urban areas hence familiarity. Our finding, may therefore, be limited to urban settings. Participants were somewhat familiar with the role of antibiotics similar to findings elsewhere [32, 35].

Half (50.4%) of the participants had a less appropriate attitude towards antibiotic use. This proportion is lower than the 67% reported in literature [35]. This could be attributed to exposure to antibiotics as a result of the urban nature of our study site [45] compared to the majorly rural setting where the previous study was conducted. Contrary to a previous study [32], participants in this study thought that antibiotics can be freely used and majority admitted to using antibiotics whenever they felt like. This may be explained by the limited knowledge about antibiotics and AMR that we found. However, almost all participants agreed that antibiotics may not necessarily help them if they had a fever as is reported in a previous study [35]. Participants were dissatisfied if a doctor didn't prescribe an antibiotic as they expected, similar to a previous study [35]. Patients tend to mistrust doctors who do not prescribe antibiotics [46]. Hence, when asked if they would seek a second opinion to get an antibiotic, participants replied in the affirmative. This is probably because participants had limited knowledge of the dangers of misuse of antibiotics.

In this study, we found majority (55.3%) of the participants to have considerably good scores on practices of antibiotic use and AMR as elsewhere [10] which may allude to rational use of antibiotics in slums. However, it may be a result of social desirability bias although we tried to minimize bias by adapting a standard study tool [34]. Participants, for example, reported to religiously complete the full treatment course even if they felt better, similar to findings from previous studies [10, 32, 35]. Although, many participants did not know that skipping antibiotic doses contributes to development of AMR as elsewhere [9]. Self- medication was also a common practice as many participants alluded to starting antibiotics without a doctor's prescription and some said they prefer buying antibiotics from drug outlets [47] to going to health facilities. This could be because people in slums are less likely to afford the recommended proper healthcare [13, 15]. But also, ease of access to drugs may prompt unregulated drug use [47, 48]. Needless to mention, self-medication is a prevalent antibiotic misuse practice in various settings [10, 49–51]. Contrary to literature [15, 50], in the current study, most participants did not use antibiotics for prophylaxis. Although this may be suggestive of rational drug use, it could to some extent reflect limited insight into some of the roles of antibiotics and hence a potential target by awareness campaigns.

Regarding the correlation between knowledge, attitude and practices, only the attitude – practices pair was statistically significant. Having a positive attitude towards antibiotic use was significantly correlated with good practices of antibiotic use as reported elsewhere [32, 35]. Although we found weak and non-significant correlations between pairs of knowledge and attitude, and knowledge and practices contrary to previous studies [32, 35], the specific questions indicated otherwise. We saw for instance that 48.3% of participants did not know that antibiotics are not needed for a common cold (Fig. 1), likewise, 52.0% said they would use antibiotics to prevent common colds from advancing into severe illness (Figs. 2) and 41.8% reported that they always prefer to take antibiotics when they have cough (Fig. 3). This depicts an interplay between their knowledge, attitude and hence practices. However, the discrepancy found in this study on the correlation between knowledge and attitude; and knowledge and practices of antibiotic use could allude to the effects of the slum environment and the unique characters of this population that prompt for a need for further studies.

Education was a constant predictor for each of knowledge and practices. Participants with tertiary education were more likely to be knowledgeable about antibiotic use and AMR compared to those with primary education as seen in previous studies [10, 32, 35]. However, highly educated people were less likely to have good practices of antibiotic use contrary to previous studies [32, 35]. This could be because, in this study there were very few participants with tertiary education compared to those with primary and secondary levels of education. The limited access to services in slums possibly hinders residents from attaining higher education [13, 15]. Similarly, only 35.7% of participants with tertiary education had good practices compared 64.3% who had poor practices of antibiotic use. These could have biased the direction of this association. Nonetheless, education empowers people to make informed personal choices and practices, some of which maybe controversial [52] like misuse of antibiotics. However, the study finding concurs with a systematic review paper that noted individuals to generally misuse antibiotics regardless of their attained level of education [53]. Additionally, people who were self-employed and those who were single were less likely to be knowledgeable about antibiotic use and AMR compared to those who were self-employed and married respectively. This could be attributed to a possible lack of social networks [for the single] and time to socialize [for the employed] to empower themselves with information. Otherwise, single people in this study were more likely to have attained higher levels of education. But also, we found that single people were more likely to be the employed. Antibiotic stewardship health education programs therefore may consider targeting the working-class group to access the single population. This could be through taking the messages to people's work stations. Similar to previous studies [10, 35, 54], men were more likely to have to an appropriate attitude towards antibiotic use and AMR. This could point to a possible role of gender differences in antibiotic use as has been reported in South Asia [55, 56] and the importance of gender in future research on antibiotic use and AMR. Gender can influence a person's health-related behaviors including access to knowledge, and access and use of antibiotics. However, participants who earned a monthly income below the study average were more likely to have a positive attitude contrary to previous studies [57, 58]. This could be due to the limited available resources in slums [59] that could limit access to antibiotics.

Limitations

Nevertheless, the results from this study should be interpreted in consideration of potential limitations that could have compromised the conclusions. Even though a multi-stage sampling technique was applied in this study, participants were overly female which may allude to selection bias. However, women were more likely to be at home than men at the time of data collection because data was collected during working hours. But also, the consecutive sampling method used at village/cell level could have resulted in contamination of interviews through sharing of information among participants due to the closeness of the selected houses in the slum setting. There was a possibility of recall bias and participants giving socially desirable responses. To minimize bias, the study used a standard questionnaire that had been used in similar settings. Additionally, the study used a cross-sectional design which cannot deduce casual inferences however, knowledge of antibiotic use and AMR in community settings in Uganda has not been well documented hence our findings provide information that may serve as a baseline for future studies.

Conclusion and recommendations

Residents of slums have limited knowledge of antibiotic use and AMR with minimal understanding of AMR concepts and side effects of antibiotics. Education level, gender, marital status and occupational status are key players in people's understanding and practices of antibiotic use and AMR. There was a correlation between having a positive attitude and good practices of antibiotic use.

Therefore, in regards to policy and practice, our study findings highlight the need to design context specific antibiotic stewardship health education programs considering peoples' education background, gender, and working schedules. Proper antibiotic use campaigns should devise ways of taking the messages to people's workstations. There's need for health promotion messaging on side effects of antibiotics, AMR concepts, and dangers of drug misuse to raise awareness in this population. This stems from the fact that participants demonstrated limited knowledge in these areas. Dissemination of information on antibiotic use and AMR needs to incorporate private drug outlets since participants preferred them to health facilities. Likewise, drug outlets need to monitored to minimize unregulated dispensing and use of antibiotics. Antibiotic stewardship initiatives should be inclusive of informal settlements and aim to target the local citizens. However, the campaigns on prudent antibiotic use may consider prioritising attitudinal change over knowledge of antibiotic use in order to maximise their impact in this population as informed by the findings on correlation between knowledge, attitude and practices. In terms of further research, there's need for qualitative studies to explore in depth people's perspectives on antibiotic use and AMR. The studies may also look into gender differences in antibiotic use and AMR.

Abbreviations

AMR	Antimicrobial Resistance
AMS	Antimicrobial Stewardship
JEE	Joint External Evaluations
KAP	Knowledge, Attitude and Practices
LC	Local Council
LMICs	Low- and Middle-Income Countries
NAPHS	National Action Plan for Health Security
UGX	Ugandan Shillings
UNCST	Uganda National Council of Science and Technology
WHO	World Health Organisation

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13756-025-01517-6.

Supplementary Material 1

Supplementary Material 2

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Author contributions

RN conceived the concept. IS reviewed the first concept draft. RN, MO and EAO co-designed the study, developed the proposal and study tools. RN and MO managed the data collection and RN conducted the analysis. EAO, IS, FA, CNL, and RNW supported data collection, statistical analysis, and interpretation of results. All authors contributed to the first draft of the manuscript. All authors reviewed and approved the final manuscript.

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Data availability

The dataset upon which the conclusions of this study were made has been shared in the supplementary files (Supplementary file 2).

Declarations

Ethical approval and consent to participate

The study was approved by Makerere University School of Biomedical Sciences Research Ethics Committee (SBS-2023-326) and cleared by Uganda National Council of Science Technology (HS2941ES). Permission and administrative clearance to conduct the study was sought from the Bwaise Local Council leadership. Only participants who provided written informed consent were enrolled in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Africa Center for Systematic Reviews and Knowledge Translation, Makerere University College of Health Sciences, Kampala, Uganda
[2]Department of Pharmacology & Therapeutics, Makerere University, Kampala, Uganda
[3]School of Graduate Studies, Research and Innovations, Clarke International University, Kampala, Uganda
[4]Clinical Epidemiology Unit, Makerere University College of Health Sciences, Kampala, Uganda
[5]Department of Global Health Security, Infectious Diseases Institute, Makerere University, Kampala, Uganda
[6]Faculty of Epidemiology and Population Health, London School of Hygiene & Tropical Medicine, London, UK

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