Antibiotic Knowledge, Attitudes, and Practices Among Students at Kampala International University in Ishaka, Bushenyi District, Uganda

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ABSTRACT

Antibiotics are drugs used to manage bacterial infections, but their abuse and irrational use have led to the development of resistant bacteria. Misuse of antibiotics, poor prescription behavior by physicians, and patients' wrong habits and lack of knowledge contribute to the spread of resistant strains. A study was conducted to evaluate the current knowledge, attitude, and behavior regarding antibiotic use among students at Kampala International University in Uganda. The data was collected using an interviewer-administered structured questionnaire. The majority of respondents believed that antibiotics were used to decrease fever, overcome pain, overcome malaise and fatigue, treat common colds, and treat infections. Most respondents agreed that starting antibiotics at home was acceptable, while others suggested starting them on doctors' prescription, pharmacists' advice, or buying from drug shops. During the drug use period, most respondents believed that antibiotics should be taken until the drug is finished, while others believed they should be taken until symptoms disappear. All respondents agreed that antibiotics should be taken as per health worker's advice. The study reveals a high rate of irrational antibiotic use among students, primarily due to misconceptions about when, what, who, and for how long to take antibiotics. This highlights the need for better prescription and regulation of antibiotic use and the need for more accurate information on antibiotic use and prescription practices.

Keywords: Antibiotics, Bacterial infections, Self-medication, Self-prescription, Drugs.

INTRODUCTION

The term–antibiotics' was first coined by the American microbiologist Selman Waksman and his colleagues to describe chemical substances produced by microorganisms and having antagonistic effects on the growth of other microorganisms. It excluded synthetic antimicrobials (sulfur drugs) and biological products of non-microbial origin having antagonistic effects on bacteria. Though antibiotics were introduced into clinical practice only in the middle of the last century, the use of microorganisms for the management of microbial infections in ancient Egypt, Greece, China, and some other places of the world is well-documented. The modern era of antibiotics started with the serendipitous discovery of penicillin from the culture filtrate of a fungus, Penicillium notatum by Alexander Fleming in 1928 [1]. Antibiotics have since been a crucial development in the evolution of medical treatment, effectively reducing the morbidity and mortality from bacterial diseases that were previously left untreated [2]. However, irrational use of antibiotics (including veterinary antimicrobial misuse/overuse, environmental contamination, nosocomial transmission, suboptimal point-of-care diagnostics, and suboptimal dosing) has contributed to the emergence and selection of resistant bacteria [3]. Consequently, the World Health Organization (WHO) has warned that the world is entering a "post-antibiotic" era where even minor infections and injuries, previously manageable with antimicrobials, will cost lives [4]. The threat of antibiotic resistance has become a worldwide public health concern, with a substantial economic and clinical burden [5]. The World Health

Organization (WHO) estimated that this problem leads to an excess of mortality of 25,000 people every year in European hospitals, with a cost of about 1,5 billion Euro [4]. Antibiotics are the most frequently prescribed drugs, but they are often misused [6] and this contributes to the spreading of resistant strains of bacteria [1]. One of the causes of antimicrobial misuse is linked to wrong prescribing behaviour among physicians [7]. There are many factors which could influence doctors' decisions, leading them to breach the principles of good clinical practice. For example, the fear of possible future complications in their patients, or a desire to fulfil patients' expectations [8]. However, patients' wrong habits and their lack of knowledge may also represent another leading cause of antimicrobial resistance [9]. Educational initiatives on the correct use and prescription of antimicrobial drugs, addressed to both the general population and healthcare professionals, should thus be promoted [10]. In particular, it would be desirable to focus on the new generations of healthcare professionals. Indeed, they must be fully aware of the increasing problem of antibiotic resistance, since they are the future antibiotic providers [11]. Several studies have tried to measure the knowledge, attitude and behaviour of students towards antibiotics [10]. The majority of these studies have a relatively low sample size, and in three of them, the response rate was lower than 50% [11]. Moreover, the existing literature is mainly focused on antibiotic prescribing behaviours rather than on attitudes about antibiotic consumption [12]. Although the results of these studies are in some cases encouraging, in many others they show a lack of knowledge on the importance of correct antibiotic use and prescription [13].

There is also a scarcity of data on perceptions and practices towards antibiotic misuse, including self-prescription, in Africa [14]. Poor knowledge, perceptions and practices towards antibiotic use have also been reported in many Africans [15].

Studies found that inappropriate use of antibiotics was associated with different factors; culture, gender, educational status, residency, marital status, age, number of children, health insurance and dissatisfaction with the health care services, and storing antibiotics at home [16]. However, the extent of inappropriate use of antibiotics and its associated factors in most countries has not yet been explored [17]. A significant amount of antibiotic misuse results from their indiscriminate accessibility. Prohibitive medical consultation costs and knowledge of the possibility of acquiring antibiotics without prescription facilitate their acquisition over the counter [18]. Both inappropriate and suboptimal exposure to antibiotics constitutes their misuse and is in turn associated with bacterial resistance. The global antibiotic resistance problem is increasing at varying rates in different regions [19]. There is a paucity of published literature on the prescribing, dispensing and administration of antibiotics to patients in sub-Saharan Africa, and recent global estimates for antibiotic consumption did not include data from East African countries like Uganda [18]. Currently, there is little known about the prescription and use of antibiotics in Uganda where most people with illnesses seek care [20]. Since there is variation in antibiotic use among and within countries related to several factors, drawing effective intervention requires exploration of antibiotic knowledge, attitudes, practices and antibiotic use in the community [17]. Therefore, the aim of the present study was to evaluate the current knowledge, attitude, and behaviour regarding antibiotic use among the students of Kampala International University in Ishaka, Bushenyi District in Uganda.

METHODOLOGY

Study design

A quantitative cross-sectional study approach was conducted in order to assess the current knowledge, attitude, and practices regarding antibiotic use among the students of Kampala International University in Ishaka, Bushenyi District in Uganda.

Area of Study

The study was conducted at Kampala

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International University in Ishaka, Bushenyi District. Ishaka is located in Igara County, in Bushenyi District, approximately 62 kilometres by road, west of Mbarara, the largest city in the sub-region. This is about 6 kilometres west of Bushenyi, the location of the district headquarters. The coordinates of Ishaka are 0°32'42.0"S, 30°08'18.0" E (Latitude: -0.545006; Longitude: 30.138343). Together with the neighbouring town of Bushenyi, it forms the Bushenyi-Ishaka Metropolitan Area. It is the largest metropolis in the district. In 2014, the national population census put the population of Bushenyi, including Ishaka, at 41,063.

Study population
The study was conducted among students at Kampala International University in Ishaka, Bushenyi District, Uganda to provide information regarding antibiotic use practices reflective of Ugandans anywhere in the Country, so to avoid bias all students irrespective of course, and year of study were considered participants, additionally, the study was carried out amongst studentsbecause they were easily accessible.

Inclusion criteria
It included all students at Kampala International University in Ishaka, Bushenyi District available at the time of collecting data and willing to participate in the study.

Exclusion criteria
Those who declined to participate in the study

Sample size determination
The sample size was determined using Kish Leslie's formula (1965)

$n=(Za/2)^2 p(1-p)e2$

Where;

'n' is the desired minimum sample size,

Z is the value

α= 0.05 which is 1.96,

e =margin of error which is proposed to be 0.05,

p is the prevalence of antibiotic use at KIU-TH, taken as 50 % since there is no literature. Therefore,

$n=(1.96 \times 1.96 \times 0.5 \times 0.5)/ (0.05 \times 0.05)$

n=384 students

However, due to limited time and financial constraints, a sample size of 350 students wasconsidered

Sampling procedure
A simple random technique was used to choose respondents to participate in the study, from whomdata was collected.

Dependent variables
Antibiotic use among students at Kampala International University in Ishaka, Bushenyi District.

Independent variable
Knowledge, attitudes and practices among students at Kampala International University inIshaka, Bushenyi District.

Data collection method and tool
Data was collected using an interviewer-administered questionnaire. The researcher met with the targeted respondents that took part in the study, after obtaining permission for data collection from respondents. Each participant was required to give informed consent before enrolling in the study. The researcher assisted the respondents in filling the questionnaires by explaining to the respondents for clarification. The properly filled questionnaires were then collected and then data was taken for analysis. The researcher used a structured questionnaire and participants were asked similar questions and from options, they picked the best alternative. A pen and paper was used to record the necessary information.

Data entry and cleaning
The data in the questionnaire was checked for completeness, cleaned and sorted to eliminate obvious inaccuracies and omissions. The data was then coded and entered into a computer.

Data analysis
The qualitative data collected was statistically analysed and documented using Microsoft Excel and Word version 2019 which analysed. The analysed data was then presented in the form of tables and graphs which was a basis for discussion and conclusion among others.

Measurement of variables
The variables are the knowledge, attitudes and practices among students at Kampala International University in Ishaka, Bushenyi District and were measured in percentage. Specific statistical tests were done to

determine the relationship between the variables.

RESULTS

Table 1: Gender and age distribution of the Participants

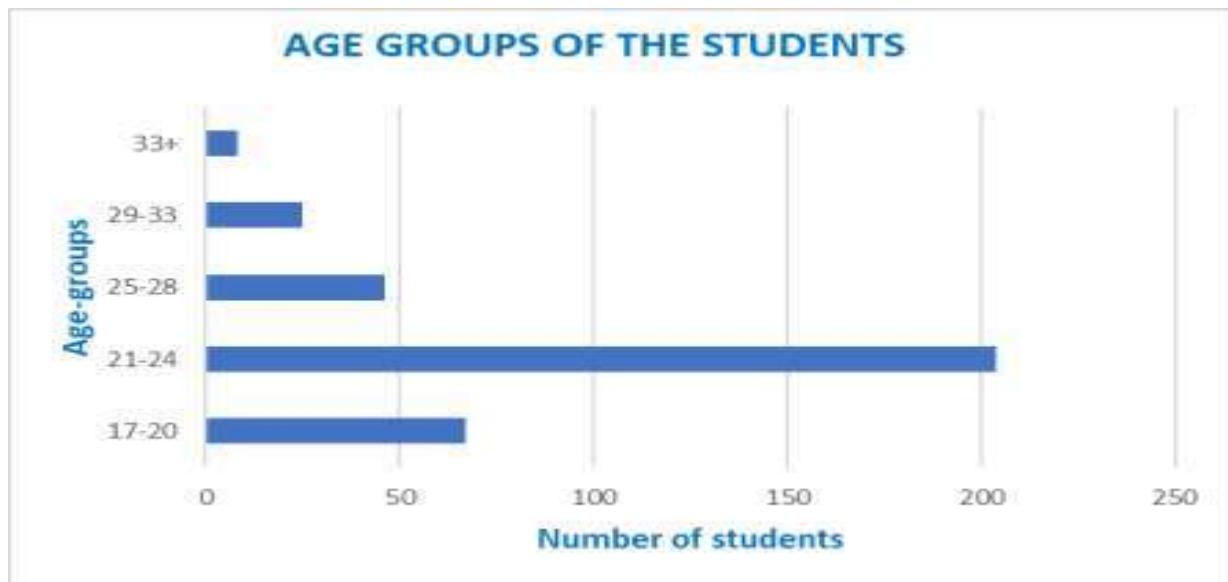| Age group	Male		Female		Total (Male + Female)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
17-20	43	12.29	24	6.86	67	19.14
21-24	63	18.00	141	40.29	204	58.29
25-28	16	4.57	30	8.57	46	13.14
29-33	10	2.86	15	4.29	25	7.14
33+	5	1.43	3	0.86	8	2.29
Total	137	39.14	213	60.86	350	100.00

Figure 1: Age groups of the students

In figure 1, Out of 350 respondents, a total of 67(19.14%), 204(58.29%), 46(13.14), 25(7.14%), 8(2.29%) were in the age groups of 17-20 years, 21-24 years, 25-28 years, 29-33 years and 33+ years respectively. More than half 204(58.29%) of the respondents belonged to the age group of 21-24 years. Only 8 respondents were 33 years and above. Furthermore,137 (39.14%) of the respondents were male while the majority 213(60.86%) were female.

Table 2: The knowledge of the respondents on antibiotic use

Questions		Freq.	%
A. The aim of antibiotic use *is:*	To decrease fever	70	20.00
	To overcome pain	23	6.57
	To overcome malaise and fatigue	30	8.57
	To treat common colds	71	20.29
	For infections	327	93.43
BB. How antibiotics can be started:	With antibiotics found at home in order not to waste time	14	4.00
	On doctor's prescription	341	97.43
	With pharmacists advise	201	57.43
	Buy from drug shop	47	13.43
C. Period of drug use:	Until the drug is finished	260	74.29
	Until the symptoms disappear	65	18.57
	As advised by the doctor	9	2.57
D. How often drugs should be taken in a day?	After waking up in the morning and before sleeping at night	28	8.00
	Once a day	28	8.00
	As per the health worker's advice	350	100.00

The questionnaire and the answers given to the questions about knowledge by the respondentsare summarised in the table above. Those that didn't answer the particular question were not included in that specific analysis. Also, a respondent was allowed to choose more than one answer. According to the study, 70(20%) of the respondents thought that the aim of antibiotic use is to decrease fever, 23(6.57%) thought it was to overcome pain, 30(8.57%) thought it was to overcome malaise and fatigue, 71(20.29%) thought it was to treat common colds and majority 327(93.43%) thought it was for infections. When asked about how antibiotics can be startedwhen ill, the majority 327(93.43%) of the respondents said one should start with an antibiotic found at home in order not to waste time, 14(4%) said one should start them on doctor's prescription, 341(97.43%) with pharmacists advise, while 201(57.43%) said one should buy antibiotics from the drug shop. ring the period of drug use, 260(74.29%) of the respondents said that antibiotics should

be used until the drug is finished, 65(18.57%) thought they should be taken until the symptoms disappear, while only 9(2.57%) said as advised by the doctor. On how often drugs should be taken in a day, 28(8%) thought after waking up in the morning and before sleeping at night, 28(8%) said once a day. All 350(100%) of the respondents said that antibiotics should be taken as per health worker advice.

TABLE 3: The attitude and behaviour of the respondents about antibiotic use

Questions	Yes		No	
	Frequency	Percentage	Frequentcy	Percentage
A. Have you ever used antibiotics in order not to get ill?	91	26.00	259	74.00
B. Have you ever started antibiotics by yourself?	259	74.00	91	26.00
C. Have you ever used antibiotics given by the doctor irregularly?	199	56.86	151	43.14
D. Do you think frequent and inappropriate antibiotic use has any danger.	313	89.43	37	10.57
Question	**Answers**		Frequency	Percentage e
E. What do you do when you think that the antibiotics you are taking are not working?	a. I stop taking it and go back to the doctor for advice		123	35.14
	b. I stop taking it and go to another doctor		15	4.29
	c. I use it for the recommended period		151	43.14
	d. Other		61	17.43
F. How did you get antibiotics during your last infection?	a. I used the antibiotic previously given and advised by my friends.		48	13.71
	b. I used the antibiotic previously prescribed by my doctor		77	22.00
	c. I went to a doctor and used the prescribed antibiotic.		165	47.14
	d. I asked the pharmacist and used the antibiotic advised by him.		43	12.29
	e. Bought drugs and used		14	4.00
G. How did you use antibiotics during your last infection?	a. Until the drugs were finished		72	20.50
	b. Until the symptoms disappeared		125	35.60
	c. As advised by the doctor		153	43.80

The questionnaire and the answers given to the questions about attitude and behaviour regarding antibiotics use were summarised in the tables above. From the study, 74% of the respondents reported having ever started antibiotics on their own, without a prescription while 56.86 % reported ever using antibiotics given by the doctor irregularly. Among the 350 respondents, 313 (89.43%) thought that frequent and inappropriate antibiotics could be dangerous. Of these 313 students, more than half (77%) had reported having ever started antibiotics on their own, without a prescription while 62% had ever used antibiotics given by the doctor irregularly. The use of antibiotics in order not to get ill was 26%. On the question of how they obtained antibiotics during their last infection, 47.14% of the students reported that they had gone to a doctor and used the prescribed antibiotic.

Table 4: Antibiotics used by the respondents

Question	Yes		No	
	Freq.	%age	Freq.	%age
Have you taken any antibiotics within the last six months? (N=350)	252	72	98	28
it prescribed by an authorized doctor? (N=252)	151	59.92	101	40.08

22% of the respondents noted that they used the antibiotic previously prescribed by their doctor, 13.71% used the antibiotic previously given and advised by their friends,12.29% said they asked the pharmacist and used the antibiotic advised by him, while only 4% said they just bought drugs and used them. When it came to the course of action if they felt the antibiotic being used was not helpful, 35.14% said they would go back to health care worker for advice while 4.29% said they would go to a different healthcare provider, 43.14% would use it for the recommended time and 17.43% gave other responses like I've never had that experience and I would stop and buy something else.
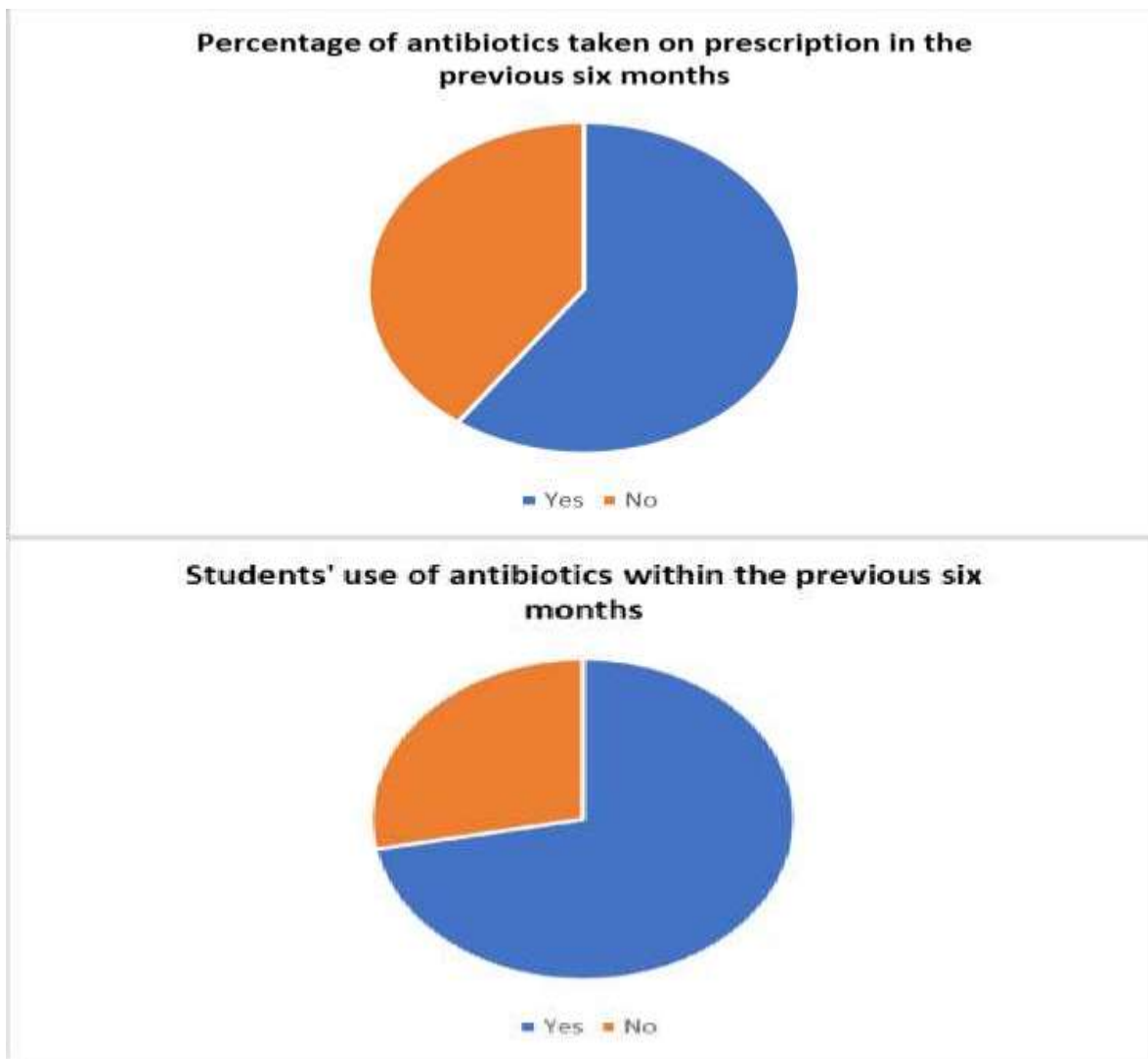
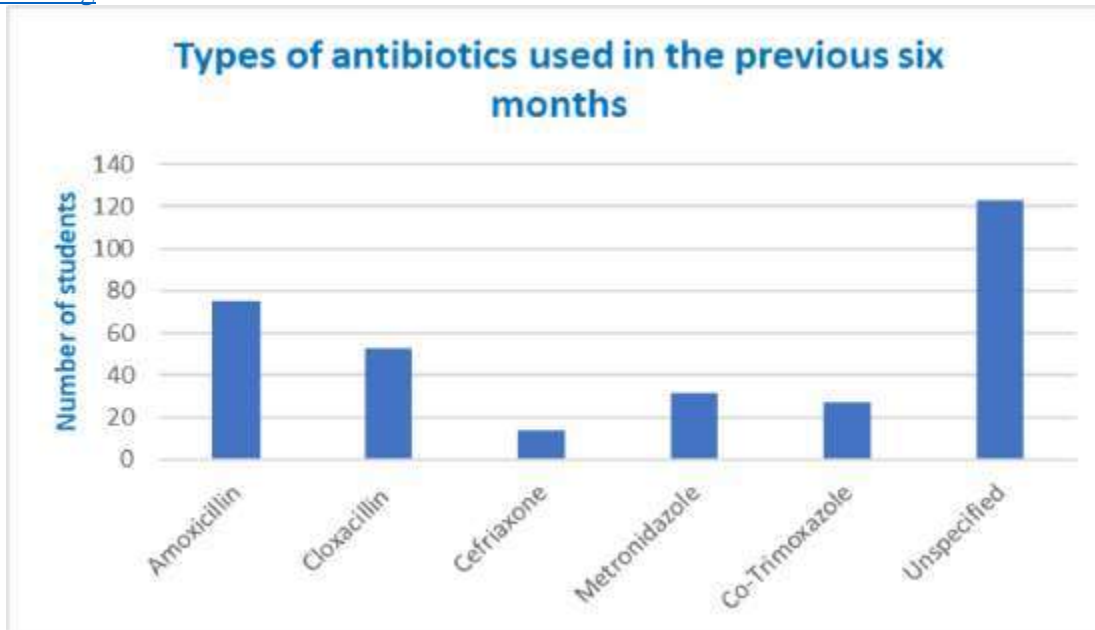**Figure 2: Usage of antibiotics by student**

Figure 3: Types of antibiotics used in the previous six months

Cough/ common cold was the major reason given for using antibiotics accounting for 44.44% of the 252 students, followed by pain, fever, headache and malaria. Urinary tract infections accounted for 26.98%, stomach aches and diarrhoea 23.81% while 13.4% of the students used antibiotics for skin conditions.
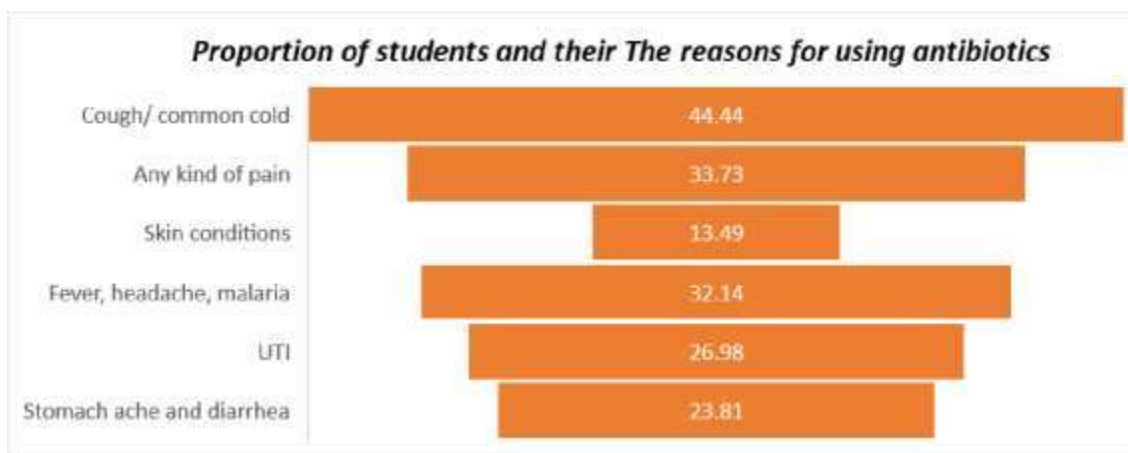

Figure 4: Proportion of students and their reasons for using antibiotics

DISCUSSION

Gender and age distribution of the Participants

Out of 350 respondents, a total of 67(19.14%), 204(58.29%), 46(13.14), 25(7.14%), 8(2.29%) were in the age groups of 17-20 years, 21-24 years, 25-28 years, 29-33 years and 33+ years respectively. More than half 204(58.29%) of the respondents belonged to the age group of 21-24 years. Only 8 respondents were 33 years and

above. Furthermore, 137 (39.14%) of the respondents were male while the majority 213(60.86%) were female.

The knowledge of the respondents on antibiotic use

Numerous studies have attempted to gauge students' knowledge, attitudes, and behaviours about antibiotics [10]. However instead of focusing on knowledge and attitudes aboutantibiotic usage, the material that is now available primarily focuses on prescribing behaviours [12]. While some of these studies' findings are positive, many others reveal a lack of understanding regarding the significance of proper antibiotic use and dosage [13]. To determine Bangladeshi university students' knowledge of antibiotics and how to use them properly, a study was conducted. About one-third of pupils (34.1%) showed weak knowledge levels (scores below 60 per cent), while less than half of students (42.4%) demonstrated the correct knowledge level (scores higher than 80 per cent) [21]. In a different study conducted in Ethiopia, it was discovered that the final-year paramedical undergrad students had a below-average level of knowledge (54.8%) [22]. Regarding the level of medical students' understanding, two investigations carried out in Malaysia yielded conflicting findings. A moderate degree of knowledge was demonstrated by 63.3 per cent of medical students in one study, while a high level of knowledge was demonstratedby 68 per cent of medical students in the other study [23]. According to the current study, 70% of respondents said that the purpose of using antibiotics is toreduce fever, relieve pain, combat malaise and exhaustion, combat weariness, and treatcommon colds. The majority of 327 people (93.43 per cent), including 71 (20.29%), believed it was for bacterial diseases. Since some people recognized that antibiotics were used to treat bacterial illnesses yet believed they could also treat fever and pain, this demonstrates that the sample population had misconceptions about the use of antibiotics. According to the respondents' justifications for using antibiotics, they don't know the difference between bacterial and viral infections and thus treat both types of diseases with them. In order to save

time, the majority of respondents, 327 (93.43%), recommended starting with an antibiotic that could be found at home. Only 14 (4.0%) suggested starting antibiotics with a doctor's prescription, while 201 (57.43%), recommended purchasing antibiotics from a pharmacy. It is clear from the study that the students lack understanding about the proper sources for antibiotics and where to get prescriptions for them; as a result, they would buy their antibiotics from unreliable vendors without a prescription. Antibiotics from some sources might be bought without a doctor's prescription, which would promote self-medication and encourage people to keep using those sources. Studies examining consumer understanding of antibiotic use in underdeveloped nations like Tanzania and Ethiopia found similar results [24], [25]. Nevertheless, research from sophisticated nations like Sweden and Norway revealed that the majority of customers have moderate to high levels of expertise [26]; [27]. The observed inconsistency may be caused by variations in the socioeconomic status of the respondents. The lack of awareness campaigns and the fact that the majority lack formal education could be blamed for the low awareness of antibiotic use seen in developing countries. Consumers in impoverished nations have been shown to have low awareness about antibiotic usage and lack of formal education, as well as primary and secondary education levels. These findings concur with those of a few earlier research. [28], for instance, evaluated the inhabitants of Lilongwe, Malawi, on their knowledge, attitudes, and practices surrounding self-medication with antibiotics as part of their study. Over 54% of participants in the survey were mistaken about the efficacy of antimicrobials in treating common colds. The efficiency of antibiotics to cure viral illnesses was one of the often-held misunderstandings in the knowledge portion of a different study by [21]. Only 37.2% of non-biology students chose the accurate statement, while more than 67.0% of biology students identified it as untrue. According to a survey conducted in China, 64.52 per cent of medical students believed that "antibiotics cannot heal a viral infection," whereas only 43.44 per cent of

non-medical students agreed with this statement [29]. According to a different survey conducted in Nepal, just 34.2% of non-medical students believed that viral illnesses could not be treated with antibiotics, compared to 73.7% of medical students [30]. Regarding the length of drug use, 260 respondents (74.29%) said antibiotics should be taken until the medication is finished, 65 respondents (18.57%) believed they should be taken until the symptoms go away, and just 9 respondents (2.57%) indicated they should be taken as prescribed by a doctor. When asked how often people should take medications in a day, 28 (8%) responded once a day, after waking up in the morning and before going to bed at night. All 350 responders (100%) agreed that antibiotics should be given in accordance with medical professionals' recommendations.

The attitude and behaviour of the respondents about antibiotic use

All 350 of the study's respondents—100%—said that antibiotics should be taken in accordance with medical professionals' recommendations. Nevertheless, 74 per cent of respondents said they had ever started taking antibiotics on their own, without a prescription, and 56.86 per cent said they had ever used prescription antibiotics sporadically. Of the 350 responders, 313 (89.43%) believed that using antibiotics frequently and inappropriately could be risky. More than half (77%) of the 313 students reported having ever started taking antibiotics without a prescription, and 62 % had ever used prescription antibiotics sporadically. About, 26 per cent of students used antibiotics to prevent getting sick. 47.14 per cent of the students said that they had visited a doctor and taken the medication they had been prescribed when asked how they acquired antibiotics for their most recent ailment. Only 4% of respondents said they just bought drugs and used them, compared to 22% who said they used the antibiotic their doctor had previously prescribed, 13.71% who said they used the antibiotic their friends hadpreviously given and advised them to use, and 12.9% who said they asked the pharmacist for advice. According to a recent similar survey conducted in Tanzania, a sizable proportion of participants said it is OK to use or seek the same antibiotics if a friend or family member has previously used them or if doing so will help them treat the same ailment or disease [24]. Antibiotic overuse, one of the causes of antimicrobial resistance, has been recorded in numerous locations around Uganda [31]. Sadly, the majority of customers think that antibiotics are "wonder medications" that can treat any illness [32]. There is a misperception in the population, especially when it comes to respiratory illnesses, where people think that using antibiotics will hasten the recovery of ailments like cough and sore throat, which are primarily brought on by viral infection [33]; [34]. When asked what they would do if they felt the antibiotic being used was not helpful, 43.14 per cent said they would use it for the recommended amount of time, 4.29 per cent said they would go to a different healthcare provider, and 17.43 per cent provided other comments like, "I've never had that experience" and "I would stop and buy something else.

Antibiotics Used by the Respondents

A total of 252 respondents, or 72%, said they had used antibiotics at least once in the six months prior. Only 151 (59.92%) of the 252 students acknowledged that the medications they had taken had been prescribed by a legitimate doctor. When asked how antibiotics should be started when sick, 327 (93.43%) of the respondents stated one should start with an antibiotic discovered at home to avoid wasting time, 14 (4%), said one should start them on a doctor's prescription, and 201 (57.43%) said one should buy antibiotics from the drug store. Ugandan pharmacies are permitted to sell class C medications (over the counter) without a prescription. However, they lack a licence to offer injectable medications and antibiotics [35]. The current findings emphasise the significance of dispensaries abiding by laws because this has an impact on the security of people seeking care at these facilities. Antibiotic pressure and consequent antimicrobial resistance could rise as a result of the careless prescribing and marketing of antibiotics. In terms of the different antibiotics taken, 75 students

(32.54 per cent), 53 students (21.03 per cent), 14 students (5.56%), 32 students (17.46%), and 27 students (10.71%) said they had taken Amoxicillin, Cloxacillin, Cefriaxone, Metronidazole, and Co-Trimoxazole in the preceding six months. However, more than half of the students who had taken antibiotics during the previous six months (54.37%) were unable to name the specific type of antibiotics they had takenor had trouble recalling them. The most common reason for utilising antibiotics, cited by 44.44 per cent of the 252 students, wasa cough or common cold, followed by pain, fever, headaches, and malaria. 26.98 per cent of the students had urinary tract infections, 23.81 per cent had stomachaches or diarrhoea, and 13.4 per cent had used medications for skin diseases. According to the respondents' justifications for using antibiotics, they were using them for both viral and bacterial diseases since they were unable to distinguish between them. For ordinary colds, the majority of responders utilised antibiotics. Numerous studies conducted among university students and other members of the public have reported this similar observation [36]; [31]. Many people utilise antibiotics in the treatment of the common cold due to their ignorance of infectious diseases. Similarly, most instances of acute diarrhoea do not require antibiotic medication because, with the exception of invasive cases, the condition usually resolves on its own [25]. More than 23.81 per cent of the participants in this study treated their diarrhoea with antibiotics indiscriminately, which is risky because enterohemorrhagic E. coli infections have been linked to an elevated risk of hemolytic uremic syndrome after indiscriminate antibiotic usage in some circumstances [31]. Additionally, a respectable 26.98% of students have used medicines to treat UTIs. People in low-income countries are susceptible to diseases like UTIs, particularly women [37]. Escherichia coli is one of the three bacteria designated by the WHO as a concern to public health and is the primary bacteria responsible for UTIs. S. aureus and Klebsiella pneumoniae are the remaining prevalent ones [38]. Most detected clinical isolates of E. coli, according to studies carried out in the East African region, were resistant to the commonantibiotics used as a first- or second-line regimen [32]. Given the high level of resistance seen, it is likely that individuals routinely utilise antibiotics to treat their disease [38].

CONCLUSION

The study reveals a high prevalence of irrational antibiotic use among students, primarily due to misconceptions about when, what, who, and how long to take antibiotics, obtained from drug shops without prescription and regulation.

Recommendations

Uganda's diverse culture, geography, and literacy levels contribute to a high rate of irrational antibiotic use in tertiary institutions. To replicate this nationwide, the public must be educated on changing their behavior and attitudes towards antibiotics to reduce resistant infections. Mass communication and health education talks by experts can help. The National Drug Authority must also implement strict regulations on the purchase and sale of antibiotics in communities. This will ensure the long-term success of rational antibiotic use initiatives.

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