Factors Associated with Self-Medication with Antibiotics in Ishaka Division, Bushenyi District

Kariuki N Caroline

School of Pharmacy, Kampala International University, Uganda

ABSTRACT

Self-medication with antibiotics is a form of irrational drug use that is a major global public health issue. Irrational use of antibiotics can lead to antibiotic resistance, treatment failure, adverse effects, and increased healthcare costs. This cross-sectional study aimed to establish the factors associated with self-medication with antibiotics among community members in Ishaka Division, Bushenyi District, Uganda. The study employed a quantitative approach using a structured questionnaire to collect data from 108 randomly selected household representatives aged 18 years and above who were permanent residents of Ishaka Division. Descriptive statistics were used to analyze the data. The results showed that 57% of participants self-medicated with antibiotics. Socio-demographic factors significantly associated with self-medication included being unmarried (p=0.004) and unemployment (p=0.019). Personal factors included lack of knowledge about antibiotics (p=0.002), obtaining drug information from non-health facility sources (p=0.001), and negative attitudes towards healthcare workers (p=0.000). Health system factors included living far from health facilities (p=0.003), long waiting times (p=0.119), unfriendly healthcare worker attitudes (p=0.000), and inadequate drug counseling (p=0.000).The study concluded that self-medication with antibiotics is highly prevalent in Ishaka Division and is influenced by socio-demographic, personal, and health system factors. Interventions are needed to address these factors through community education, improving access to quality healthcare services, enforcing regulations on antibiotic dispensing, and promoting rational antibiotic use.

Keywords: Self-medication, Antibiotics, Irrational drug use, Uganda, Factors

INTRODUCTION

The irrational use of antibiotics is a major global public health challenge that has far-reaching consequences. Irrational antibiotic use encompasses a range of inappropriate practices, including self-medication with antibiotics, incorrect dosing or duration, and use of antibiotics for non-bacterial infections. The World Health Organization (WHO) estimates that more than 50% of all medicines are prescribed, dispensed, or sold inappropriately worldwide, with 50% of patients failing to take them correctly [1]. This irrational use of medicines, particularly antibiotics, is even higher in many developing countries. Irrational antibiotic use has significant negative impacts. It is a key driver of antibiotic resistance, which reduces the efficacy of antibiotics in treating bacterial infections. The emergence and spread of antibiotic-resistant bacteria is considered one of the biggest public health threats of the 21st century [1]. In addition to resistance, irrational antibiotic use can lead to adverse drug reactions, treatment failures, prolonged illness, higher medical costs, and increased mortality [2]. Economically, irrational medicine use imposes a tremendous burden on already strained healthcare systems and leads to wasted resources.

Self-medication with antibiotics, which is the focus of this study, is one of the key manifestations of irrational antibiotic use globally. It involves obtaining and consuming antibiotics without a valid prescription from a qualified healthcare provider. While self-medication can sometimes be appropriate for certain minor or chronic conditions, self-medicating with antibiotics is considered universally inappropriate and dangerous [3]. The risks include incorrect self-diagnosis, incorrect choice of therapy, incorrect dosing, inadequate treatment duration, drug interactions, polypharmacy, and the potential for missed follow-up and drug resistance [4]. In developing countries like Uganda, the issue of self-medication with antibiotics is particularly concerning. A number of factors may drive this phenomenon, including poverty, high medical costs, long distances to health facilities, unreliable supplies of quality medicines at public facilities, cultural beliefs, and low health literacy [5, 6, 7]. Non-prescription antibiotic sales and lax regulation further enable self-medication practices. While data on antibiotic self-medication rates in Uganda are limited, some studies indicate a high prevalence. For example, a recent study revealed that the prevalence of self-medication with antibiotics among medical students in Eastern Uganda was 93.8%, with prior use of antibiotics and having a minor illness being common drivers [7].

In Bushenyi District, which is the setting for this study, reports and personal observations suggest irrational antibiotic use and self-medication are widespread issues [8]. Yet there is a lack of comprehensive local data to guide interventions to promote rational antibiotic use in this community. Understanding the key factors that drive self-medication behavior is crucial for designing targeted solutions. This study therefore aimed to establish the socio-demographic, personal, and health system factors associated with self-medication with antibiotics among community members in Ishaka Division, Bushenyi District. By comprehensively examining the potential determinants across different domains, the findings can inform multifaceted interventions to curb this risky practice. This is critical for safeguarding antibiotic efficacy, improving treatment outcomes, and reducing the burden of antibiotic resistance in this setting and beyond.

METHODOLOGY
Study Design and Rationale
A cross-sectional study was conducted and employed a quantitative approach of datacollection to provided information about factors associated with self-medication withantibiotics among community members in Ishaka Division, Bushenyi District withinfour weeks.

Study Setting and Rationale
The study was carried out in Ishaka Division where the researcher resides and haswitnessed irrational drug use of antibiotics especially on self-medication. This geographical area was selected because Ishaka is where theresearcher resides when she is at school and has seen majority of the people practiceirrational drug use.

Study Population
The target population comprised of all household representatives aged 18 years andabove who were permanent resident living in Ishaka Division by using the householdswithin the study area. This group was chosen because they take the final decisionabout the method of treatment in the study families/households.

Sample Size Determination
The sample size of the study respondents weredetermined using Kish and Leslie's formula of 1965 which state that;

Where;

n -Minimum required sample size $n = \left(\frac{Z^2 p\,(1-p)}{d^2}\right)$

Z- Is the required Z value in 2 tails at a= 0.05 which is'= 1.96 approximately 2

d - Precision whose value in this proposal is 0.1.

P- Conventionally taken as 0.5 because there was no documented literature about thisstudy by the time of this proposal.

By substituting the formula; estimated at 50% = 0.5 thus, p =0.5

$$n = \left(\frac{2^2 \times 0.5 \times 0.5}{0.1^2}\right)$$

n = 100

However, to cater for the non-respondency and other unforeseen factors, 108respondents was the number of household representatives interviewed. On top of this,three key informants administered interviews were purposively preferred. Theseinclude; a health worker (health unit in charge) from the nearest health center (K.I.U),Bushenyi District Drug Inspector (BDDI), and Bushenyi District Health Officer(BDHO).This is because they were directly involved in drug monitoring in BushenyiDistrict in general and Ishaka municipality in particular.

Sampling Procedure
For the purpose of this study, the study area, Ishaka Division was divided into fourzones: East, West North and South. A list of all households living in each of thosezones was written. Then by lottery method numbers were allocated. Finally the paperswere folded and placed in a bucket which was closed and shaken. The first 27 paperswere then picked for each of the four regions this gave a total of 108 householdrepresentantives.

This sampling method was considered because the technique was faster, easy, fair andcosteffective in recruiting the population with desired characteristics in the study.

Inclusion Criteria
The study considered only household representatives aged 18 years and above whowere permanent resident living in Ishaka Division, Bushenyi District concerned withthe treatment of members in that home, mentally stable and able to participatevoluntarily, and freely consented during the time of study.

Exclusion Criteria
The study excludes the household representatives aged below 18 years, not concernedwith the treatment of member in that home , who did not consent to participate in thestudy , those who were mentally ill or very sick and those who were not permanentresident in lshaka Division, Bushenyi District.

Study Variables
Dependent variable
Self-medication with antibiotics among community members in Ishaka Division,Bushenyi District
Independent variables

Socio-demogi·aphic factors associated with self-medication with antibiotics amongcommunity members in Ishaka Division, Bushenyi District.Personal factors associated with self-medication with antibiotics among communitymembers in Ishaka Division, Bushenyi District.Health system related factors associated with self-medication with antibiotics amongcommunity members in Ishaka Division, Bushenyi District.

Research Instrument
The questionnaire contained both close and open-ended questions. The close endedquestions were to enable the respondents choose from available options while theopen-ended questions would allow them express their own ideas in their own words.The use of the questionnaire was considered because it enables the researcher toensure privacy and confidentiality as the respondents would fill them independently.

Data Collection Method
The self-administered questionnaire was used to conduct face to face interviews withone respondent at a time to ensure privacy. Data collection took a period of fourweeks. Each study respondent was requested to fill the questionnaire in English withthe help of the researcher. The respondents were thanked for the cooperation andparticipation on the study.

Quality Data Control
Data verification and validation involved rechecking all data entries against the original forms to ensure data cleanliness. The questionnaire was formulated under supervision and pretested on 30 respondents in Central Division, Bushenyi District. Data editing and coding were performed to ensure consistency. Questionnaires were checked for completeness and consistency of information. Before closure, all interview questionnaires were double-checked for completeness and approved for storage by the principal investigator. The collected data was kept confidentially by the researcher.

Data Analysis and Presentation
Data was cleaned, coded and entered into Microsoft Office Excel version sevenExcel. Descriptive statistics and analysis were carried out usmg the Statisticalpackage for social sciences (SPSS) version 16.0. Descriptive data was presented asfrequencies and percentages, and illustrated using frequency tables, pie charts and bargraphs. Qualitative data collected during the interviews were coded in themes andentered into master sheets by the principle investigators (PI).

Ethical Considerations
All study protocols were presented for review and approval by research ethicscommittee (REC) of Kampala International University (KIU) School of Pharmacyand the local administration of the study area. Also KIU School of Pharmacy alsoissued the researcher with an introductory letter that was presented to Ishaka DivisionCouncil, Health Department to endorse carrying out this study in the area.On interacting with the residents at grass root levels, written informed consent weresought from all study participants before being enrolled into study. For all collecteddata, confidentiality was maintained by not revealing the participants identities. Datasafely stored under lock and key, only accessible to the study investigators.

Limitations of the Study
Some stakeholders mainly at the district level delayed the study by delaying toendorse letters to be used at village/cell level to seek consent on participation in thestudy. This was overcame by getting endorsement letter early .Some people did notwant to participate thinking they will be implicated .This was overcame by assuringthem that the information obtained was confidential.

RESULTS
Socio-demographic Factors of the Study Participants
Socio-demographic factors considered: Gender, age group, marital status, level ofeducation, occupation and religion.

Table 1: Showing Socio-demographic Data of the Study Participants (n=108)

Demographic data	Variables	Frequency (n)	Percentage/ (%)
Gender	Male	36	33
	Female	72	67
	Total	**108**	**100**
Age group	20-29 years	30	28
	30-39 years	29	27
	40-49 years	26	24
	50 years and above	23	21
	Total	**108**	**100**
Marital status	Single	28	26
	Married	62	57
	Divorced	6	6
	Others; widow, separated	12	11
	Total	**108**	**100**
Level of Education	No formal education	14	13.0
	Primary	20	18.5
	Secondary	54	50.0
	Tertiary	20	18.5
	Total	**108**	**100**
Occupation	Housewives	11	10
	Civil servant	18	17
	Self-employed	42	39
	Unemployed	24	22
	Other; businessperson	13	12
	Total	**108**	**100**
Religion	Protestants	44	40.7
	Catholics	14	13.0
	Seventh Day Adventist	6	5.6
	Muslims	25	23.1
	Other; Born again	19	17.6
	Total	**108**	**100**

Table 2: Showing whether it was necessary to access drugs before seekingmedical attention when someone is sick

Variables	Frequency (n)	Percentage / (%)
Yes	91	84
No	17	16
Total	**108**	**100**

The results in Table 2 above show that out of 108 participants, the majority (84%) would access drugs before seeking medical attention when someone is sick, while only a minority (16%) would not.

Personal Related Factors Associated with Self-medication with Antibiotics
Personal related factors considered : participants knowledge on any drugs used athome to treat sickness without consulting a trained health care professional, generalknowledge on drugs that were used to treat sick people, common diseases that weretreated from home without seeking help from a trained health care professional,awareness of the common diseases that affect their family, where those who wereaware of diseases got treatment, whether they had information on drug use and thesource of information , whether they think it's

important to seek advice before theprescription of drugs and reasons why they think it's not important to seek advice.On assessing whether participants knew any drugs used at home to treat sicknesswithout consulting a trained health care professional; majority 79 (73%) of therespondents knew drugs used at home without consulting trained medicalprofessionals while few 29 (27%) did not know.

Table 3: Showing Participants' Knowledge on Antibiotics

Variables	Frequency (n)	Percentage / (%)
Antibiotics (like Ampicox, Amoxicillin, Septrin, Ciprofloxacin, Metronidazole)	42	53.2
Others included; Dicofenac, Panadol, Piriton, Coartem, Albendazole, Herbal medicines, Dexamethasone	37	46.8
Total	**79**	**100**

Figure 1: Showing common Diseases that were treated from home withoutseeking help from a trained health care professional
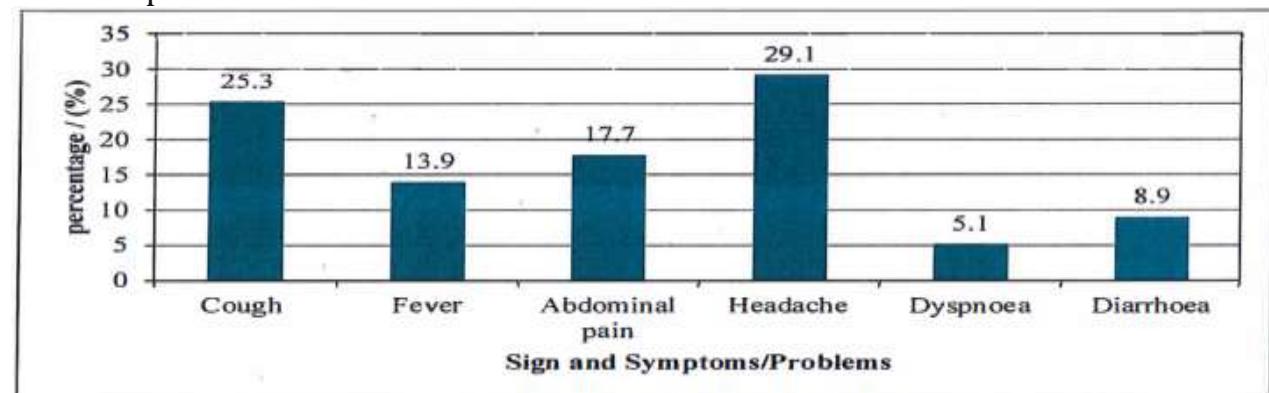
Table 4: Showing whether Participants were aware of the Common Diseases that Affect their Family

Variables	Frequency (n)	Percentage / (%)
Yes	99	92
No	9	8
Total	108	100

The findings from Table 4 indicate that out of 108 participants, the majority (92%) are aware of the common diseases that affect their families, while a minority (8%) were not aware.

**Figure 2: Showing participants' source of health services**
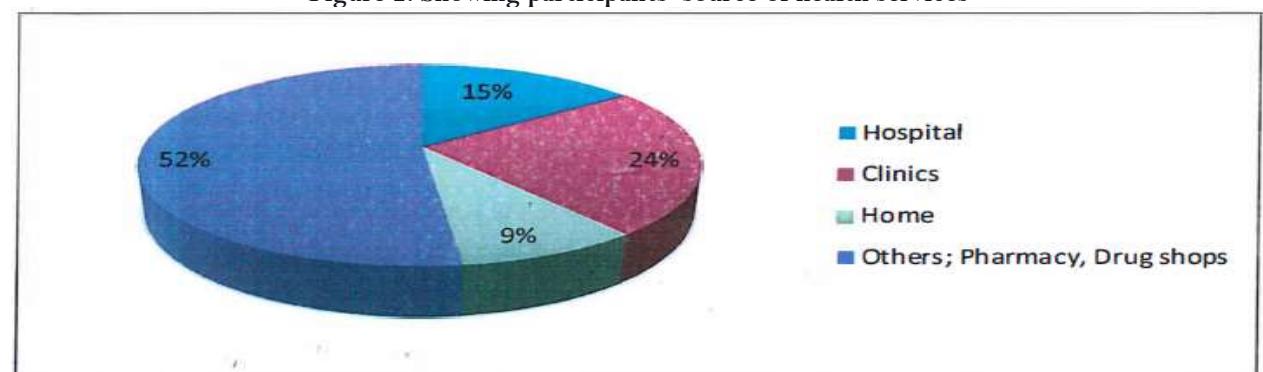
Table 5: Showing whether participants had information on drug use and thesource of information

Variables	Responses	Frequency (n)	Percentage / (%)
Participant ever had education about use of drugs	Yes	60	56
	No	48	44
	Total	**108**	**100**
Source of information about the use of drugs	Health facility	20	33
	Radio/television	4	7
	Relatives	12	20
	School	8	13
	Other; friends, pharmacy	16	27
	Total	**60**	**100**

Health System Related Factors Associated with Self-medication with Antibiotics

Health system related factors include: Participants' nearest distance to drugshops/pharmacy/health facilities from home , time spend waiting to be attended to atthe health care ,response of health workers when participants inquired aboutprescribed drugs and other variable responses concerning health facilities factors.

Figure 3: Participants' distance to nearest drug shops/pharmacy/health facilitiesfrom home
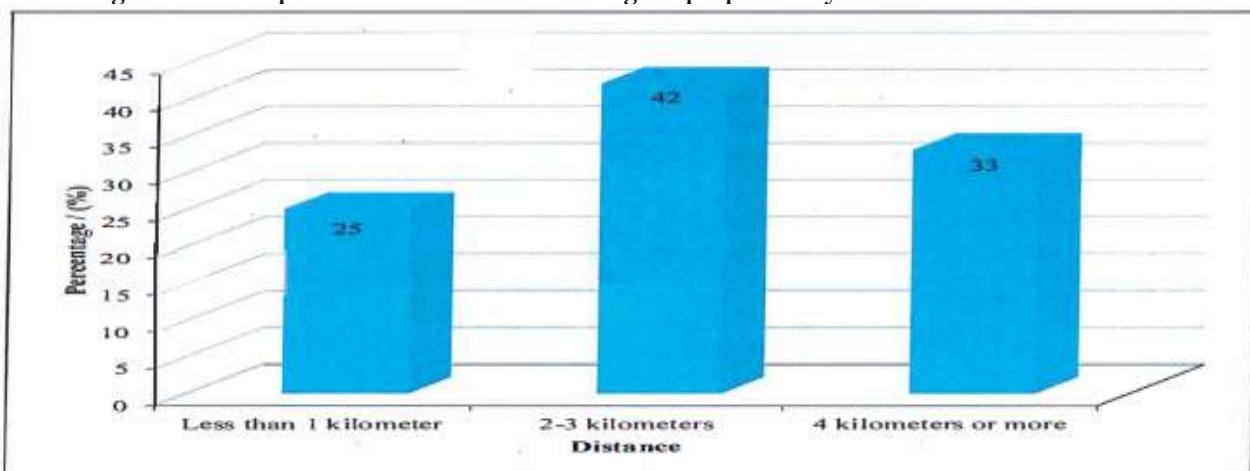
Results on figure 3 above show that 42%)of the participants live 2-3 kilometersaway from drug shop/pharmacy/health facilities and only 27 (25%) live in less than 1kilometer.

On assessing time spend waiting to be attended to at the health care facility

The majority of participants (56%) reported spending less than 1 hour to be attended to, while 39% spent 1-3 hours, and a few (5%) said they waited 4 hours or more.

Figure 4: Showing response of health workers when participants inquired aboutprescribed drugs
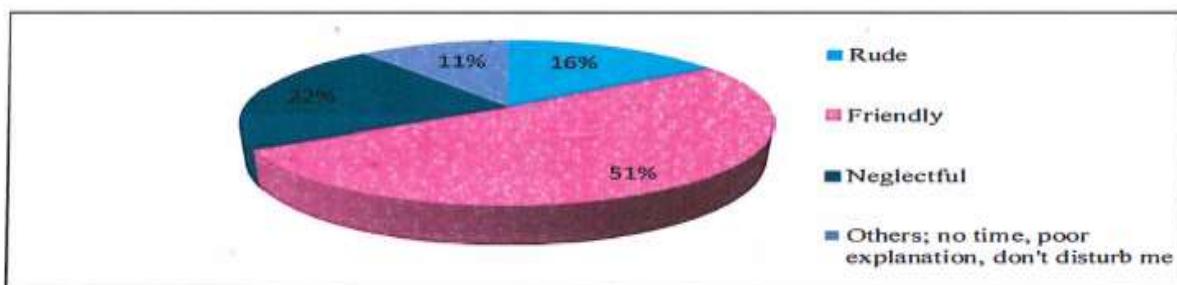
Table 6: Showing different responses concerning health facilities factors

Variables		Frequency, (n)	Percentage / (%)
Do public health facilities ask money for treatment	Yes	35	32
	No	67	62
	Not response	6	6
	Total	**108**	**100**
Whether health facility have strong regulations that ensure good handling of drugs	Yes	10	9
	No	4	4
	Not sure	94	87
	Total	**108**	**100**
Any precaution given in the health facility at dispensing level regarding drugs	Yes	53	49
	No	47	44
	No sure	8	7
	Total	**108**	**100**
Whether health workers provide you with the complete dose of the prescribed drugs	Yes	15	14
	No	86	80
	Not sure	7	6
	Total	**108**	**100**
Whether participants always access the type of treatment plan as suggested by the health workers	Yes	96	89
	No	12	11
	Total	**108**	**100**

DISCUSSION

Self-medication is a widespread global phenomenon, with antibiotics being the most commonly self-medicated drug, posing a serious risk to infectious disease control and public health [9].

The study involved household representatives permanently residing in Ishaka Division. Results showed that the majority (67%) were female, while the minority (33%) were male. Among females, a majority (60%) practiced self-medication, often administering medication to children under five due to their role as primary caretakers. This aligns with the Uganda Ministry of Health report [10] on self-medication prevalence among hospital and non-hospital patients. Additionally, a significant proportion (28%) of participants were aged 20-29 years, compared to a smaller proportion (21%) aged 50 years and above, which is consistent with findings by Moro *et al.*[11] in Italy linking irrational drug use to gender, with young men being more prone to self-medication.

Furthermore, the study found that 57% of participants were married, and a majority (78%) of those unmarried self-medicated, likely due to financial constraints. Mothers, responsible for childcare in the absence of husbands, often resort to self-medication to save costs, reflecting findings from Kyalimpa [12] on unmarried caretakers' irrational use of medicine due to financial limitations. Education level also played a role, with 86% of those with no formal education self-medicating, possibly due to difficulties in understanding information, as supported by the World Health Organization's report on education level and irrational antibiotic use [1, 13].

Occupation also influenced self-medication, with 79% of unemployed participants self-medicating due to lack of income, as highlighted by Mbonye *et al.*[14] regarding occupation, residence, and chronic disease. Religion was another factor, with 53% of Christians practicing irrational drug use, suggesting a role of religious beliefs in drug use behaviors. Most participants (54.6%) were influenced by their husbands in drug use decisions, reflecting family dynamics and consultation practices noted by Mortazavi*et al.*[15] among older adults with low-income occupations or involved in medicine businesses. The study also revealed that 84% of participants would access drugs before seeking medical attention, underscoring the need for community-wide educational programs to raise awareness about the risks of self-medication and reduce its prevalence.

Personal Related Factors Associated with Self-medication with Antibiotics

The study found that a majority (73%) of respondents were aware of drugs used at home without consulting trained medical professionals, with 79% of those unaware engaging in self-medication due to lack of knowledge about drug use, similar to findings by Brookes-Howell et al. [16]. Among those aware, 53.2% recognized antibiotics like Ampicox, Amoxicillin, Septrin, Ciprofloxacin, Metronidazole, which they used without prescriptions, aligning with the report by Mbonye *et al.*[14] on common self-medication practices using antibiotics like amoxicillin for instant therapy. Additionally, 29.1% treated headaches at home, reflecting the preference to self-treat symptoms before seeking professional help, as noted by Kistler *et al.*[17].

The study also revealed that 92% of participants were aware of common family diseases, leading to self-medication practices, as reported by Reyes-Morales *et al.*[18] in Peru and Chile. Most (52%) sought treatment from pharmacies or drug shops, echoing Reyes-Morales' findings on irrational drug use driven by perceived minor illnesses. Education on drug use correlated with rational drug use, with 60% of those educated using drugs irrationally, often sourced from health facilities (33%) or media (7%), reflecting WHO's [1] findings on drug familiarity and media exposure in Scandinavian countries.

Regarding seeking advice before drug prescription, 69% believed it was important, contrasting with 31% who did not, with reasons like consultation fees or doctor unavailability. This aligns with Adebayo and Hussain's [19] study on irrational drug use among low social status individuals. Policy implications suggest reviewing drug information in media to promote positive attitudes and reduce self-medication rates.

Health System Related Factors Associated with Self-medication with Antibiotics

The study findings revealed that the highest proportion (42%) of participants lived 2-3 kilometers away from drug shops, pharmacies, or health facilities, with the majority of those far (56%) engaging in self-medication due to distance challenges, in line with WHO's report on pharmacy roles and drug access [20]. Additionally, a majority (56%) of participants spent less than an hour waiting at healthcare facilities, and those facing long wait times (64%) tended to self-medicate, similar to findings from Tripathi's study in India [21] on client discouragement due to lengthy waits. Over half (51%) viewed health workers as friendly, but some (11%) had negative perceptions, leading to limited knowledge and irrational drug use, as seen in Bashrahil's survey in Zambia [22]. Concerning public health facilities, most participants (62%) believed treatment was free, influencing self-medication due to limited resources, echoing findings by Bashrahil on unprofessionalism and wrong dispensing [22]. Many participants (87%) were unsure about health facility drug regulations, and a majority (80%) felt they did not receive the full prescribed drug dose, aligning with Bashrahil's findings on improper drug dispensing [22]. Lastly, most participants (89%) adhered to health worker treatment plans, while a few (11%) did not, suggesting a need for professional health worker conduct and policy adherence to promote rational drug use, emphasizing the importance of positive attitudes and increased healthcare facility access to reduce self-medication rates.

CONCLUSION

In Ishaka, a high rate of self-medication was observed, with the majority self-medicating and fewer not doing so. Several factors, including marital status, knowledge of antibiotics, source of drug information, attitude, and distance, were significantly associated with self-medication (p<0.05).

RECOMMENDATIONS

Based on the research findings, the researcher recommends the following to relevant authorities and institutions: Firstly, policy makers should conduct community-wide educational programs to raise awareness about the adverse effects of self-medication, which can help reduce its prevalence. Secondly, there should be a review of drug-related information in media sources (such as radio and television) to foster a positive attitude and further reduce self-medication. Thirdly, efforts should be made to enforce professional conduct among health workers and promote adherence to policies, which will enhance positive perceptions of health workers and encourage rational drug use. Additionally, constructing more healthcare facilities to serve disadvantaged populations would contribute to reducing the rate of self-medication.

REFERENCES

1. WHO (2014). Antimicrobial resistance: Fact sheet. *World Health Organization(WHO)*, Geneva.
2. Machowska, A., & Lundborg, C. (2018). Drivers of Irrational Use of Antibiotics in Europe. *International Journal of Environmental Research and Public Health*, 16.
3. Ruiz, M. (2010). Risks of self-medication practices..*Current drug safety*, 5 4, 315-23.
4. Sachdev, C., Anjankar, A., & Agrawal, J. (2022). Self-Medication With Antibiotics: An Element Increasing Resistance. Cureus, 14.
5. Torres, N., Chibi, B., Middleton, L., Solomon, V., & Mashamba-Thompson, T. (2019). Evidence of factors influencing self-medication with antibiotics in low and middle-income countries: a systematic scoping review..*Public health*, 168, 92-101.
6. Ocan, M., Obuku, E., Bwanga, F., Akena, D., Richard, S., Ogwal-Okeng, J., & Obua, C. (2015). Household antimicrobial self-medication: a systematic review and meta-analysis of the burden, risk factors and outcomes in developing countries. *BMC Public Health*, 15.
7. Nakato, G., Adongo, P. R., Iramiot, J. S., & Epuitai, J. (2023). Practices and drivers of self-medication with antibiotics among undergraduate medical students in Eastern Uganda: A cross-sectional study. *Plos one*, 18(12), e0293685.
8. Paska, L. (2023). Awareness, attitude and practice of self-medication among some selected second year medical students of KIU western campus.
9. Limaye, D., Limaye, V., Krause, G., & Fortwengel, G. (2017). A Systematic Review of the Literature to Assess Self-medication Practices. *Annals of Medical and Health Sciences Research*, 7.
10. Ministry of Heath. (2014). Prevalence and Incidence of self-medication, Self-medication among hospital patients and non-hospital patients, Kampala; Ministry of Health.
11. Moro, M. L., Marchi, M., Gagliotti, C., Di Mario, S., Resi, D., & " Progetto Bambini a Antibiotici [ProBA]". (2009). Why do paediatricians prescribe antibiotics? Results of an Italian regional project. *BMC pediatrics*, 9, 1-9.
12. Kyalimpa, J. (2011). Self-medication blamed for increased drug resistance, Uganda: Inter press service English news wire.
13. WHO (2015). Self-medication, Global use of medicine and drugs in treating ailments; Geneva, Switzerland; World Health Organization.
14. Mbonye, A.K., Buregyeya, E., Rutebemberwa, E., Clarke, S.E., Lal, S., Hassen, Magnussen, P., and LaRussa, P. (2016). Prescription for antibiotics at drug shops and strategies to improve quality of care and patient safety: a cross-sectional survey in the private sector in Uganda, Global health, *BMJ Open*; ,6:e010632.
15. Mortazavi, S., Shati, M., Khankeh, H., Ahmadi, F., Mehravaran, S., & Malakouti, S. (2017). Self-medication among the elderly in Iran: a content analysis study. *BMC Geriatrics*, 17.
16. Brookes-Howell, L., Hood, K., Cooper, L., Little, P., Verheij, T., Coenen, S., Godycki-Cwirko, M., Melbyd, H., Borras-Santos, A., Worby, P., Jakobsen, K., Goossens, H., & Butler, C. C. (2012). Understanding variation in primary medical care: a nine-country qualitative study of clinicians' accounts of the non-clinical factors that shape antibiotic prescribing decisions for lower respiratory tract infection. *BMJ open*, 2(4), e000796.
17. Kistler, C. E., Sloane, P. D., Platts-Mills, T. F., Beeber, A. S., Khandelwal, C., Weber, D. J., ... & Zimmerman, S. (2013). Challenges of antibiotic prescribing for assisted living residents: perspectives of providers, staff, residents, and family members. *Journal of the American Geriatrics Society*, 61(4), 565-570.

18. Reyes-Morales, H., Flores-Hernandez, S., Tome-Sandoval, P., and Perez-Cuevas, R.(2009). A multifaceted education intervention for improving family physicians'case management. *Family Medicine*, 41, 277-284.

19. Adebayo, E. T., & Hussain, N. A. (2010). Pattern of prescription drug use in Nigerian army hospitals. *Annals of African medicine*, 9(3).

20. WHO (2010). Factors influencing Primary Care Physicians to Prescribe Antibiotics in New Delhi. India, Essential Medicines and Health Products; World Health Organization.

21. Tripathi, K. D. (2008). Aspects of pharmacotherapy; clinical pharmacology and drug development. Essentials of medical pharmacology. 6th edition. *New Delhi: Jaypee Brothers*, 68-71.

22. Bashrahil, K. A. (2010). Indicators of rational drug use and health services in Hadramout, Yemen. *EMHJ-Eastern Mediterranean Health Journal*, 16 (2), 151-155, 2010.