Drug, Healthcare and Patient Safety

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/dhps20

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To cite this article: Joan Nakakande, Ivan Mugisha Taremwa, Miisa Nanyingi & Samuel Mugambe (2023) The Utility of Internet-Enabled Antibiotic Self-Medication and Its Associated Factors Among Patients Attending Private Clinics in Kawempe Division in Kampala Capital City, Uganda: Community-Based Cross-Sectional Study, Drug, Healthcare and Patient Safety, , 85-91, DOI: 10.2147/DHPS.S405072

To link to this article: https://doi.org/10.2147/DHPS.S405072

Published online: 02 Apr 2023.

Drug, Healthcare and Patient Safety

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ORIGINAL RESEARCH

The Utility of Internet-Enabled Antibiotic Self-Medication and Its Associated Factors Among Patients Attending Private Clinics in Kawempe Division in Kampala Capital City, Uganda: Community-Based Cross-Sectional Study

Joan Nakakande[1], Ivan Mugisha Taremwa[2], Miisa Nanyingi[1], Samuel Mugambe[1,2]

[1]Faculty of Health Sciences, Uganda Martyrs University, Kampala, Uganda; [2]Institute of Allied Health Sciences, Clarke International University, Kampala, Uganda

Correspondence: Joan Nakakande; Ivan Mugisha Taremwa, Email joannakakande2@gmail.com; imugisha@ymail.com

Introduction: The expanding practice of internet-based antibiotic self-medication raises public health concerns as it increases antibiotic resistance and introduces avoidable risks. This study aims to examine the utility of internet-enabled antibiotic self-medication and its associated factors among patients attending private clinics in Kawempe division in Kampala Capital City, Uganda.

Methods: This was an analytical cross-sectional study that enrolled participants attending private clinics in Kawempe Division's randomly selected zones. These were interviewed using a structured questionnaire, and the data were analyzed using STATA version 12 software. Logistic regression analysis was used, and variables with $p \leq 0.05$ were considered as significantly associated with internet-enabled antibiotic self-medication.

Results: Out of the 313 respondents, 246 (79%) reportedly had ever used internet sources to self-medicate with antibiotics. Factors such as being male; single; had knowledge of antibiotics; believed that Internet should be used for antibiotic self-medication; Distance to the nearest medical center/hospital from your residence/workplace of about 5 km and residing near a drug shop/pharmacy that gives antibiotics without a prescription increased internet-enabled antibiotic self-medication. Furthermore, the variables of more than three household members; common practice of antibiotic self-medication in a household; did not agree that one can recover from the illness without a doctor's prescription and medical workers who did not explain adequately the antibiotics medication given for the illness decreased internet-enabled antibiotic self-medication.

Conclusion: This study found that internet-enabled antibiotic self-medication practice is highly utilized and is associated with a variety of individual, household, and healthcare system factors. This necessitates strict adherence to national drug policy regulations governing antibiotic use. Furthermore, community health education is critical in combating such medication practices.

Keywords: internet-enabled, antibiotics, antibiotic resistance, self-medication, Uganda

Introduction

Self-medication is the practice of obtaining drugs without a prescription, resubmitting old prescriptions, exchanging medications with family or friends, or using leftover medications stored at home to treat self-identified disorders or symptoms.[1] As global digitalization progressed, an estimated 65% of Ugandans have access to internet, of whom, 88% live in the central region.[2] Additionally, it is anticipated that internet penetration will increase significantly due to the fast growing demand for information and communication technology (ICT), which fosters information access and remote working as posed by the novel Corona Virus Disease-2019 (COVID-19) pandemic.[3–6] On the other hand, this has profoundly acted as an antecedent for irrational antibiotic self-medication and exaggerated the deleterious consequences such as incorrect choice of therapy and misuse, masking of severe disease, risk of drug abuse and toxicity, antibiotic resistance, and preventable deaths.[7–9] Self-

Received: 16 January 2023
Accepted: 28 March 2023
Published: 3 April 2023

medication is a global phenomenon practiced by an estimated 32.5% to 81.5% of the population,[10,11] and in Uganda, it was reported to be 22.2% at Mulago National Referral Hospital,[9] and 63.5% among students at Mbarara University of Science and Technology.[12] The practice of internet-enabled antibiotic self-medication is the use of the internet to obtain health information that is used to obtain antibiotics without a clinician prescription. This practice complicates healthcare as it augments severe adverse events and raises the risk of antibiotic resistance, which jeopardizes the ability to treat common infectious diseases, restricts access to affordable healthcare and worsens outcomes.[7,13–15] Although complex, internet-enabled antibiotic self-medication (over-the-counter-OTC) continues to thrive in the face of rising health-care costs, limited access to health insurance, and lacked regulatory measures governing antibiotic access; has grave repercussions.[16–18] In Uganda, the main outlets for medicines, including antibiotics, include both public and private players in health facilities, pharmacies, and drug shops. The pharmaceutical sector is mainly concentrated in urban centers. The Ministry of Health (MoH) and the Uganda National Drug Authority are responsible for quality assurance and are mandated to oversee drug use in the country. Despite these regulatory and supervisory roles, antibiotics and other prescription-only medicines are widely available without prescription, and they are currently no systems in place to control the use of antibiotics or routine surveillance for drug resistance. This unregulated environment and the recent access to medical information over the internet has enabled the practice of self-medication with antibiotics to thrive.[9]

Several factors have been linked to the use of internet-enabled antibiotic self-medication. Participants' age, gender, family size, educational level, and monthly income have been reported.[14,19–22] Also influencing internet-enabled self-medication were knowledge about antibiotics on the risk of misuse, accessibility, affordability; health facility conditions, illicit purveyors (market vendors), and residence location.[14,16,19–26] Distance to the health facility, health worker attitude and patient perception, payment methods for prescriptions or consultations, internalized stigma, reluctance to seek care, and unwillingness to disclose risk behaviors to health-care workers, as well as organizational quality in terms of monitoring systems and regulatory framework for prescribed antibiotics, were all reported.[21,27–29]

According to Uganda National Drug Authority (NDA), an estimated eight out of every ten people self-medicate or buy drugs over the counter.[30] At the same time, the NDA directs the formulation and implementation of the National Drug Policy (NDP), which promotes rational drug use and regulates the local production of essential drugs.[30] As a result, Class A and Class B drugs, which include controlled drugs such as antibiotics, require a prescription before dispensing. Moreover, the novel COVID-19 pandemic has exacerbated the problem, with millions of people frantically searching for health-related information online, and there was an increase in the empirical use of antibiotics such as azithromycin, among others, in preventing and treating COVID-19.[31–33] As the COVID-19 pandemic raged on, and with the uncertainty surrounding emerging waves and new variants, internet-enabled antibiotic self-medication poses a critical risk, necessitating coordinated interventions. This study aims to examine the e utility of internet-enabled antibiotic self-medication and its associated factors among patients attending private clinics in Kawempe division of Kampala Capital City, Uganda.

Materials and Methods

Study Design, Duration, and Area

This was an analytical cross-sectional study employing quantitative methods. The research was carried out from March to September 2022. The research was conducted in Kawempe Division, one of Kampala's five divisions, which borders Wakiso District to the west, north, and east, Nakawa Division to the southeast, Kampala Central Division to the south, and Lubaga Division to the southwest. The division is located at 00 23N, 32 33E. (Longitude: 32.5574; Latitude: 0.3792). It comprises the zones of Kanyanya, Kazo, Mpererwe, Kisaasi, Kikaya, Kyebando, Bwaise, Komamboga, Mulago, Makerere, and Wandegeya. The division is divided into 19 parishes, with informal settlements in 18 of them. Kawempe Division has a population of 338,665, with women constituting 52% of the population and 94,202 households accounting for 25% of the total capital city population and is occupied by slum settlements.[34]

Study Population and Sample Size Estimation

Patients who visited private clinics in the Kampala district's Kawempe Division constituted the study population. At the time of data collection, patients were defined as those who had experienced any medical condition in the previous 12

months. The Cochran formula was used to calculate the ideal sample size given a desired level of precision, desired confidence level, and estimated proportion of the attribute present in the population.[35] The prevalence of self-medication at Kiruddu National Referral Hospital of 22.2% was used.[9] When the Z score was substituted at 1.96 with the allowable error of 5%, a total of 264 people were estimated to participate. After adjusting for 20% non-response, 315 people were considered.

Sampling Procedure

A systematic sampling method was used. With 12 zones, the Kawempe division was the first level of selection. As the total number of private medical centers in each zone is unknown, sixty percent of these zones were chosen at random based on the theory that a percentage sample of more than ten percent is representative of the population's characteristics,[36] thus 7 zones were sampled. Private clinics/drug shops and pharmacies were chosen at random in these zones.

Selection Criteria

This study included patients who attended private clinics and lived in Kawempe Division, were 18 years or older, and could give informed consent to the study. People with cognitive impairment were excluded from the study.

Data Collection Tool, Quality Control, and Collection Process

A structured questionnaire (Appendix I) was developed based on the existing literature.[8–10,12–14,16,17,21–27] This survey included both open-ended and closed-ended questions about socio-demographic characteristics, antibiotic use in the previous year, frequency, source of information, and drug specificities. Three trained research assistants assisted with data collection. These assisted the research team in administering the questionnaires and ensuring that complete and accurate data was collected. To allow for timely correction of errors, data inconsistency checks were performed while still in the field. To ensure the face and content validity, three experts familiar with social behavioral research reviewed copies of the questionnaire, and contributions from these experts were duly incorporated. Also, an overall content validity index above 0.8 was obtained; thus, the tool was considered valid.[37] To test reliability, the questionnaire was pretested on 20 patients in Nakawa Division, Kampala, and all gaps found during the pretesting were filled. Pre-tested and approved questionnaires were used to collect data from patients attending private clinics in Kawempe Division. Every valid response provided by the respondent was coded, and all responses were assigned numerical numbers.

Data Analysis

The information was entered into the STATA version 12 software. The analysis included frequency extraction as well as bivariate and multivariate analyses. Cross tabulations were used as a standard measure for two categorical variables: the use of internet-enabled antibiotic self-medication (dependent variable) and the individual, household, and health system factors associated [independent variable(s)]. The probability values (p) generated from each of these cross-tabulations were determined using logistic regression reporting Crude odds ratios and their 95% confidence intervals at the 0.05 level of significance. Variables with $p \leq 0.05$ at the bivariate level were investigated further in a binary multiple regression model adjusting for confounders, and those that remained significant ($p \leq 0.05$) were considered independent predictors. The strength of the association was calculated using adjusted odds ratios (aOR) and 95% confidence intervals to represent the level of precision.

Ethical Considerations

Ethical approval was obtained from an Ethics Review Committee of Uganda Martyr's University. Additionally, administrative clearance was obtained from Kampala City Council Authority (KCCA) and the private clinics. Participation in the study was voluntary and written informed consent was obtained. The study ensured anonymity, confidentiality, and privacy. Only the study team had access to the questionnaires as they were kept under lock and key. The study complied to the Declaration of Helsinki.

Results

Of the 313 participants, 211 (67.4%) were male. Their average age was 25.0 years (range: 19–53). Furthermore, 217 (69.3%) did not have medical insurance, and 134 (43.09%) worked informally as shown in Table S1.

Of the respondents, 246 (or 79%) had ever used online resources and self-medicated with antibiotics. Furthermore, 232 respondents (74.8%) thought that antibiotics were effective for treating the common cold, and 296 respondents (94.9%) knew what antibiotics were. Additionally, 87 (28.1%) people admitted to using antibiotics as self-medication one to two times in the previous 12 months, compared to 181 (58.4%) people who did so at least twice a year. Metronidazole (Flagyl) (N = 162, 63.3%) was the most frequently used antibiotic based on online information, followed by Co-trimoxazole (Septrine) (N = 153, 59.8%), Amoxicillin (N = 111, 43.4%), Azithromycin (N = 92, 35.9%), and Amoxicillin/Clavulanic acid (N = 52, 20.3%).

Varied individual, household, and health systems factors in a bivariate analysis showed an association with internet-enabled antibiotic self-medication as illustrated in Table S2.

Further, multivariate analyses of individual, household, and health systems factors were analyzed. Individually, males (aOR: 4.1; CI (1.7–9.8), p = 0.001), single respondents (aOR: 12.6 (3.8–41.8), p < 0.001), respondents with knowledge of antibiotics (aOR: 15.2; CI: (2.0–117.0); p = 0.009), those who thought it was difficult to access and use online information (aOR: 5.2; CI: (1.6–17.4)), and those who thought the internet should not be used for self-medication with antibiotics (aOR: 3.6; CI: (1.2–11.9); p = 0.036) were more likely to practice internet enabled antibiotic self-medication. At the household level, households that believed that self-medication with antibiotics was a common practice (aOR: 7.13; CI: (2.1–24.7); p = 0.002) had a positive association with internet enabled antibiotic self-medication, while households with three or more occupants (aOR: 0.1; CI (0.03–0.4); p = 0.001), and households that believed that one could only recover from an illness with a doctor's prescription (aOR: 0.16; CI: (0.01–0.6); p = 0.004) presented a negative association with internet enabled antibiotic self-medication. As for the health system factors: Patients who lived within a 5-kilometer radius of the nearest health facility [aOR: 4.60; CI: (1.5–14.5); p = 0.009], those whose nearest pharmacy or drug shop provided antibiotics without a prescription [aOR: 7.08; CI: (1.8–28.1); p = 0.005], and those who did not believe medical workers adequately explained medical information about their illness [aOR: 0.27; CI: (0.1–0.8); p = 0.024] were all more likely to practice internet enabled antibiotic self-medication, as shown in Table S3.

Discussion

Over three-quarters of those studied reportedly used internet-enabled antibiotic self-medication for a variety of ailments, including the common cold. The observed trend is close to the 75.7% reported in northern Uganda, which is consistent with a previous study,[38] however, it is lower than 90% as reportedly estimated by NDA.[30] The utility of internet-enabled antibiotic self-medication, on the other hand, is greater than the 22.2% reported by Kiruddu National Referral Hospital in central Uganda.[9] The observed variance is explained by differences in the studied area and respondent characteristics. Concerningly, the high utility of internet-enabled antibiotic self-medication indicates a concerning challenge that, without a doubt, may worsen antibiotic resistance, with dire consequences for our limited resource setting where health-care systems continue to face severe challenges.

The most used antibiotics were consistent with the pattern reported from northern Uganda,[38] and a previous study from central Uganda.[39] As the two studies discussed were both conducted in Uganda,[38,39] it is likely that these antibiotics are widely available and perhaps more affordable. At the same time, these antibiotics treat multiple infections,[30] implying that their irrational use may render them resistant, which will have catastrophic effects for communities in such a setting with limited antibiotic options. Although not explored, the consequences of antibiotic resistance will rage across the continuum of care, complicating and worsening healthcare.

Knowledge of antibiotics was linked to internet-enabled self-medication practice in this study. This finding is consistent with previous findings.[7,40] This is, however, contrary to other studies.[41–43] Our findings can be explained by Orem's self-care theory, which states that an individual will perform a task based on basic conditioning factors that may extend beyond basic knowledge to include other sociocultural inclinations.[44] To this, it is likely that individuals who have knowledge of antibiotics and have self-medicated may not critically consider the dire consequences of self-medication.

According to this study, people who perceived the internet as a difficult tool to use were also more likely to self-medicate using online information. This could imply that, similar to a previous report,[45] will be unable to obtain better information for better decision-making. It appears to imply that the internet is a simple tool for seeking medical assistance. Thus, the inability to efficiently search the internet for antibiotic use may increase self-medication because one may inadvertently miss out on information cautioning against taking these antibiotics without consulting a health-care worker. The majority of the respondents believed that the internet should be used for antibiotic self-medication. According to this finding, health promotion messages aimed at reducing antibiotic self-medication should go beyond basic information about antibiotics and emphasize the long-term effects, as well as reassuring the public that information available on the internet should not be used in place of a health worker's prescription, but rather as an add-on.

Individuals who lived in households with fewer members were more likely to self-medicate with antibiotics, according to previous reports.[14,15] This complex feature is driven by a socio-dimensional community. According to Orem's self-care theory, medical care decisions in a household are not solely dependent on an individual but are also influenced by conditioning factors such as resource availability and living patterns.[44] Furthermore, a previous report[14] hypothesizes that low levels of internet-enabled antibiotic self-medication in a larger household may be due to consultation with family members and friends rather than searching online for a remedy. This explanation is strengthened by the fact that the study was conducted in an urban setting. It is undeniable that individual care-seeking may influence the antibiotic selection and eventual practices. Furthermore, this study discovered that households with a history of self-medication practices were more likely to self-medicate with antibiotics using online information, a finding that is consistent with previous Ethiopian reports.[20,22] This is explained by prior knowledge of which antibiotics to use for an illness, as well as family or peer pressure to adhere to existing practices within the household. Similarly, the study discovered that beliefs a household holds about the possibility of recovering from an illness only after receiving a medical worker's prescription reduce antibiotic self-medication practices with the use of online information within a household, which is similar to a report from Ethiopia.[20] This is supported by Orem's self-care theory, which identifies socio-cultural orientation as a conditioning factor that influences a health decision. Furthermore, similar to a previous report,[23] household access to the nearest health facility prompted antibiotic self-medication using online information. This finding could relate closely to the experiences household had about services of the nearest facility such attitude of the health workers and their belief that health workers also used information from the internet to write their prescription. As a result, a household should be the unit targeted for health information dissemination. Individuals whose nearest pharmacy or drug shop sold antibiotics without a prescription had a higher likelihood of using online information to self-medicate, similar to previous research findings.[26,28] This is explained by the use of online information to request a specific antibiotic from a nearby pharmacy over the counter, as well as the lack of control measures at such a unit, which leads to an increase in antibiotic self-medication practices. Moreover, providing an individual with information about his or her previous medical condition and antibiotics used increased self-medication practices using online information. This is consistent with a previous report.[46] This would be due to the use of previous prescription knowledge to seek online information on previously prescribed antibiotics, thereby increasing self-medication. Based on these, medical advice to patients should be broadened to include individual and environmental considerations, as well as the potential adverse effects of antibiotics taken without a prescription over time, which leads to antibiotic resistance.

This study has several strengths including the number of participants selected from the different age groups, participants' response rate, and the analysis at a multivariate level that increased the accuracy of reported observations. The findings of this study should be interpreted with caution as the reported associations are prone to bias due to the small sample size and recall bias. Also, the study is limited by a limited mentioned common antibiotics which were generally selected by the respondents. Also, the self-reports as responses to this study may hinder generalizability. Future studies should examine internet-enabled antibiotic self-medication in rural settings.

The observed problem of internet-enabled antibiotic self-medication requires that health-care providers increase public awareness about the dangers of antibiotic self-medication. Policymakers should develop relevant policies and ensure their implementation.

Conclusions

We found that a significant number, three out of the four study participants, have ever utilized internet for antibiotic self-medication. There were multiple factors that were significantly associated with internet enabled antibiotic self-medication

such as sex, marital status, knowledge about antibiotics included antibiotic knowledge and perceptions of internet use on antibiotic self-medication practices. Also included were the number of household members, pre-existing antibiotic self-medication practices, and household beliefs about using online information for antibiotic self-medication. Additionally, a significant association was found between the health system factors of proximity to the nearest pharmacy that sells antibiotics without a medical worker's prescription and medical information given to an individual about their illness. Based on these findings, there is an urgent need to consider interventions that increase knowledge antibiotics use Patient information, education, and communication (IEC) materials to include information on the consequences of inappropriate antibiotic use as well as proper use of online health information as a health-seeking behavior. ii) The Ministry of Health should re-ignite Health Promotion, Education, and Communication with strategic messages on antibiotics and internet use; to target individuals and households with structured health messages that include; what antibiotics are and the possibility of short-term and long-term consequences of inappropriate antibiotic use, as well as this practice with the use of the internet. iii) The National Drug Authority should sensitize health workers on the National Drug Policy and its limitation of unnecessary dispensation of antibiotics without a medical worker prescription.

Disclosure

The authors report no conflicts of interest in this work.

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