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Antimalarial Self-medication among Adults during the COVID-19 National Lockdown in Northern Uganda: Implications for Antimicrobial Resistance. A cross-sectional study.

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Abstract

Background:

The practice of self-medication is increasingly becoming a major health concern globally. In Uganda, there is documented evidence of self-medication, especially for common endemic illnesses such as malaria. This has individual and public health consequences, including drug misuse and resistance. We assessed the prevalence and factors associated with antimalarial self-medication among adults during the COVID-19 national lockdown in Lira district, Northern Uganda.

Methods:

We conducted a mixed-method cross-sectional study among adults in Lira District, Uganda. A total of 315 participants selected using a systematic random selection method from the community were enrolled in the study. Quantitative data were collected using a researcher-administered questionnaire. Conditional logistics regression was used to analyse data.

Results:

A total of 315 participants were enrolled in the study. The prevalence of antimalarial self-medication was 80.6% (254/315). Artemether-lumefantrine (Coartem) was the most commonly used antimalarial drug (62.5%). Factors significantly associated with antimalarial self-medication included age 45–64 years (aOR=3.10, 95% CI: 1.29–7.44), secondary education (aOR=3.30, 95% CI: 1.11–9.85), waiting time of one hour or more at health facilities (aOR=9.10, 95% CI: 4.15–19.94), distance greater than 5 km to a health facility (aOR=2.05, 95% CI: 1.14–3.69), and lack of awareness about the dangers of self-medication (aOR=4.69, 95% CI: 2.06–10.70).

Conclusion:

The prevalence of antimalarial self-medication among adults in Northern Uganda was high during the COVID-19 national lockdown and has the potential to worsen antimicrobial resistance. Health education messages about the dangers of self-medication, targeting the entire population, and improved access to health facilities could be enforced by the Uganda Ministry of Health and health partners.

Recommendation:

The Ministry of Health should strengthen regulation of drug outlets, increase supervision of private health facilities and pharmacies, and intensify public education on the dangers of self-medication with antimalarial drugs.

Keywords: *Self-medication, antimalarial, malaria, antimicrobial resistance.*
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Background

Malaria is a global concern with an estimated 228 million new cases and 405,000 deaths annually. (WHO, 2020). It is a mosquito-borne disease caused by Plasmodium parasites and presents with fever, chills, and flu-like illness. Left untreated, severe complications may arise, leading to death. (CDC, 2019)This is even worse in Africa, which is responsible for the 93% cases and 94% death globally reported. In Sub-Saharan Africa alone, six countries account for more than half of all malaria cases worldwide: Nigeria at 25%, the Democratic Republic of Congo at 12%, Uganda at 5%, and the Ivory Coast, Mozambique, and Niger at 4% each. (WHO, 2019b). In Uganda, the MOH reveals a 40% increase in malaria cases from 1 million in June 2018 to 1.4 million by June 2019, making the country still among 11 countries that account for 70% of all malaria cases globally. (Lirri, 2019). Furthermore, it is projected that Uganda has the third-highest deaths from malaria in Africa. (Malaria Consortium, 2020). In the Lira district, to be specific, even with the unending efforts to control malaria, it is still known to be a highly endemic area for the disease. The district already reports plasmodium multi-drug resistant

strains, gene-1 (Pfmdr-1) at 90%, and D1246 genotypes at 92.3% among patients. (Achol et al., 2019).

High incidences of malaria correlate with an increase in self-medication with antimalarial medicines. (Chipwaza et al., 2014). Self-medication refers to the selection and use of medicines chosen by the patient for the treatment of a disease or perceived illness. (Oluwole et al., 2016). The phenomenon is widely practiced worldwide, particularly in developing countries, and people often diagnose themselves by referring to old prescriptions. (Baig et al., 2012). Studies done in Europe present the prevalence of self-medication at 68%. African countries exhibit a higher prevalence of self-medication between 40.7% to 81.8% (Oluwole et al., 2016). In Sub-Saharan Africa, self-medication with antimalarials is on the increase because some countries apply it as an acceptable way to prevent and treat malaria, with a narration that *"self-medication is a commonly employed practice with an attempt to normalize perceived illness*" (Abrha et al., 2014). But this does not take into account drug resistance resulting from failure to target the causative agent of the disease. Uganda, in particular, from a study conducted in Tororo district, revealed the prevalence of self-medication in children under five years at 30.1%. These researchers further discovered that even the symptoms of cough were treated using antimalarial medicines, where the prevalence of use of these medicines stood at 44%, with dosage estimation mainly done by reference to old prescription notes. (Alele, 2013).

The World Health Organization (WHO) recommends that the presence of malaria parasites in human blood be confirmed either through microscopy or rapid diagnostic tests before taking any antimalarial medicines. (WHO, 2019a)Yet self-medication with these medicines still continues to rise. In Northern Uganda, 75.7% of people practice self-medication with artemether-lumefantrine, being the most self-medicated antimalarial drug among other antimicrobials. (Ocan et al., 2014). It is worrisome that this bad habit could have increased during the long mandatory national lockdown due to the COVID-19 pandemic. The lockdown spanned from March 30, 2020, to around June 30, 2020. During the first phase of this lockdown (March 30 to May 5, 2020), dubbed the total lockdown, essential services, including access to healthcare, were severely compromised. This prompted many households to stock up in large quantities of essential care items, including medicines. It is not yet known to what extent this lockdown impacted the already prevalent self-medication habits among residents of the Lira district. Therefore, we investigated to assess the prevalence and factors associated with antimalarial self-medication among adults during the COVID-19 national lockdown in Lira district, Northern Uganda.

Methods

Study design and setting

The study employed a cross-sectional study design collecting quantitative data from 01st March 2020 to 31st May 2020.

The study was conducted in Lira District. This district is located in the Northern part of Uganda and covers 1326 square kilometers, bordered by seven districts: Pader in the North, Otuke and Alebtong in the East, Kaberamido and Dokolo in the South, Kole in the west, and Oyam in the north-west. It is approximately 337km from the capital city of Kampala. (UBOS, 2018).

Study population

The study population was men and women aged 18-64 years from the selected communities of Adekokwok, Amach, and Lira subcounties in Lira district.

Sample size and sampling technique

Sample size was determined using the Kish-Leslie (1965) formula. $(n_o = z^2pq/e^2)$ where n_o = sample size, z = selected critical value of desired confidence level, p = estimated proportion of population, $q = 1-p$ and e = desired level of precision. Using 95% confidence level, z=1.96, e= 0.05, p=28.8%, which is the estimated prevalence of antimalarial use in northern Uganda (Ocan et al., 2014).Therefore, q = 1 - 0.288 = 0.712. So n_o = $(1.96)^2*(0.288)*(0.712)/(0.05)^2$ = 315. 097 $\simeq$ 315 respondents. Therefore, a sample size of 315 respondents was utilized for the research.

The study employed a multistage sampling technique to source participants. In the first stage, of the 10 sub-counties in Lira District, 3 sub-counties of Adekokwok, Amach, and Lira were randomly selected. In the second stage, a parish was randomly chosen from the 3 sub-counties, and they were Angwetangwet, Abwocolil, and Anai, respectively. In the third stage, of the 3 chosen parishes, a village each was chosen randomly, and they were Opila, Olil 'B, and Anai Pida, respectively, and 105 participants from each of them were selected using simple random sampling, where each member stood an equal chance of being included in the study.

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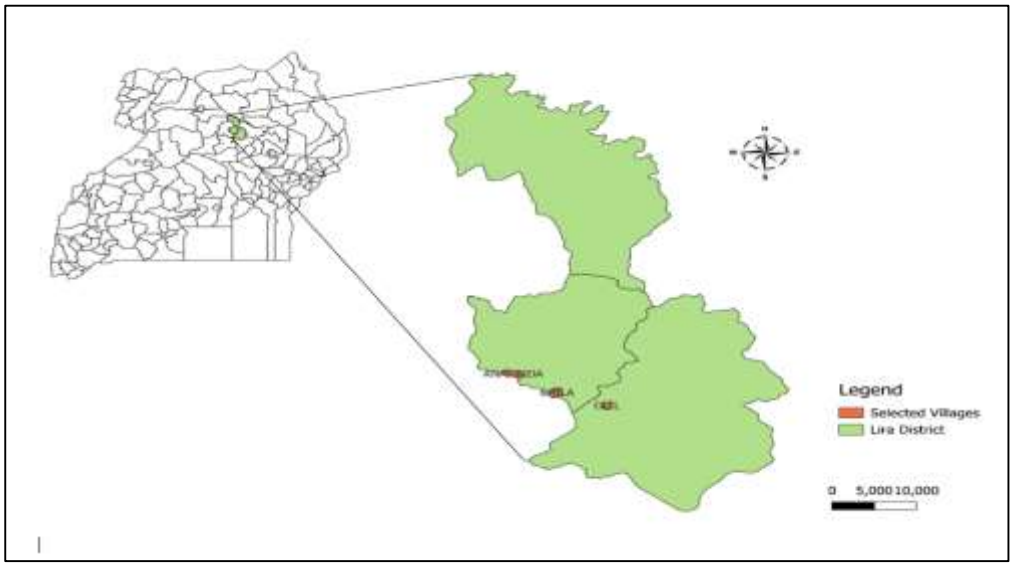

Figure 1: Study area showing the selected villages in Lira District

Bias

Several measures were undertaken to minimize bias. Multistage probability sampling was used to reduce selection bias. The questionnaire was pretested in a non-selected village before data collection. Research assistants received training on questionnaire administration to ensure consistency. The questionnaire was translated into the local language (Lango) to minimize information bias and improve participant understanding. Data checking and cleaning were conducted throughout data collection to ensure completeness and accuracy.

Inclusion and exclusion criteria

Men and women aged 18 to 64 from the community were included in the study.

All people who were just visiting the selected sub-counties of Amach, Adekokwok, and Lira, and participants who were too sick at the time of the study were excluded from the study.

Study Variables

Primary Outcome Variable

The primary outcome was antimalarial self-medication, defined as the use of antimalarial drugs without a prescription from a qualified health worker.

Independent Variables

Sociodemographic factors: age, sex, marital status, religion, education level, and source of livelihood.

Individual factors: awareness of dangers of self-medication, drug storage practices, and actions taken following treatment failure.

Health facility factors: availability of antimalarial drugs, affordability of medicines, distance to health facilities, waiting time, and health worker-community relationship.

Data collection tools

A researcher administered a questionnaire, which was translated into Lango, which is the local language used in the study area. The questionnaire consisted of four sections of sociodemographic data of the participant, prevalence of antimalarial self-medication, individual factors for self-medication with antimalarial medicines, and health facility factors for self-medication with antimalarial medicines.

The questionnaire was pretested among individuals from non-participating communities to test for consistency and reliability.

Data management and analysis

Quantitative data from questionnaires were entered and analyzed using the SPSS software version 20. At the univariate level of analysis, descriptive analysis was done to produce frequencies and percentages of single variables. Bivariate analysis was conducted to establish the relationship between dependent and independent variables using the Chi-square test, where all variables at 95% confidence interval, with P-values less than 0.05, were rendered statistically significant. Multivariate analysis was carried out to determine the strength of associations established at the bivariate analysis level. Here, only variables that were considered significant at the bivariate level of analysis were included, where logistic regression was done to estimate the adjusted odds ratios at 95% confidence interval.

Ethics approval and consent to participate

An approval letter from the Clarke International University Research Ethics Committee (CIUREC) in conjunction with the National Research Information Management System (NRIMS) was sought, and authorization from the District Health Officer of Lira District and permission from Local Council 1 of each of the selected villages were also sought.

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Study participants were voluntarily included in the study after being informed about the aim and objectives of the study. A consent letter was signed by each participant who agreed to take part in the study for the case of questionnaire administration.

Results

Participant Flow

A total of 315 individuals were assessed for eligibility. All eligible individuals consented to participate in the study. No participants were excluded, resulting in a final sample of 315 participants and a response rate of 100%.

Participant Characteristics

Table 1 Socio-demographic characteristics of participants

Variable	Frequency (N=315)	Percentage (%)
Sex		
Male	120	38.1
Female	195	61.9
Age		
18 to 24	76	24.1
25 to 44	153	48.6
45 to 64	86	27.3
Marital status		
Married	222	70.5
Single	63	20.0
Separated/Widowed	30	9.5
Religion		
Catholic	127	40.3
Protestant	142	45.1
Muslim	7	2.2
Born again	39	12.4

Source: primary data from the respondents

Among the 315 participants, 195 (61.9%) were female, and 120 (38.1%) were male. The majority, 153 (48.6%), were aged 25–44 years, while 86 (27.3%) were aged 45–64 years and 76 (24.1%) were aged 18–24 years. Most participants were married (70.5%), had attained primary education (38.4%), and earned a livelihood through farming (51.1%).

Quantitative data

Of the 315 participants enrolled in the study, the majority were males at 61.9%, and the majority were married at 70.5%.

Prevalence of antimalarial self-medication:

A vast majority of participants practiced self-medication with antimalarials at 80.6%, the majority used antimalarials with prescription at 66.1%, Artemether-lumefantrine was the most self-medicated antimalarial at 62.5%, the majority self-medicated for fever at 61.6%, majority of antimalarials were accessed from drug shops at 44.4%.

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Table 2: Prevalence of antimalarial self-medication

Variable	Frequency (n)	%
Antimalarial self-medication in past one-year		
Yes	254	(80.6)
No	61	(19.4)
Prescription done by a qualified person (n=254)		
Yes	168	(66.1)
No	86	(33.9)
Type of antimalarial used for treatment		
Artemether-lumefantrine (coartem)	197	(62.5)
Quinine	15	(4.8)
Chloroquine	11	(3.5)
Artesunate	80	(25.4)
Primaquine	12	(3.8)
Antimalarials used for fever (n=315)		
Yes	194	(61.6)
No	121	(38.4)
Antimalarials used for general body weakness		
Yes	165	(52.4)
No	150	(47.6)
Access to antimalarial medicines		
Drug shops	140	(44.4)
Pharmacies	31	(9.8)
Government hospitals	33	(10.5)
Private hospital	111	(35.2)

Factors associated with antimalarial self-medication

Socio-demographic factors associated with self-medication included being in the 45-64 age group (aOR=3.1, 95% CI: 1.3-7.4); having attained secondary education (aOR=3.30, 95% CI: 1.1-10); having a business as a source of income (aOR=3.3, 95% CI: 1.1-9.8).

Individual factors: Participants who were not aware of self-medication dangers were highly associated with self-medication with antimalarials (aOR=4.69, 95% CI: 2.06-10.695).

Health facility factors: participants who reported having waited for ≥1 hour to seek service at a nearby health facility were associated with self-medication with antimalarials (aOR=3.96, 95% CI: 1.862-8.418). Participants who lived far (≥5km) from the nearest health facility were more likely to self-medicate with antimalarials compared to those who stayed closer to the health facility (aOR=02.05, 95% CI: 1.14-3.69).

Table 3: Factors influencing self-medication with antimalarial medicines

Variable	aOR	95%CI	P-value
Age			
18 to 24	Ref		
25 to 44	2.07	(0.9-4.8)	0.1
45 to 64	3.1	(1.3-7.4)	**0.01**
Level of education			
No formal education	Ref		
Primary education	2.4	(0.9-6.4)	0.1
Secondary education	3.30	(1.1-9.9)	**0.01**
Tertiary education	0.89	(0.3-2.8)	0.8
Source of livelihood			
Farming	Ref		
Business	3.3	(1.1-9.8)	**0.03**
Civil servant	1.2	(0.3-4.1)	0.9
Minimum waiting time at the nearby health facility			
Half an hour	Ref		
1 hour	9.10	(4.2-19.9)	**<0.01**
2 hours	1.8	(0.8-4.2)	0.2
> 2 hours	2	(0.9-4.4)	0.1
Distance to the nearby health facility			
≤ 5km	Ref		
> 5km	2.1	(1.1-3.7)	**0.02**
Awareness of self-medication dangers			
Yes	Ref		
No	1.5	(0.7-3.1)	0.3
Don't know	4.7	(2.1-10.7)	**<0.01**
Antimalarials are part of the medicines stored at home.			
Yes	Ref		
No	0.2	(0.03-1.3)	0.09
Next action after failed treatment with antimalarials			
Continued with treatment	Ref		
Revisited the health unit	0.13	(0.01-1.3)	0.08

Discussion

According to our findings, there was a very high prevalence of self-medication with antimalarial medicines of 80.6%. This is higher than 75.7% self-medication registered by a study done in Northern Uganda. (Ocan et al., 2014). This could be linked to panic buying of medicines during the COVID-19 national lockdown, as the movement of persons was overly controlled.

This study revealed that participants with secondary education were 3.3 times more likely to self-medicate than those with other education levels. Similar findings were revealed in a study in Eritrea. (Araia et al., 2019). This could be attributed to peer advice backed by a common practice where most of these school-going age students are packed for medicines and often instructed by their parents on their use. A habit they might be practicing without knowledge of its consequences.

According to our study, 67.3% of participants stored medicines at home. This is much higher than the results from a study done in Gondar Town, northwestern Ethiopia, which produced 44.2% storage of medicines at home. (Teni et al., 2017). However, there was no association between drug storage at home and antimalarial self-medication. This could mean that most of the medicines stored at home fall in other categories, for example, antibiotics, and a possible implication for self-medication of other classes of medicines as well.

They revealed that self-medication was attributed to long-distance health facilities. Participants who lived ≥5km from health facilities were twice as likely to self-medicate as compared to those who lived closer. This was backed by findings from the 2017/18 report from the Uganda Ministry of Health that stated that 15.1% of the people within the Lango sub-region accessed health care at a distance of 5 km or more on average. (MOH, 2018). The impact of distant health facilities on healthcare seeking has been clearly documented in several studies, including the promotion of self-medication practices among the affected. (Ekholuenetale, 2025) Therefore, it is apparent that access to healthcare services, including easy access to affordable medical consultations, could be helpful in combating self-medication practices in such communities.

Generalizability of Findings

The findings of this study may be generalizable to populations living in malaria-endemic settings with similar demographic characteristics, healthcare access barriers, and disease burden as Northern Uganda. However, caution should be exercised when applying the findings to non-endemic regions or settings with

substantially different healthcare systems and patterns of medicine use.

Conclusions

The prevalence of antimalarial self-medication among adults in Northern Uganda was high during the COVID-19 national lockdown and has the potential to worsen antimicrobial resistance. Health education messages about the dangers of self-medication, targeting the entire population, and improved access to health facilities could be enforced by the district health teams.

Recommendation

The Ministry of Health should strengthen supportive supervision and regulation of private hospitals, clinics, pharmacies, and drug shops to ensure rational use of antimalarial medicines.

Additional drug inspectors should be recruited and facilitated to strengthen the enforcement of medicine dispensing regulations.

Community awareness campaigns should be intensified to educate the public on the dangers of self-medication and the importance of seeking professional healthcare services.

Health facilities should be supported to reduce waiting times and improve the availability of essential medicines to minimize reliance on self-medication.

List of abbreviations

ACT Artemisinin-Based Combination Therapy
COVID-19 Coronavirus disease 2019
CDC Center for Disease Control and Prevention
MOH Ministry of Health
Pfmdr-1 Plasmodium multi-drug resistant gene-1
RDT Rapid Diagnostic Test
SPSS Statistical Package for the Social Sciences
UBOS Uganda Bureau of Statistics
WHO World Health Organization

Declarations

Ethics approval and consent to participate

An approval letter from the Clarke International University Research Ethics Committee (CIUREC) in conjunction with the National Research Information Management System (NRIMS) was sought, and authorization from the District Health Officer of Lira District and permission from LC1s of the various villages were also sought.

Study participants were voluntarily included in the study after being informed about the aim and objectives of the study. A consent letter was signed by each participant who agreed to take part in the study for the case of questionnaire administration.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to the fact that they are the property of Clarke International University, but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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Authors' contributions

Philemon Ojok Eger: Conceived the study, collected data, participated in data analysis, interpretation of findings, and manuscript writing.
Alimah Komuhangi: Supervised the study, reviewed the methodology, interpreted findings, and critically reviewed the manuscript.
Jonathan Izudi: Provided technical guidance on study design, statistical analysis, interpretation of results, and manuscript review.
Emmanuel Okiror Okello: Contributed to study design, interpretation of findings, and critical review of the manuscript.
Felex Okori: Participated in data analysis, manuscript organization and preparation, provided technical guidance throughout the study process, and reviewed the final manuscript.

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