COVID-19 self-medication practices among slum dwellers in Jinja City, Uganda

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ABSTRACT

Introduction: Self-medication is one of the elements of self-care, which the World Health Organization (WHO) defines as the selection and use of medicines to treat self-identified symptoms or ailments without consulting a physician. Self-medication is a worldwide public health concern, and the COVID-19 pandemic exacerbated it. Uganda was hit by two waves from April to June 2021, the second of which was more severe, resulting in lockdowns and quarantine. Effective COVID-19 treatments were difficult to obtain in Africa, and government treatment guidelines focused on symptom management. This increased the likelihood of self-medication practices in communities battling COVID-19 symptoms, especially slums. We identified self-medication practices for COVID-19 prevention, treatment, and management among Jinja City slum dwellers so that appropriate educational, regulatory, and administrative measures could be developed to address this public health challenge. **Methods:** A cross-sectional study was conducted among urban slum dwellers randomly selected from slums in Jinja city. Households were proportionately recruited from the slums and an adult who had self-medicated for COVID-19 during 2021 was enrolled from each household. An electronic semi-structured interviewer-administered questionnaire was used to collect quantitative data. The data were imported into STATA version 14.0 for analysis. Self-medication practices for COVID-19 were also reported as frequencies and proportions using univariate analysis. **Results:** More than half, 58.1% (262/451) of the respondents reported using concoctions, 52.6% (237/451) used conventional medicine, and 41.2% (186/451) reported using herbal medicine for self-medication of COVID-19. Among the respondents who used concoctions, 95.0% (249/262) drank boiled concoctions, 68.3% (179/262) steamed concoctions. Among the 237 respondents who used conventional medicine 69.6% (165/237) self-medicated with vitamin C, 57.8% (137/237) with azithromycin, 55.7% (132/237) with paracetamol, and 54.9% (130/237) with zinc tablets. **Conclusion:** Majority of the slum dwellers self-medicated with conventional medicines or with herbal concoctions for COVID-19 prevention or treatment. The agents used for self-medications included antibiotics and potentially toxic agents. Pharmaceutical regulatory agents and public health agencies should conduct routine public awareness campaigns about the dangers of irrational drug use.

Introduction

The World Health Organization recognizes self-medication as a global public health concern. Even though self-medication is a useful tool for treating minor ailments [1], improper self-medication practice can result in serious adverse drug reactions, drug interactions, drug addiction or dependence, drug toxicity, and even death [2]. Self-medication is one of the elements of self-care and refers to the selection and use of medicines to treat self-identified symptoms or ailments without consulting a physician [3]. The current COVID-19 pandemic and its control measures [4], which included a series of lockdowns, quarantines, and travel restrictions in many parts of the world [5, 6], exacerbated this practice [4]. These measures were exacerbated by the challenge of limited access to health care, particularly in underserved communities like slums. This, combined with the general fear of COVID-19, increased the likelihood of self-medication in communities struggling to prevent or manage COVID-19 symptoms. The virus that causes COVID-19, SARS-CoV-2, was declared a public health emergency of international concern on January 30, 2020, and a pandemic on March 11, 2020 [7]. It was discovered for the first time in November 2019 in Wuhan, China [8]. The COVID-19 pandemic has had an impact on nearly every sector of development around the world. By the 21st of February 2023, there had been over 758 million confirmed cases of COVID-19 worldwide, with 6.8 million deaths [9]. The total number of cases in Africa exceeds 9.4 million, with approximately 175,289 deaths [9].

From April to June 2021, Uganda experienced two waves, with a more severe second wave [10]. The pandemic's second wave was fuelled by five different variants [11]. By February 21, 2023, Uganda had recorded 170,383 confirmed cases and 3,630 deaths [12]. In the midst of that burden, effective COVID-19 treatments were difficult to obtain in Africa, and government treatment guidelines focused on symptom management [13]. To reduce disease transmission and the burden on the healthcare system, many parts of the world implemented lockdowns, quarantines, and travel restrictions [5,6]. These policies exacerbated the problem of limited access to health care, particularly in underserved communities like slums. This, combined with the general fear of COVID-19, increased the likelihood of self-medication practices in communities struggling to prevent or manage COVID-19 symptoms. There has been a growing concern about the rise of antibiotic-resistant microorganisms, a problem exacerbated by widespread self-medication [14]. To address this issue, it was crucial to understand how different community segments engage in self-medication for infection prevention, treatment, and management. This understanding can help in crafting appropriate educational, regulatory, and administrative measures to reduce the public health risks linked to improper self-medication. This study focused on the self-medication practices for COVID-19 among slum dwellers in Jinja City, aiming to extract valuable lessons that can improve self-medication practices during future epidemics, which include emphasizing the importance of educating communities about the risks of self-medication, implementing strict regulations on the sale and distribution of medicines, improving access to healthcare services during emergencies especially in underserved areas. By learning from the self-medication practices observed during the COVID-19 pandemic, we can better prepare for and respond to future health crises and improving overall public health outcomes.

Methods

Study design and area

A cross-sectional study employing quantitative data collection methods was conducted in Jinja, a city in Eastern Uganda with a population of 331,079 people and 83,204 households [14]. The study was conducted in five slums out of eight slums. The city also has several institutions and business centres, which has resulted in a growing population and, as a result, unplanned settlements. Consequently, several slum communities have emerged throughout the city, facing a unique set of challenges such as poverty, poor health-care delivery, and illiteracy.

Study population and eligibility criteria

The study population were adult urban slum dwellers aged 18 and above who reported to have self-medicated for COVID-19 prevention, treatment, and management from January to December 2021. We excluded non-residents and adults who were unable to give informed consent for any reason (i.e., mentally ill, critically ill, or unable to respond).

Sample size determination and sampling technique

The sample size was estimated using Kish Leslie (1965) formula [15]. An estimated prevalence of 72% among slum dwellers who self-medicated was considered [16], the standard normal deviation at 95% confidence (1.96), and a 5% margin of error to yield a minimum sample size of 451. (**Figure 1**).

Sampling procedures / techniques

A multi-stage sampling method was used to select study participants. We used stratified sampling method in the first stage, selecting five of Jinja's eight slums at random and proportionate to the size of each slum (the number of households in each slum divided by the total number of households in the five slums multiplied by the total sample

size calculated). We then chose households from the five slums in the second stage. To reach the desired number of respondents per slum, a systematic sampling technique was used in which every 47th household (derived by dividing 21,284 total households by the calculated 451-sample size) was chosen. Simple random sampling was used in the third stage to select a participant from each household where more than one person met the inclusion criteria. To avoid selection bias, the Kish Grid was used to select the required participant [17, 18]. If no one was eligible, the next household with an eligible respondent was chosen. This was repeated until the desired number of 451 respondents were reached.

Study variables and measurements

The dependent variable was self-medication. This was determined by self-reporting the use of medicines for COVID-19-related reasons without a prescription or consultation with a medical practitioner/physician in the year 2021. The medicines comprised of conventional medicine, herbal medicine, and concoctions obtained and consumed by individuals without the advice of a physician at any stage of COVID-19 management. Herbal medicine was defined as the sale or use of plants and plant extracts to treat or prevent disease and enhance general health and well-being, it may have National Drug Authority approval or not. Conventional medicine was defined as a system in which medical doctors and other healthcare professionals treat symptoms and diseases using approved drugs, radiation, or surgery. Concoctions were products or substances obtained after the process of preparing medicines, foods, or other substances out of many ingredients for a particular purpose, for example, disease prevention or treatment.

Independent variables were source of advice that guided self-mediation and sociodemographic characteristics.

Data collection management and analysis

To collect data, well-trained research assistants interviewed study participants using semi-structured questions installed on the KoBo Toolbox application tool version 2022.1.2. The study team recruited and engaged household respondents at their homes in December 2021. The principal investigator worked with all the research assistants to ensure data quality and identify early data collection issues.

Data were transferred to Microsoft Excel and then to STATA version 14.0 for further management. This entailed tabulating the variables in the dataset using the "describe" command. To create a complete dataset, data were cleaned by looking for variables with missing data and duplicates, as well as converting variables from string to numerical for analysis. Geographic methods and a Q-Q plot were used to find outliers (quantile-quantile plot).

A descriptive analysis was performed, with frequencies and percentages for the independent variables (IVs) computed using the "tab" command, to identify the most common medicine used, type of conventional medicines, herbal medicines, and concoctions used for prevention, treatment, and management of COVID-19-related self-medication among urban slum dwellers in Jinja City.

Quality assurance and control

An expert (professional language teacher) translated the tool into Lusoga, the local language. Data were gathered by research assistants who spoke both the local language and English. However, the interviews were conducted in the respondents' preferred language. The tools were tested in a slum that was not part of the study area, and they were modified to account for missing variables and errors such as Vitamin C medicine, other options used, marijuana and unnecessary skips, among other things. When the Cronbach's Alpha coefficient reliability test was used to determine the validity of the data collection tool, the results were 0.83 greater than 0.7, indicating that they were reliable.

Ethical approval and consent to participate

Approval to conduct the study was obtained from Makerere University's School of Public, Health Higher Degrees Research and Ethics Committee (HDREC) with ethical approval number FWA00011353. Administrative approval was also obtained from Jinja city officials and the office of Local Council one. Before the interview, all respondents provided written informed consent. Confidentiality was maintained throughout the study.

Results

Social-demographic characteristics of the respondents

A total of 451 respondents were interviewed. The median (IQR) age of respondents was 31 (26-40) and 39.7% (179/451) were within the age group of 20-29 years. More than half of the respondents 61.2% (276/451) were females. Among the respondents, 53.9% (243/451) had attained secondary-level education, 82.3% (371/451) were married while 48.8% (220/451) had a family monthly income between 0-100,000 Uganda shillings (approximately ≥27 U.S. dollars), with the median income (IQR) being 120,000 (50,000-300,000) (Table 1).

Self-medication practices

Among the 451 respondents who self-medicated, more than half 58.1 (262/451) of them used concoctions, 52.6%

(237/451) used conventional medicine and 41.2% (186/451) used herbal medicine.

Majority of the respondents used concoctions and conventional medicine 30% (135/451), concoctions only 22% (99/451), herbal medicine only 21% (95/451). 14% (63/451) used both conventional medicine and herbs, about 8% (35/451) used conventional medicine only and 5.3% (24/451) used both concoctions and herbs. The least 1% (4/451) used a combination of all the three medicines that is concoctions, conventional, and herbal medicines for self-medication.

Source of advice to self-medicate

Of the 451 respondents who self-medicated, 82.3% (371/451) sought advice on which medicine to use from friends and 25.5% (115/451) from social media, 97(21.5%) Village Health Teams (VHTs), 83(18.4%) community pharmacies and 23(5.1%) family (**Figure 2**).

Concoctions used for COVID-19-related self-medication

A total of 262 respondents used concoctions, of which, 95% (249/262) drank boiled ginger, garlic, turmeric, onions, oranges, and lemon, and 68.3% (179/262) steamed using mango leaves, guava leaves, and lemongrass. About 4.2% (11/262) used other options of red pepper.

Conventional medicines used for COVID-19-related self-medication

Of the 237 respondents who used conventional medicine, 69.6% (165/237) took vitamin C, 57.8% (137/237) azithromycin, 55.7% (132/237) paracetamol, 54.9% (130/237) zinc, (**Table 2**).

Herbal medicines used for COVID-19-related self-medication

Among the 186 respondents who used herbal medicine, 43% (80/186) used Covidex, 5.4% (10/186) Marijuana, and 74.7% (139/186) used other herbal medicines such as Kazire herbal, eucalyptus, *Biden pilosa* ("sele"), *Vernonia amygdalina Delile* ("mululuza"), herbal ointments, herbal cough syrups, and *Callistemon citrinus* ("mwambala butonya").

Discussion

We found that, most of respondents (58.1%) self-medicated with various concoctions, closely followed by use of conventional medicine (52.5%) and the least (41.2%) was herbal medicine. Majority of respondents used more than one treatment option, majority using both concoctions and conventional medicine 30% and a few (1%) using a combination of all the three that is concoctions, conventional, and herbal medicines for self-medication. This is similar to studies which were conducted in Peru among the general population which found out that same respondents combined used of more than one treatment option at the same time [19, 20]. This could be because the majority of COVID-19 patients were confined in one area for treatment and thus had no opportunity to seek such products or even time to prepare the concoctions home remedies. In contrast, the majority of respondents (74.1%) in an Indian study of COVID-19 patients reported not using any herbal, conventional medicine or any concoctions during or after treatment [21]. However, a systematic review by Liu et al., suggested that combining herbal medicine with conventional medicine improved cure rates and symptom relief in COVID-19 [22]. Majority of the people who self-medicated sought advice on which medicine to use from friends, followed by social media and VHTs. Similar studies have been found in Dhaka City and post-conflict northern Uganda [23, 24] This could be because, during the COVID-19 pandemic, people were fearful of the disease, and these concoctions were readily available in people's homes, whereas for conventional medicine, drug shops or pharmacies were usually within easy reach of the vulnerable people in urban settings. Additionally, village health teams/community health workers serve as a source of information and the community's initial point of contact, given the VHTs live in close proximity of the community they serve and tend to be trusted by fellow community members. This finding underscores the importance of leveraging trusted informal networks, such as community health workers, social media, and personal connections, to disseminate accurate public health information and combat misinformation in future outbreaks [25].

More than half of the respondents self-medicated with several concoctions. These included the use of drinking concoctions such as lemon, oranges, onion, ginger, garlic, and turmeric. Other respondents used steaming concoctions including mango leaves, guava leaves, lemongrass, and red pepper. The high use of concoctions could be because the concoction ingredients are readily available in homes, gardens, and local markets, and are affordable compared to conventional medicine, and their application does not involve any techniques. This is comparable to studies conducted in Nigeria, where ginger and turmeric most frequently used [26], and Bangladesh where garlic was commonly used [27] in the management of COVID-19. However, several studies and health experts have recommended the use of Vitamin C in the management of COVID-19 [28-32]. This could have potentiated the public use of citrus fruits such as lemons and oranges as a replacement for vitamin C. In addition, these concoctions have been scientifically proven to have

therapeutic benefits against acute respiratory tract infections all of which are symptoms associated with COVID-19 infection [28]. In contrast, a study conducted in Ghana found that steam inhalation increased the risk of COVID-19 infection [33]. Concoctions have an advantage of potentially offering symptomatic relief; but on the other hand, some people believe that despite them being more natural they are likely to be unsafe due to lack of dosage standardization, which can result in inconsistent effects or toxicity; additionally, there is a risk of harmful interactions with other medications or medical conditions.

Furthermore, red pepper was reported to be used by respondents in this study. The effectiveness of red pepper could be due to its known compounds that show significant physiological and pharmacological properties. This reasoning was also captured in a study that was conducted in India [34]. Similar findings have been found in a study conducted in Northern Uganda which revealed that red pepper was used in the management of COVID-19 [35]. On the contrary, a study conducted in Iran used red pepper powder to treat plasma levels of pituitary-gonad axis hormones in male mice but not treatment of COVID-19 in humans [36]. Since, there is no approved treatment for COVID-19 and the standard of care is limited to symptom management, these natural products serve as home-based, inexpensive, easily accessible, prophylactic agents used against COVID-19 infection. However, although these are organic food products known for human consumption, they might lead to detrimental health effects if unregulated. [37].

Almost half of the respondents used conventional medicine to self-medicate, and in particular, vitamin C, azithromycin, paracetamol and zinc. These medicines are meant to be used following proper prescription by a health practitioner after diagnosis. This is typically not the case, especially among vulnerable communities like slum dwellers during public health emergencies like the COVID-19 pandemic. These findings concur with studies conducted in Bangladesh where it was reported that azithromycin (54%); Azithromycin and paracetamol [20]; Vitamin C [38] were the most commonly used conventional medicines. The advantages of conventional medicine include its usual reliance on clinical trials and scientific evidence, exact dosages and established efficacy for particular conditions; its disadvantages are the possibility of drug interactions, misuse or overdose, and the potential to contribute to antimicrobial resistance if antibiotics are used inappropriately.

The majority of respondents used other options of herbal medicines. The high use of herbal medicines could be attributed to the fact that these herbs are widely available, even for free, in these communities. Some herbs have been found to contain significantly high levels of carcinogenic compounds notably in *Callistemon citrinus* herbal medicine which was used widely in the communities [39]. There is also a growing interest in plants with activity against COVID-19 like Bidens Pilosa, among others [40]. A study conducted in Nigeria suggested *Vernonia amygdalina* is a good drug candidate against COVID-19 with no toxic effects, although further clinical trials are required [41]. However, in another study, it has been suggested to use it collectively with other herbal medicines [42]. In addition, almost half of the respondents used Covidex herbal medicine. Covidex was approved by the Uganda NDA as an alternative herbal medicine [43]. One of the other herbal medicines used was Kazire herbal. This bottled herbal was approved in 2022 by the NDA as an herbal treatment for peptic ulcers, increased blood volume, and improved blood circulation while it boosted immunity. No literature is available for its use in management of COVID-19 but a study conducted among several travellers reported that it was used to prevent malaria, commonly consumed before or during travel [44]. However, herbal use may also lead to herb-drug interactions [45], although this is difficult to assess. It has also been reported that due to the lack of an approved treatment for COVID-19, patients turned to herbal remedies to relieve symptoms, and the majority reported some improvement [46]. The benefits of using herbal medicine include its potential to boost immunity and reduce inflammation. Herbs are also widely available and culturally acceptable in many communities. However, its drawbacks include the possibility of contamination during preparation and packaging, lack of regulation, potential for side effects or interactions with conventional medications, and the potential to delay seeking professional care.

The study was not without limitations. First, since we relied on self-reporting, it may have resulted in social desirability bias due to stigma and fear. However, this was minimized by assuring respondents about information confidentiality before the study, reviewing respondents' medical records while collecting data, and checking the Jinja City health database for COVID-19 test results. This study was conducted during the COVID-19 pandemic when people were afraid to interact freely with anyone for fear of contracting the disease. This was addressed, by ensuring that all research assistants followed COVID-19 SOPs while in the field. These findings can be used to plan and manage future epidemics or other public health emergencies, as well as to guide slum engagements.

Conclusion

This study found that concoctions, conventional and herbal medicines were widely used for COVID-19 self-medication to prevent, treat, and manage the condition among urban slum dwellers in Jinja City. This is a warning sign of potential toxicity and antimicrobial resistance, particularly in vulnerable groups such as urban

slum dwellers. The effects of the COVID-19 pandemic are expected to last for years and will have a significant social-economic and psychosocial impact on people's lifestyles and behavior. This is a more serious threat that may lead to people self-medicating during future pandemics. As a result, the WHO and MoH should ensure easy access and affordability of medicines for the treatment of COVID-19 and other pandemics, particularly in vulnerable communities such as slums in developing countries like Uganda. Pharmaceutical regulatory agents and public health agencies should conduct routine public awareness campaigns about the dangers of irrational drug use.

What is known about this topic

- The self-medication practices in general have been widely discussed in many countries however, there is limited data on self-medication practices for COVID-19 in underserved populations like slums
- Effective treatments for COVID-19 are not accessible in Africa, and the government treatment guidelines have focused on symptom management
- Potential risks of self-medication include incorrect self-diagnosis, adverse drug reactions, incorrect administration and dosage, masking of a severe disease, and the risk of drug dependence and abuse

What this study adds

- Concoctions and conventional medicines were most used for COVID-19 self-medication among the slum dwellers. Herbal medicines were the least used
- Majority of the respondents self-medicated using a combination of conventional medicine and concoctions while a minority used a combination of concoctions, conventional and herbal medicines
- The most commonly used conventional medicines (vitamin C, azithromycin, paracetamol, and zinc) were consistent with the Uganda ministry of health treatment guidelines for COVID-19
- Among the herbal medicines used were Covidex and Kazire Herbal, which were both NDA approved

Competing interests

The authors declare no competing interests.

Authors' contributions

Acknowledgments

Tables and figures

Table 1: Socio-demographic information of the respondents (n=451)
Table 2: Conventional medicines used for COVID-19-related self-medication (n=237)
Figure 1: Sample size determination flow chart
Figure 2: Source of advice to self-medicate

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Table 1: Socio-demographic information of the respondents (n=451)

Variable	Category	Frequency or median (IQR)	Percentage
Age (years)	10-19	10	2.2
	20-29	179	39.7
	30-39	146	32.4
	40-49	66	14.6
	≥50	50	11.1
	Median age (IQR)	31 (26-40)	
Sex	Male	175	38.8
	Female	276	61.2
Religion	Anglican	100	22.2
	Catholic	116	25.7
	Muslim	144	31.9
	Pentecostal	73	16.2
	Other	18	4.0
Educational level	No formal education	42	9.3
	Primary	122	27.1
	Secondary	243	53.9
	Tertiary	44	9.8
Tribe	Baganda	31	6.9
	Bagisu	30	6.7
	Basoga	326	72.3
	Iteso	16	3.6
	Others	48	10.6
Marital Status	Never Married	97	21.5
	Married	371	82.3
	Separated	26	5.8
	Widower/widow	23	5.1
Occupation	Informal business	123	27.3
	Formal sector	192	42.6
	Student	24	5.3
	Unemployed	112	24.8
Monthly Income (UGX)	≤100, 000	220	48.8
	100,001-200,000	81	18.0
	200,001-300,000	60	13.3
	300,001-400,000	31	6.9
	>400,000	59	13.1
	Median income (IQR)	120,000 (50,000-300,000)	
IQR: Inter-quartile range			

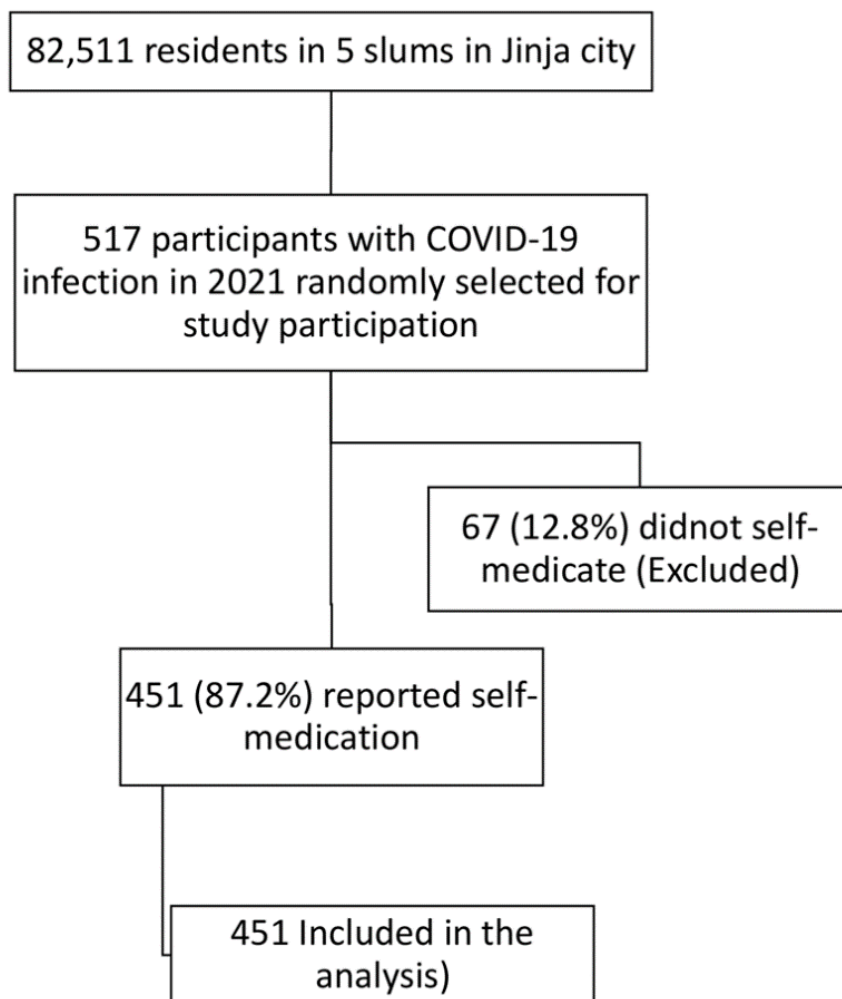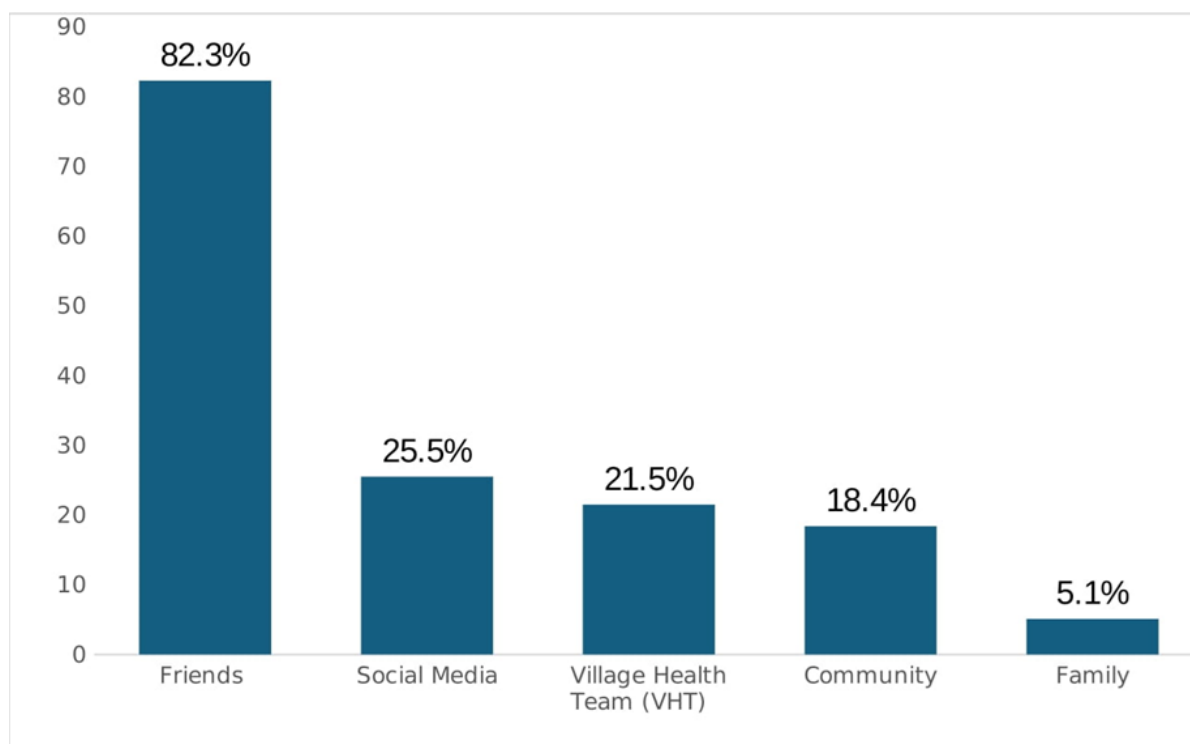| Table 2: Conventional medicines used for COVID-19-related self-medication (n=237)	
Type of conventional medicine used	**Frequency (%)**
paracetamol / Acetaminophen	132 (55.7)
Ibuprofen	12 (5.1)
Azithromycin	137 (57.8)
Hydroxychloroquine	5 (2.1)
Penicillin	20 (8.4)
Antiretroviral (lopinavir, ritonavir, e.t.c.)	1 (0.4)
Zinc	130 (54.9)
Vitamin C	165 (69.6)
Dexamethasone	56 (23.6)
Remdesivir	4 (1.7)
Ivermectin	1 (0.4)
*Others	19 (8.0)
*Other conventional medicines: Ibuprofen, Hydroxychloroquine, Antiretroviral, Remdesivir, Ivermectin Replenishing capsules, Ampiclox, Amoxil, Strepsil, Antimalarials, Nut B, Pilton, Sinarest, and flucap	

Figure 1: Sample size determination flow chart

Figure 2: Source of advice to self-medicate