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Article

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Abstract: In Burkina Faso, there is lack of awareness of antibiotics use at community level. In this study, we generate information on the commonly used antibiotics along with the reasons for which they have been used, in rural Burkina Faso. The 'drug bag' method, was employed to collect information from 423 households, in the health district of Nanoro. Descriptive analyses were performed using R software version 4.2.1. The number of self-reported antibiotic use on a regular basis was estimated at 3401 of which amoxicillin was reported 367 times (10.8 %), oxytetracycline was reported 288 times (8.5 %), ampicillin, 245 times (7.2 %), metronidazole, 239 times (7 %), and norfloxacin 223 times (6.6 %). Among the health complaints for which amoxicillin was used, wounds accounted for 28.5% (88/309) and gastrointestinal disorders 17.1% (53/309). For oxytetracycline, gastrointestinal disorders accounted for 57.1% (121/212) and wounds 22.64% (48/212). The study highlights the use of antibiotics for a range of health problems within the community, as well as antibiotics that appeared to of importance in people's life. Further research is essential to elucidating the rationalities and logic reasoning underlying such use of antibiotics.

Keywords: antibiotic use; drug bag method ; community; rural; Nanoro; Burkina Faso

1. Introduction

Antibiotics stand for one of humanity's medical revolutions that have played a pivotal role in combating infectious diseases [1]. In the past two decades, antibiotic use (ABU) in humans has risen in low- and middle-income countries [2,3]. In low- and middle-income countries (LMIC), the use of antibiotics in healthcare for humans is shaped by factors such as inappropriate prescription at healthcare facilities, access to antibiotics from unregulated providers, failure of the healthcare system to meet patients' needs, and storage of antibiotics for later consumption during common illnesses [4–6].

The World Health Organization's Global Action Plan on Antimicrobial Resistance formulated in 2015 urges to generate knowledge on antimicrobial resistance (AMR) and antibiotic use in order to optimize the use of antibiotics [7]. Furthermore, as part of its efforts to monitor the use of antibiotics, the WHO has defined three groups of antibiotics for human use – 'Access', 'Watch', and 'Reserve'

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(AWaRe) – based on their clinical importance, specific recommendations for their appropriate use, and their potential for resistance [8,9].

In African countries, it is challenging to get a sense of the actual consumption of antibiotics as the global antibiotic consumption assessment usually report data on pharmaceuticals records which are known to be missing or unreliable [10]. In Burkina Faso particularly, to the best our knowledge, existing publications on the use of antibiotics reports prescription patterns within healthcare facilities [11–13] some of them relying on routinely collected data from primary healthcare facilities registers [11] targeting only patients attending clinics [13] and children in particular [11,12]. However, using healthcare facilities' routine data to study the use of antibiotics cannot provide a whole picture. In LMICS, antibiotics are often purchased over the counter and obtained through informal channels [14]. This implies that relying on healthcare attendance to ascertain antibiotic use may potentially result in a lack of awareness of antibiotics obtained and used outside of formal healthcare facilities. For instance, a publication on antibiotic use in rural Burkina Faso [13] has reported on the use of antibiotics prior to hospital attendance, which supports the importance of further investigating on antibiotics' use at community level. This survey conducted in rural setting in Burkina Faso, will provide an overview of which antibiotics are used on a routine basis in the community and for what purposes.

To reach this goal, trustworthy and robust data needs to be generated in order to reflect the conditions prevailing in the research context. To do so, this study employed the drug bag method developed by researchers at the London School of Hygiene & Tropical Medicine [15]. The method involves buying locally available antibiotics for respondents to show and classify antibiotics that are available for them in local sources and gathering information on the specific use of antibiotics. The reason for choosing this approach is due to the existing biases associated with classic surveys on antibiotics use[15]. In fact, investigating antibiotics use in household may face the following issues: *(i)* antibiotics are purchased without prescription, as well as without packets or labels, *(ii)* people may store antibiotics for later consumption and forget or do not know the type of antibiotic that they are using, *(iii)* there is no term for antibiotics in local language.

Through the study of antibiotic use in the community, antibiotics from different sources will be reported as well as the role played by each of them in resolution of people health concerns. Furthermore, this study will serve as an excellent foundation for further research in this area.

2. Results

2.1. Respondents' Socio-Demographic Characteristics

More than half of respondents were female (58.6%). The study respondents had a relatively low level of education as about 57.4% had not attended school. Almost all the respondents (96.7%), were engaged in agricultural activities, with the majority of these respondents engaged in subsistence farming (84.1%). With regard to the possession of antibiotics in the households, our investigation revealed a substantial level of drug storage. Indeed, among the 423 households surveyed, almost half of respondents (48.7%) were found to be storing drugs. The socio-demographic characteristics of the study participants are presented in Table 1.

Table 1. Respondents' socio-demographic characteristics.

		Overall	**Nanoro**	**Nazoanga**	**Gouroumbila**
	N	423	232	125	66
	Gender = Male, n (%)	175 (41.4)	99 (42.7)	52 (41.6)	24 (36.4)
Main occupation, n (%):	Agriculture/farming	271 (64.1)	97 (41.8)	115 (92.0)	59 (89.4)
	Merchant	46 (10.9)	44 (19.0)	2 (1.6)	0 (0.0)
	Pupils/student	27 (6.4)	25 (10.8)	1 (0.8)	1 (1.5)
	Others	19 (4.5)	12 (5.2)	3 (2.4)	4 (6.1)
	Artist	17 (4.0)	14 (6.0)	2 (1.6)	1 (1.5)
	Private sector officer	16 (3.8)	16 (6.9)	0 (0.0)	0 (0.0)
	Government officer	11 (2.6)	9 (3.9)	2 (1.6)	0 (0.0)

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	Housewife	9 (2.1)	9 (3.9)	0 (0.0)	0 (0.0)
	None	6 (1.4)	5 (2.2)	0 (0.0)	1 (1.5)
	Independent	1 (0.2)	1 (0.4)	0 (0.0)	0 (0.0)
Level of education, n (%):	Uneducated	243 (57.4)	110 (47.4)	94 (75.2)	39 (59.1)
	Incomplete primary school	55 (13.0)	29 (12.5)	19 (15.2)	7 (10.6)
	Non formal education	38 (9.0)	17 (7.3)	6 (4.8)	15 (22.7)
	Incomplete secondary	48 (11.3)	45 (19.4)	1 (0.8)	2 (3.0)
	Secondary	17 (4.0)	13 (5.6)	3 (2.4)	1 (1.5)
	Primary school	12 (2.8)	9 (3.9)	1 (0.8)	2 (3.0)
	Advanced study	10 (2.4)	9 (3.9)	1 (0.8)	0 (0.0)
Drug storing, n (%):	No	217 (51.3)	105 (45.3)	82 (65.6)	30 (45.5)
	Yes	206 (48.7)	127 (54.7)	43 (34.4)	36 (54.5)

2.2. Sources of Drug Procurement in Study Households

Our analysis of the sources of drug procurement by household members showed that people navigate between government primary health care centers, informal medicine providers, private drug retailers and hospital drug store. Around three-quarters (76.6%) of respondents obtained drugs from primary healthcare centres. Nevertheless, we observed that a considerable proportion of households (61.2%) obtained drugs through the informal vendors, namely at marketplaces. Regarding the private sector, official pharmacies also play an important role in the procurement of antibiotics with 57% of respondents indicating that they use such pharmacies (Table 2).

Table 2. Main source of drug procurement among the 423 households surveyed.

Source of drug procurement*	n (%)
Primary health care facility	324 (76.6)
Informal drug sellers	259 (61.2)
Private drug sellers	241 (57.0)
Hospital	109 (25.8)
Traditional/faith healers	8 (1.9)
Neighbour/friends	5 (1.2)
Other family member	2 (0.5)
Community health workers	2 (0.5)

*Households could have many sources of drug procurement and could have more than one source of drug procurement.

2.3. Recognition of Antibiotics

A total of 33 antibiotics intended for human healthcare was presented to the respondents in a household setting. Respondents were asked to identify which of the antibiotics they knew or had ever seen, by pointing to them. Each respondent selected a group of antibiotics with which they were familiar. Based on their choices, we found that people were more familiar with amoxicillin 395/423 (93.4%) and oxytetracycline 366/423 (86.5%), followed by ampicillin 295/423 (69.7%), metronidazole 292/423 (69%) and norfloxacin 290/423 (68.6%). The list of antibiotics recognised is presented in Table 3.

In addition to the quantitative data on recognition, the survey generated further discussions about the recognized antibiotics, and particularly the local terminologies used in the community, some common antibiotics practices and reasons for their use.

Amoxicillin was the only antibiotic that was named by its drug name. The others were identified by their colours:

- Amoxicillin: amoxicillin or 'toupaye white head'
- Oxytetracycline: 'toupaye red head'
- Norfloxacin: 'toupaye chinois' or 'Chinese toupaye'
- Ampicillin: 'toupaye black head'

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Participants were unable to say much about some antibiotics. This was particularly the case for certain antibiotics that were rare in community pharmacies, and some of which they were simply unfamiliar with. For example, some men were confused when presented with medicines for paediatric use and called women to provide more details. It was also a challenge to recognise some medicines given in hospitals, for example, as injections, while specialised antibiotics were not easy to name in community pharmacies due to their rarity. Finally, some difficulties in the identification of antibiotics could be attributed to similar shapes and colours.

Table 3. Antibiotics recognized by the 423 households surveyed.

Antibiotics (N=423)	n	%
Amoxicillin tablet	398	93.4
Oxytetracycline tablet	369	86.6
Ampicillin tablet	298	70.0
Metronidazole tablet	295	69.2
Norfloxacin tablet	293	68.8
Amoxicillin suspension	247	58.0
Ciprofloxacin tablet	210	49.3
Cotrimoxazole tablet	210	49.3
Penicillin v tablet	204	47.9
Gentamicin eye/ear	203	47.7
Lincomycin tablet	203	47.9
Gentamicin eye	200	46.9
Metronidazole suspension	191	44.8
Cotrimoxazole suspension	181	42.5
Erythromycin steraete tablet	181	42.5
Erythromycin stereate suspension	172	40.4
Cipro eye/ear drop	130	30.5
Cloxacillin sodium suspension	121	28.4
Diloxanide metronidazole suspension	104	24.4
Clavulanic acid tablet	89	20.9
Cefixime suspension	85	20.0
Penicillin injection	82	19.2
Ampicillin sodique	82	19.2
Cloxacillin tablet	76	17.8
Clavulanic acid suspension	76	17.8
Ciprofloxacin tinidazole	62	14.6
Ceftriaxone injection	60	14.1
Cefixime tablet	58	13.6
Azithromycin tablet	47	11.0
Clavulanic acid injection	42	9.9
Neomycin polydexa	40	9.4
Clarithromycin tablet	35	8.2
Flucloxacin tablet	20	4.7

2.3. Commonly Used Antibiotics

The number of self-reported antibiotic use in the study area was estimated at 3401. Amoxicillin, oxytetracycline, ampicillin, metronidazole, and norfloxacin were selected more often than any other drug used. Amoxicillin was reported 367 times (10.8%), oxytetracycline was reported 288 times (8.5%), ampicillin, 245 times (7.2%), metronidazole, 239 times (7%), and norfloxacin 223 (6.6%). (Table 4). The top five antibiotics were commonly used, according to respondents, due to their availability and affordable prices from informal market vendors.

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Table 4. Distribution of self-reported antibiotic use in the study area (N*=3401.

Antibiotics	N*	%
Amoxicillin tablet	367	10.8
Oxytetracycline tablet	288	8.5
Ampicillin tablet	245	7.2
Metronidazole tablet	239	7.0
Norfloxacin tablet	223	6.6
Amoxicillin suspension	200	5.9
Co-trimoxazole tablet	157	4.6
Gentamicin eye/ear (drop)	147	4.3
Metronidazole suspension	142	4.2
Ciprofloxacin tablet	135	4.0
Co-trimoxazole suspension	134	3.9
Gentamicin oeil (gouttes)	130	3.8
Penicillin V tablet	127	3.7
Lincomycin tablet	115	3.4
Erythromycin Stearate suspension	107	3.1
Erythromycin Stearate tablet	88	2.6
Diloxanide furoate metronidazole suspension	74	2.2
Cloxacillin sodium suspension	71	2.1
Ciprofloxacin eye/ear drop (Boncipro)	65	1.9
Amoxicillin/Clavulanic Acid tablet	48	1.4
Cefixime (Ceficap) Suspension	48	1.4
Amoxicillin/Clavulanic Acid suspension	39	1.1
Penicillin V injection	32	0.9
Cefixime tablet	28	0.8
Ceftriaxone Injection	26	0.8
Ampicillin Sodium (injection)	23	0.7
Azithromycin tablet	19	0.6
Amoxicillin/ Acid Clavulanic injection (Clavuject)	18	0.5
Ciprofloxacin Tinidazole (Ciprozole Forte) tablet	17	0.5
Neomycin+Polymyxine B oeil (goutte)	15	0.4
Clarithromycin tablet (Clariva)	14	0.4
Cloxacillin tablet	14	0.4
Flucloxacillin tablet	6	0.2

*N Total number of self-declared medicines. Participants may have used more than one medication. Study sample, n = 423.

2.4. Health Complaints Leading to ABU

The most reported reasons for taking amoxicillin were wounds 28.5% (88/309), gastrointestinal disorders 17.1% (53/309), ulcers 15.9% (49/309), musculoskeletal and connective tissue disorders 11.7% (36/309), and respiratory and thoracic disorders 11.7% 57.1% (36/309). Oxytetracycline was used to mostly treat gastrointestinal disorders 57.1% (121/212) and wounds 22.64% (48/212). Ampicillin was used to treat mostly wounds 35.32 % (65/184), gastrointestinal disorders 29.34% (54/184), and skin and subcutaneous tissue disorders 15.21% (28/184). Norfloxacin was mainly taken to treat skin and subcutaneous tissue disorders 45% (79/180) and particularly for the treatment of anal fungus infection in children as respondents revealed during informal discussions, and gastrointestinal disorders 32.77% (59/180), while metronidazole was highly used for gastrointestinal disorders (111/132). These results highlight several health problems that respondents felt required the use of antibiotics, such as gastrointestinal disorders, wounds, skin and subcutaneous tissue disorders, and musculoskeletal and connective tissue disorders

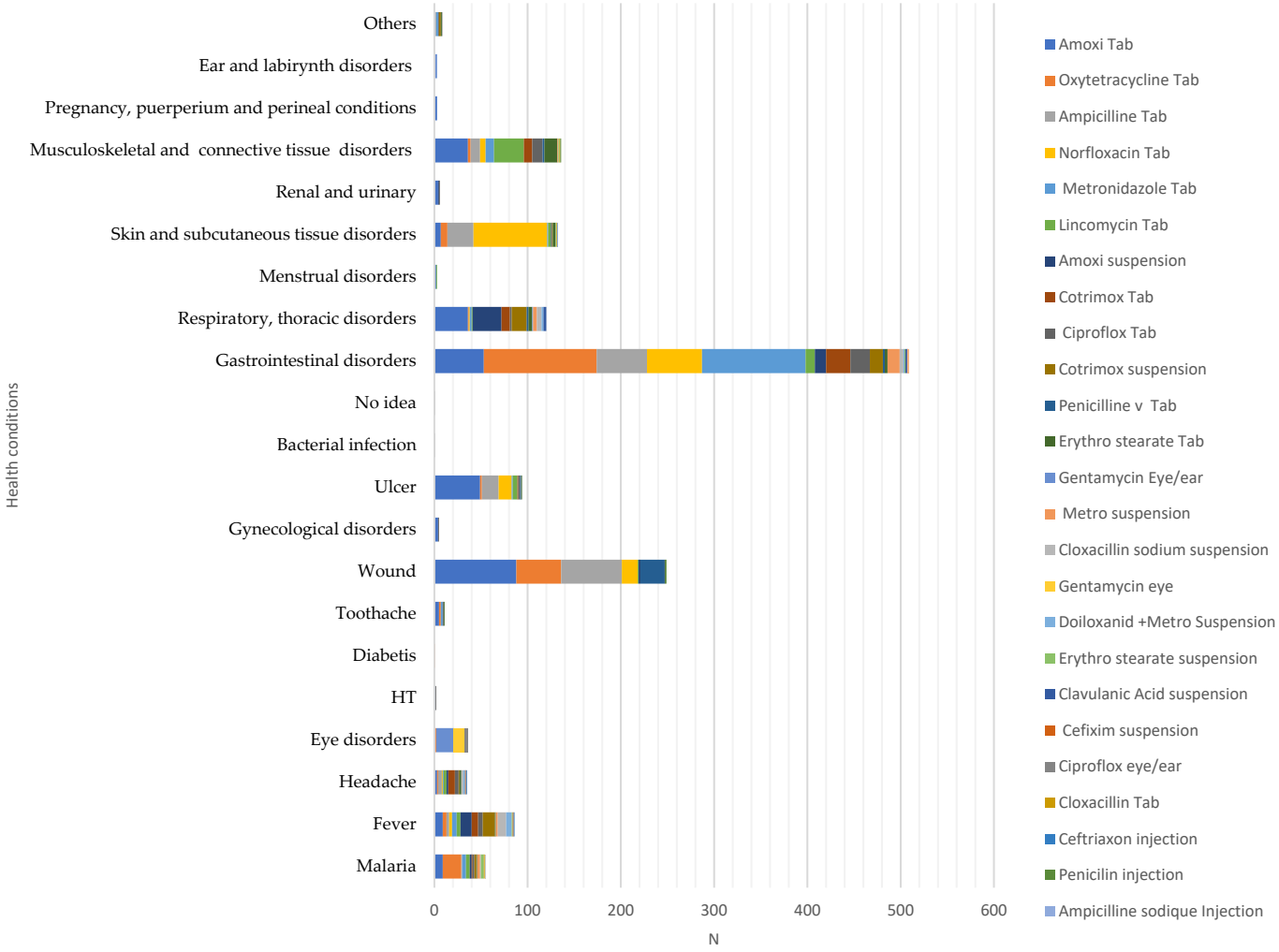

Figure 1. Health conditions which led to antibiotics'use.

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3. Discussion

The use of antibiotics at community level is one of the major drivers of antibiotic resistance [17]. This is relevant as most antibiotics are purchased over the counter and obtained from illegal providers or untrained vendors. To the best of our knowledge, few studies have been conducted in Burkina Faso to investigate antibiotic use outside formal health care facilities. The present study aimed at identifying antibiotics which are mostly in rural communities in Burkina Faso, along with the reasons for their utilisation, in order to establish a foundation for a more in-depth investigation towards drivers of inappropriate use of antibiotics. However, studying antibiotic use among people with a low literacy and within a context where there exists no specific term to refer to antibiotics can pose a problem of data accuracy. Due to such complexity, we employed the drug bag method [15] which allows people to physically identify antibiotics and share their knowledge and experiences towards them.

The results of this study demonstrate that the most frequently used antibiotics are in capsule form, and users identify them based on their respective colours. Moreover, the findings suggest that antibiotics are employed to address a range of ailments individuals encounter as part of their everyday lives.

One of the primary outcomes of this study is the identification of the antibiotics mostcommonly used in these localities such as amoxicillin, ampicillin, and metronidazole. This finding is consistent with other research conducted in Burkina Faso [13] , Ghana [17], and Tanzania [18] which found that amoxicillin was the most common used antibiotics. The widespread use of these antibiotics could be attributed to the fact they belong to the 'Access group' which means that they are recommended as first-line treatment options for infections according to the WHO AWaRe framework [9] and because they are registered in the Essential Medicine List (EML) of Burkina Faso [19]. Furthermore, it can be observed that these medicines are also readily available from a variety of over-the-counter retailers as well as informal sellers. During the survey, some metaphorical descriptions of amoxicillin were observed. For instance, amoxicillin was considered "Sagabo" (a local dish in Moore: local language spoken in the study area) or "Yaaba" (meaning Elder or ancestor in Moore). These descriptions corroborate the significant role these medications play in people's day-to-day lives. Metaphors are being used in the field of anthropology and were considered to have an impact on the way individuals distinguish what is "meaningful and meaningless, valuable and worthless, healthy and sick"[20].

Another finding to consider in this study is the widespread use of certain "Watch antibiotics" such as oxytetracycline and norfloxacin. Yet, these medicines are not included in the Burkina Faso's EML list [19], which prompts inquiries regarding their introduction into the community. It can also be hypothesized that their use within communities is attributable, in part, to the fact that they are readily available through informal vendors at affordable prices in marketplaces and without the recommendation of a trained health professional. Watch antibiotics are critically important antibiotics that are particularly vulnerable to the emergence of AMR [9]. These findings call for a closer look at the types of medicines available to the general population and the mechanism that facilitate their availability in the informal sector.

As part of the study objectives, this study allowed the identification of health conditions which led to the use of antibiotics. Gastrointestinal disorders, wounds, skin and subcutaneous tissue disorders, and musculoskeletal and connective tissue disorders were found to be the top four common health problems that required antibiotics use based on respondents' answers. The use of antibiotics to treat gastrointestinal disorders, wounds, skin and subcutaneous tissue disorders necessitates an examination of the hygiene situation that prevails in the daily life of these communities. Evidence suggests that a lack of sanitation and hygiene spreads infectious diseases and, therefore, increase ABU. In the WHO opinion editorial on Water Sanitation and Hygiene (WASH), the regional Director of South-East Asia explains how poor sanitation and unsafe water are responsible for a range of bacterial infections that increase the use of antibiotics [21]. Consequently, improving hygiene and sanitation can reduce the transmission of AMR and therefore the use of

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antibiotics [22,23]. Additionally, an anthropological analysis of this situation could be made with a reference to the work of Chandler and Willis who interpreted antibiotics use as a "quick fix" for lack of hygiene in settings of minimised resources [24]. This suggests that antibiotics are used are substitutes to non-hygienic conditions within which individuals leave and work. In our study setting, open defecation is practiced by half of the total population (58.6%) however it is particularly common in remote villages like Nazoanga were 85.6% of the inhabitants practice open defecation. A thorough exploration of the WASH situation become relevant in these settings as they will allow to get better insights into contextual barriers to improve WASH and challenges households face in their everyday lives.

The findings indicated that individuals employed the use of antibiotics to address musculoskeletal and connective tissue disorders. From a biomedical perspective, this can be considered an irrational or knowledge-deficiency-related phenomenon [25]. Nevertheless, this line of reasoning is consistent with a rationalist perspective that views individual behaviour as problematic rather than focusing on structural factors, individual specific circumstances and reasoning processes [24,26]. In our research setting people's primary source of livelihood is derived from agricultural production and income-generating activities. Consequently, individuals are seeking methods to maintain or enhance their health in order to ensure their ability to work. For instance, during the data collection phase, it was documented that amoxicillin and oxytetracycline were frequently combined with alcohol or coffee with the objective of enhancing physical energy and alleviating discomfort, such as joint pain and fatigue. Previous ethnographic research conducted in Est Africa supported the idea of antibiotics use in LMICs as "a quick fix for productivity" where antibiotics are used as means of not losing wages due loss of labour [24]. These elements inform the direction of further research, which is necessary to gain a deeper understanding of the underlying motives for antibiotic use in our setting.

Furthermore, our study prompts us to consider the pathways to antibiotics. Notably, our data indicate that individuals frequently seek medicine from informal market sellers, often referred to as "street drug sellers". This practice is prevalent and appears to be competitive with the formal healthcare system. Purchasing medicines on the street is a pervasive practice in resource-limited countries [27] and is sometimes recognised as a response to the inadequacies of the health system in contexts where communities cannot afford health costs and access to formal health facilities is limited. Informal drug providers find their way to offer services as they play a crucial role in in reducing the burden of the healthcare costs (travel costs, drug costs, etc.) and time constraints on people. Healthcare costs have an impact on inappropriate use of antibiotics as previous studies in Burkina Faso, Côte d'Ivoire, and other low-income settings have shown [5,6,27–29]. Given the important role of informal markets in antibiotic consumption, our findings also raise questions about the access to quality medicine for rural communities. Previous studies on antimalarials in Burkina Faso and other LMICs have shown that most substandard antimalarials are found in illicit markets [30–34] which begs a question about the quality of antibiotics as well.

The drug bag method employed to investigate the use of antibiotics showed that people were likely to choose antibiotics in capsules such as amoxicillin, oxytetracycline, norfloxacin, and ampicillin which were categorized as 'toupaye'. The meaning of 'toupaye' was unclear to us as people could not really explain what it meant. In the literature this term refers to 'topaye' a local dialect in Ghana 'Twi', which means 'throw and burst'[38]. Yet other informants believed it is a French distortion of 'tout passe' (everything goes away), by Ghanaian drug sellers who had difficulty pronouncing it.

The medicines in question share a common physical appearance in capsule form, which the respondents were able to distinguish based on colour. This recognition phase yielded valuable insights into the level of familiarity with antibiotics among community members. However, it also highlights a potential risk of confusion regarding medicines, as respondents relied on the physical appearance of antibiotics to distinguish them from other medications. The practice of confusing medicines based on their appearance is a common phenomenon in both low- and middle-income countries [35] and higher-income settings [36,37]. In our study, certain types of antibiotics look similar

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to some non-antibiotic drugs, mainly painkillers, which probably led to their misuse. A study conducted in Ghana on inappropriate antibiotic use raised the issue of confusing antibiotics with painkillers which are usually in capsules [38] . To address the issue of confusion some researchers suggest the use of physical appearance tools to improve the identification of oral antibiotics and differentiate them from other commonly sold medicines such as painkillers [35]. This could be a starting point for further reflexions on how to reduce non-essential use of antibiotics.

There are several limitations to the study. First, the results of the data collected cannot be generalized to the whole country as the study findings were based on data from a specific rural setting in Burkina Faso. However, these findings provide some baseline information to start some in depth investigations as antibiotic use can vary from setting to setting. For example, it allowed familiarisation with local terminologies related to some antibiotics and the potential providers of antibiotics. In addition, it is the most systematic study carried out on Health Demography Surveillance System and in terms of the inventory of available antibiotics from formal and informal sources. It provides an overview of the use of antibiotics locally. Finally, our research relied on self-reporting of antibiotic use, which introduces the problem of recall bias. Nevertheless, despite the respondents' low level of literacy and the lack of scientific knowledge about antibiotics, we believe that our data is are as accurate as possible and that the results are meaningful due to the use of the drug bag method, where participants had the opportunity to physically show antibiotics. Although the study lists the regularly used antibiotics and identifies where they were obtained, it does not provide information on the frequency or total amount of antibiotics used.

The study has the merit of being the first in Burkina Faso to examine antibiotic use at the community level with the drug bag method. The study revealed the use of antibiotics for a range of health problems within the community, as well as antibiotics that appear to be part of people's everyday life. It raises concerns about the accessibility of antibiotics in communities, as well as the importance of understanding the circumstances under which antibiotics are used.

4. Materials and Methods

4.1. Study Context

This study is part of an ethnographic study aimed at comprehending antibiotic use at the community level in rural Burkina Faso. The study employed a mixed-methods design -quantitative and qualitative data collection, to elucidate the processes by which antibiotics are prescribed and used, as well as the infrastructural and socioeconomic contexts which shape antibiotic use. The research delves into the relationship between individuals' socioeconomic circumstances and their antibiotic requirements, exploring how daily activities intersect with antibiotic needs.

As an initial step in the study, the survey provided essential baseline data, familiarising researchers with the terminology used in the study setting to refer to particular antibiotics, which informed the subsequent data collection.

4.2. Study Sites

The survey was conducted within the Health and Demographic Surveillance System (HDSS) coverage area in the health district of Nanoro, Burkina Faso. The HDSS was set up in Nanoro in 2009 and covers 24 villages and more than 60,000 inhabitants [39]. Nanoro is in the central west region of Burkina Faso, approximately 85km from the capital Ouagadougou. It is a typical rural region with an estimated population of 185,160 inhabitants in 2020 [40].

The literacy rate is approximately 23% for both men and women [39]. Nanoro health district has 28 primary healthcare facilities and one rural Missionary Hospital (CMA St Camille) with an approximate ratio of 6,613 inhabitants per healthcare centre. In 2020, approximately 64% of the population lived within 5km, 3.2% within 5–10km, and 32.9% more than 10km away from a primary health care facility [40]. In addition, the region is impoverished with 53% to 57 % of people living with less than 0.7$ per day [41] which contributes to self-medication strategies.

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In Nanoro, diseases caused by inadequate potable water facilities and poor sanitation are the main causes of health problems [42]. Communicable diseases such as malaria, acute respiratory infections, and fever of unknown origin are leading causes of death among adults and children under five years old [43,44].

4.3. Study Participants and Sampling Strategies

Due to the lack of previous studies or pilot studies which would have estimated the prevalence of antibiotics use in the same target population in a rural community, an estimated prevalence of 50% was used to calculate the study sample size. Thus, considering a confidence level of 95%, precision of± 5% and 10% maximum missing data, a sample size of 423 households were needed. Therefore, a total of 423 households was randomly selected using the HDSS household sample frame. A proportional allocation household was performed according to the size of three villages. Actually, in order to obtain a contextual description of the phenomenon that the study is aiming to explore, three villages were specifically selected on the basis of the HDSS socio-economic categorization (high, middle, low): Nanoro, Nazoanga, and Gouroumbila.

The proportional size of households was chosen based on the following criteria: *(i)* inclusion of all the clusters in a village; *(ii)* including women, men, and young people in the sample. A cluster was defined here as a sub village composed of a set of locations within the village.

This classification did not aim for comparative analysis. Instead, the objective was to obtain as much as possible a representation of different socio-economic backgrounds of the population living in the study setting to allow a more realistic description of ABU.

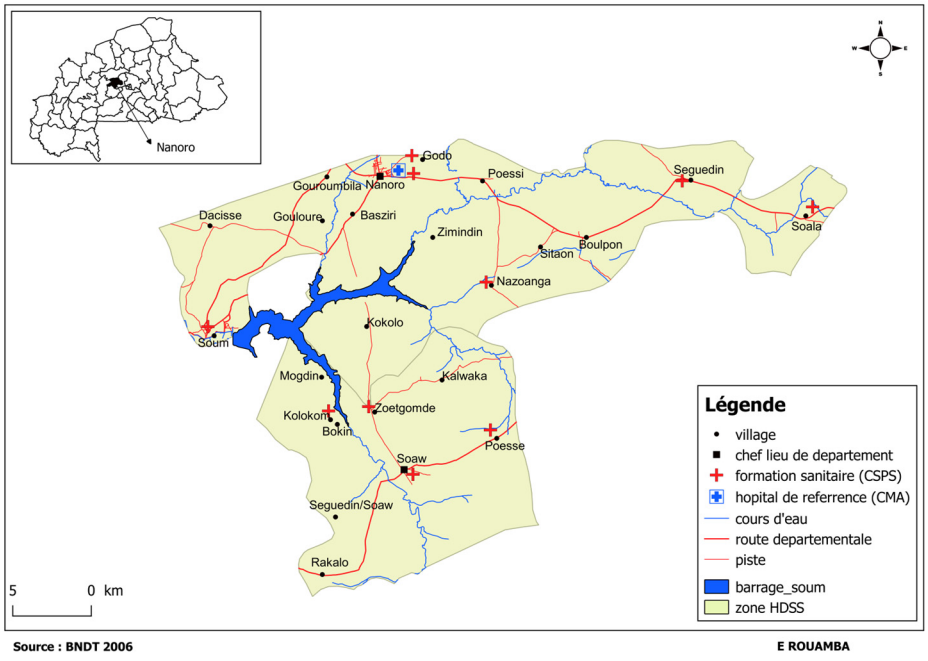

Figure 2. Research site and study.

4.4. Data Collection Procedures

We created a database of antibiotics accessible for the local people from an inventory of antibiotics available at community drugstores (formal or informal). Hence, antibiotics were purchased in the neighbourhoods either from formal sellers, for instance in public clinics and authorized private drug stores, or informal sellers at market's places. To make our survey as representative as possible, we tried to gather all the antibiotics available to the community members. In the formal context, the purpose of the research was explained to the providers, as some antibiotics could not be sold without a prescription. However, in anticipation to some informal vendors'

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reluctance to allow researchers to access their shops, we employed community liaisons or personnel at the Clinical Research Unit of Nanoro (CRUN), who are members of the community.

With the assistance of a clinician with experience in microbiological research, a list of antibiotics was compiled and categorised according to their active principles and assigned a numeral identifier in alphabetical order. The same number was then allocated to the drug to allow the investigator to tick the corresponding names in the questionnaire.

Amongst the 423 selected households, one respondent was preselected from the HDSS database for an interview. The existing population database, permitted the selection of respondents from a range of household members including fathers, mothers, elders, and young members. The list was communicated to community contact points whose primary role was to relay information to the HDSS and to facilitate community mobilization. However, during the interviews, it was common to observe that other household members provided responses to certain questions particularly when the participants were asked to indicate whether encountered antibiotics.

During the interviews, the medicines were laid out on a cloth and presented one by one to the respondents to answer the following questions: which one they know or have seen before; which one they have ever used; which one they use the most; what health problems required their use. Antibiotics were presented either in the package, in a folio package and as pills. The packaging and presentation of the antibiotics varied depending on the method of sale. Furthermore, participants were allowed to remove the drugs from the packages and examine them more closely.

The data was collected via an electronic questionnaire utilising the software Open Data Kit (ODK) Collect setup. ODK is an open-source suite of tools comprising ODK Collect, an Android-Based mobile client that serves as the interface between the user and the underlying form used to collect data. The data was collected in person during the visits to the households by two field assistants with a background in sociology. The data collection period spanned from June to September 2021.

Figure 3. Implementing the Drug Bag Method in Nazoanga. Author Photo: Adélaïde Compaoré (06/2021).

4.4. Data Processing and Analysis

Once the data collection was completed, the responses to the survey questions were verified for completeness and consistency. Following this, the verified responses were uploaded to the server (ODK aggregate). Subsequently, the data was then downloaded from the server for the purpose of quality control. All analyses were performed using R software version 4.2.1 (R Development Core Team, R Foundation for Statistical Computing, Vienna, Austria). The descriptive analysis included

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categorical variables that are represented as frequencies and percentages, continuous variables as means with standard deviations.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board at the Institute of Tropical Medicine of Antwerp in Belgium (Ref 1441/20) and by the Comité d'Ethique pour la Recherche en Santé (CERS, Ref 2021-01-023).

Informed Consent Statement: The study details and what it involved was explained to the participants in their local language. Informed consent was obtained from all participants verbally. Verbal consent was deemed the most appropriate method given the high rate of illiteracy in the populations surveyed and to prevent the generation a climate of mistrust within the communities by requiring signatures.

Conflicts of Interest: The authors declare no conflicts of interest.

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