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The prevalence and risks of antibiotic self-medication in residents of a rural community in Accra, Ghana ☆

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ABSTRACT

Antibiotic self-medication (ASM) is widespread, thus contributing to the increasing global burden of antimicrobial resistance. Even though there exists sufficient research on urban communities, knowledge on ASM among rural dwellers in Accra is limited. The aim of the study was to investigate the prevalence and risks of antibiotic self-medication among residents of the rural community of Abokobi sub-municipality of Greater Accra Region of Ghana. A community-based cross-sectional survey with multistage random sampling was used in recruiting 350 adult residents of Abokobi, from 18 years and above. A researcher-assisted questionnaire was then used to gather quantitative information from the participants. The overall prevalence of ASM was 36% (95% CI: 34.6 - 42.8). The major intentions for antibiotic self-medication were past successful experience 82 (47%) and ease of purchase of antibiotics 64 (36%). Others practiced self-medication as a result of self-reported health problems such as gastrointestinal infection 81 (46%) and fever 19 (11%). The predominant antibiotic used in self- medication was amoxicillin 94 (53%). The risk factors associated with ASM among participants were tertiary education (aOR = 0.07, 95% CI: 0.01–1.08) and subscription to the National Health Insurance Scheme (NHIS) (aOR = 2.32, 95% CI: 0.97–5.38). Antibiotic self-medication rates are quite high among rural dwellers of Accra, Ghana. Therefore, governments and pharmaceutical agencies responsible for regulations of medicines have to effectively educate residents about the policy on appropriate use of antibiotics, strictly enforce the laws and take appropriate actions on medication outlets dispensing antibiotics without prescriptions in rural settings of LMICs.

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Background

Self-medication may refer to the process of using medicines to treat ones' own illnesses or symptoms, without prescription by an authorized practitioner [1]. The global estimation of self-prescribed and privately purchased antibiotics without appropriate prescription from clinicians or pharmacists has been reported to be more than 50% [2]. Antibiotic self-medication (ASM) is often recognized as a key contributor to the problem of drug resistance, which has become a major global health concern [3]. According to Gajdacs [4], the phenomenon refers to "an antibiotic, which was once able to effectively stop the growth of bacteria at its therapeutic level, has now lost its ability to do so".

Antibiotic self-medication has been found to contribute to the phenomenon of resistance and associated risk of failure to cure communicable diseases of bacteria etiology. The spread of antibiotic-resistant bacteria worsens the rates of morbidity and mortality related with community-acquired infections which account for high healthcare costs and loss of productivity especially among poor and rural communities of low-and middle-income countries (LMICs) [5]. Antibiotic resistance particularly manifests itself in persistent infections, more visits to healthcare facilities, prolonged stay in hospitals, more expensive antibiotics purchase and may end in death [6]. The additional therapy required to remedy treatment failures creates a burden for healthcare systems with subsequent financial costs to patients in such communities (Aslam et al., [7]). According to a recent modeling performed by the independent review on antimicrobial resistance, it has been projected that the health and economic consequences arising due to drug resistance could cause an additional ten million global deaths per annum by the year 2050, particularly in LMICs, if suitable interventions to control the situation fail to be implemented [8].

Previous studies on ASM in LMICs have identified socio-demographic, socio-cultural, health insurance and a person's underlying health problems as factors and reasons that influence the practice among different populations ([9] Torres, et al.; [10]). Other specific factors such as education, monthly income, sex, accessibility to antibiotics and their affordability, state of health facilities and health seeking behavior have also been reported from literature to influence ASM in LMICs [10,11].

The widespread lack of awareness about the dangers of ASM and the non-enrolment on national health insurance schemes, especially among rural dwellers of LMICs, may also account for high self-medication rates and associated emergence of resistance and adverse effects [12].

The problem with the relative ease with which residents in such settings could access antibiotics through unapproved outlets compared with urban dwellers of high income countries, reveals the flaws in enforcing national laws, policies or regulations in selling and distribution of prescription-only drugs like antibiotics in resource-limited communities of LIMCs [13].

Health problems necessitating the use of antibiotics are communicable in nature, the majority of which are related to poor sanitation and inadequate waste management systems found in resource limited settings in Africa, Asia and South America. In Ghana, as in many other LMICs, the health distribution and burden of diseases are predominantly of infectious disease origin, including the likes of diarrhea, respiratory infections, malaria, HIV/AIDS and tuberculosis, which remain among the ten leading causes of annual morbidity and mortality [14].

These health problems as well as self-reported symptoms of fever and skin diseases may thus necessitate ASM among the affected populations [15], with amoxicillin as one of the most frequently used, posing a considerable risk of becoming less effective [16]. One key strategy to save persons and communities from the dangers of antibiotic resistance is, however, by acquiring the medications from approved sources for the appropriate indications.

Whilst there remains a considerable level of research findings on risks associated with ASM predominantly among urban communities of LMICs such as Nigeria [17], Karachi [18] and Ghana [15], the knowledge among rural dwellers in southern parts of Ghana is limited (Jima et al., [19]). This study therefore sought to investigate this among the rural dwellers of Abokobi, a suburb of the capital city of Accra, in the southern part of Ghana. The study also aimed at identifying common self-reported illnesses that necessitated ASM, the commonly used antibiotics and the reasons for ASM. The results from the current research would help policy makers identify context-specific risk factors to be able to plan health promotion measures to address same. Recommendations on public health measures and law enforcement mechanisms to address the problems of ASM to improve the prudent use among rural dwellers in LMICs would also be suggested.

Methods

Study area

The study area was the Ga East Municipality (GEM) with Global Positioning System (GPS) co-ordinates of 5° 44′ North and 0° 11′ West. The Municipality has a total population of 147,742, comprising 51% females and 49% males (Ghana Statistical Service, [20]). The GEM is partitioned into four sub municipalities namely Abokobi, Dome, Taifa and Haatso. The Abokobi sub municipality is made up of rural communities with a total population of 6484 (Ghana Statistical Service, [20]). The leadership and governance of health services in the municipality is provided by the municipal health management team.

Study participants, design and sampling

This community-based cross-sectional survey was conducted among adults from May to August 2016 to assess the prevalence and risks of ASM of a rural suburb of Accra, Ghana. The study population included individuals aged 18 years and above

residing in the community for not less than three months. A multistage random sampling technique was used to recruit 350 study participants in Abokobi as previously described in Al Rasheed et al., [21]. A researcher-assisted questionnaire was then used to obtain quantitative responses from the participants. The sample size (n) was calculated using the Cochrane formula of single proportion without correction for continuity as $n = Z^2P (1-P)/d^2$ [22]. At 95% confidence interval, the Z statistic was 1.96 and P was determined to be 70% from a previous prevalence study on antibiotics in Ghana [15]. Assuming d, the degree of precision to be 0.05 (in proportion of one) and 5% non-response rate adjusted by considering design effect (1.5), n was calculated to be 350 respondents.

Approach and instrument for data collection

A semi-structured questionnaire was developed by reading the literature on a similar study conducted by Ateshim et al., [23]. The instrument consisted of both closed and open-ended questions and was in two parts. The first part obtained the information on socio-demographic characteristics, whilst the second part captured the data on previous ASM in the past 12 months, health problem(s) for which antibiotics were self-prescribed, the information source on the type of antibiotics, the reasons for ASM as well as name(s) of the antibiotics used and subscription to the NHIS. The respondents who agreed to participate in the study were interviewed for about 30–45 min in their respective homes. Information on the frequently used antibiotics in Abokobi was obtained from the health facilities and community medicines outlets and used as examples to help the respondents recollect the names of previously used antibiotics.

Study variables

The independent variables in the study were socio-demographic characteristics such as sex, age, educational level, occupation, marital status, health insurance status, previously self-used antibiotics in the past 12 months, health problem(s) for which the antibiotics were used, information source on the type of antibiotics, the reasons for ASM and name(s) of antibiotics used. The main outcome variable was ASM among the rural community of Abokobi in the Greater Accra Region, Ghana.

Data analysis

The data were entered into SPSS version 17.0 for Windows 7 (SPSS, Inc., Chicago, IL.) and later exported into STATA MP Version 13 (STATA Corporation, College Station, USA) for statistical analysis. The data were summarized in the form of frequencies and percentages by using descriptive analysis. Chi square test statistic was then used to establish possible associations between ASM and the independent variables. The risk factors of ASM and odds ratios were obtained at 95% confidence intervals (CI) by using a bivariate analyses. Those independent variables which had p-values <0.05 at the bivariate analyses stage and were previously reported to be associated with ASM were included in the multivariate analysis stage to establish the effect of the risk factors on ASM.

Ethical statement

The protocol used for data collection was approved by the Ethical Review Committee of MountCrest University College (MP/AG/2016/02/EC). We sought permission from the Ga East Municipal Health Directorate, which was the main healthcare facility that served residents of Abokobi. Written informed consent was obtained from each respondent after explaining the objectives of the study, risks and benefits, right to refuse and confidentiality to them. Those who agreed were voluntarily recruited, after receiving their signatures on the consent forms. The identity and information on the respondents were not disclosed.

Results

Socio-demographic and antibiotic self-medication characteristics of respondents

The respondents were predominantly females, 210 (60%) whilst a majority 149 (43%) were between the ages of 26–39 years. Two-hundred (200, 57%) of them were married. Most of the respondents, 123 (35%) had attained highest education at the Junior High School level, whilst a majority of 140 (40%) engaged in artisanal work as occupation. Regarding National Health Insurance Scheme (NHIS) subscription, 179 (51%) had subscribed whiles 171 (49%) were non-subscribers as shown in (Table 1).

Antibiotic self-medication was used for gastrointestinal problems 81 (46%), fever 19 (11%), skin problems 15 (9%), genitourinary tract problems 13 (7%) and upper respiratory problems 5 (3%) (Table 1). The major reasons for ASM were previous successful experience 82 (47%), ease of purchasing antibiotics 64 (36%), minor health problem to seek medical attention 64 (36%), intention of getting quick relief / for emergency use 21 (12%) and being less expensive to purchase compared to going to the hospital for treatment 20 (11%) (Table 1).

Table 1
Socio-Demographic and antibiotic self-medication characteristics of respondents.

Socio-demographic/self-medication characteristics	Frequency	Percent (%)
Sex		
Male	140	40.0
Female	210	60.0
Age		
18 - 25yrs	79	22.6
26 - 39yrs	149	42.6
40 - 59yrs	106	30.3
60 - 65yrs	16	4.6
Marital status		
Married	200	57.1
Single	139	39.7
Divorced	11	3.1
Level of education		
No formal education	26	7.4
Primary	43	12.3
JHS[a]	123	35.1
MSLC[a]	48	13.7
SHS[a]	61	17.4
Vocational	23	6.6
Tertiary	26	7.4
Occupation		
Unemployed	59	16.9
Government employee	26	7.4
Petty trading	115	32.9
Artisan	140	40.0
Farming	10	2.9
NHIS subscription		
Yes	179	51.1
No	171	48.9
Health problems		
Gastrointestinal (diarrhea, vomiting and nausea)	81	46.0
Fever (headache, hot body)	19	10.8
Skin problems (boils, wounds)	15	8.5
Genitourinary tract (pain in passing urine, genital discharge)	13	7.4
Upper respiratory (cough, common cold and sore throat)	5	2.8
Reasons for antibiotic self-medication		
Previous successful experience	82	46.6
Ease of purchase	64	36.4
Minor illness	64	36.4
Quick relief	21	11.9
Less expensive	20	11.4
Type of antibiotic used		
Amoxicillin	94	53.4
Ampicillin	41	23.3
Tetracycline	37	21.0
Flucloxacillin	8	4.5
Cloxacillin	7	4.0
Co-trimoxazole	5	2.8
Ciprofloxacin	5	2.8
Source of antibiotics		
Community pharmacies	68	38.6
Chemical shops	51	29.0
Herbal shops	1	0.6
Drug peddlers	1	0.6

[a] JHS (Junior High School); MSLC (Middle School Leaving Certificate); SHS (Senior High School).

A majority of those who practiced ASM, 94 (53%) used amoxicillin at least once within the 12 months duration (Table 1), followed by ampicillin 41 (23%), tetracycline 37 (21%), flucloxacillin 8 (5%), co-trimoxazole 5 (3%) and ciprofloxacin 5 (3%). As shown in Table 1, the antibiotics used by the respondents for self-medication were purchased mostly from community pharmacy retail outlets 68 (39%), chemical shops 51 (29%), herbal shops 1 (0.6%) as well as from drug peddlers 1 (0.6%).

Prevalence and risk factors associated with antibiotic self-medication

The prevalence of ASM in the past 12 months was 36% (95% CI: 34.6 - 42.8) (Table 2). The risk factor analysis showed that the only socio-demographic characteristics of the rural dwellers that significantly correlated with ASM were level of

Table 2

Prevalence and association between socio-demographic characteristics and antibiotic self-medication.

Characteristics	No. of respondents	Use antibiotics	ASM[a]MSSantibiotics (SMA)		Chi-square ($\chi 2$)	P-value
			Yes	No		
	N[a]=350	n[a] = 176	(n[a]=125)	(n[a]=51)		
Sex					0.113	0.740
Male	140	62	45 (72.6)	17 (27.4)		
Female	210	114	80 (70.2)	34 (29.8)		
Age					3.046	0.390
18–25yrs	79	26	16 (61.5)	10 (38.5)		
26–39yrs	149	78	54 (69.2)	24 (30.8)		
40–59yrs	106	63	47 (74.6)	16 (25.4)		
60–65yrs	16	9	8 (88.9)	1 (11.1)		
Marital status					0.210	0.900
Married	200	109	77 (70.6)	32 (29.4)		
Single	139	58	41 (70.7)	17 (29.3)		
Divorced	11	9	7 (77.8)	2 (22.2)		
Level of education					26.859	<0.001
No formal education	26	18	17 (94.4)	1 (5.6)		
Primary	43	24	23 (95.8)	1 (4.2)		
JHS[a]	123	57	38 (66.7)	19 (33.3)		
MSLC[a]	48	29	19 (65.5)	10 (34.5)		
SHS[a]	61	24	19 (79.2)	5 (20.8)		
Vocational	23	14	5 (35.7)	9 (64.3)		
Tertiary	26	10	4 (40.0)	6 (60.0)		
Occupation					9.098	0.059
Unemployed	59	19	11 (57.9)	8 (42.1)		
Government employee	26	14	7 (50.0)	7 (50.0)		
Petty trading	115	69	49 (71.0)	20 (29.0)		
Artisan	140	68	55 (80.9)	13 (19.1)		
Farming	10	6	3 (50.0)	3 (50.0)		
NHIS subscription					7.213	<0.006
Yes	179	86	53 (61.6)	33 (38.4)		
No	171	90	72 (80.0)	18 (20.0)		

[a] N (sample size); n (frequency); ASM (Antibiotic self-medication); JHS (Junior High School); MSLC (Middle School Leaving Certificate; SHS (Senior High School).

Table 3

Socio-demographic and other risk factors associated with antibiotic self-medication.

Socio-demographic/ Risk factors	Unadjusted Odds Ratio		Adjusted Odds Ratio	
	(95% CI)	P-value	(95% CI)	P-value
Level of education		0.001		<0.000
No formal education	Ref[a]		Ref[a]	
Primary	1.35 (0.08, 13.19)		3.47 (0.06, 9.54)	
JHS[a]	0.12 (0.01, 0.95)		0.15 (0.01, 1.95)	
MSLC[a]	0.11 (0.01, 0.97)		0.07 (0.01, 0.76)	
SHS[a]	0.22 (0.02, 2.11)		0.30 (0.03, 3.13)	
Vocational	0.11 (0.00, 0.32)		0.10 (0.00, 0.35)	
Tertiary	0.04 (0.00, 0.42)		0.07 (0.01, 1.08)	
Other	0.73 (1.25, 4.59)		0.07 (1.16, 1.74)	
NHIS subscription		0.008		<0.043
Yes	Ref[a]		Ref[a]	
No	2.49 (1.25, 4.89)		2.32 (0.97, 5.38)	

[a] JHS (Junior High School); MSLC (Middle School Leaving Certificate); SHS (Senior High School); Ref (Reference).

education and subscription to the NHIS ($p<0.05$) (Table 2). The multiple binary regression analysis showed that the odds of ASM among participants with tertiary education was 30% (aOR = 0.07, 95% CI: 0.01 −1.08) less than the odds of ASM among those who did not have any formal education. Respondents who did not subscribe to the NHIS, however, had 2 times greater odds of ASM compared with those who subscribed to the NHIS (aOR = 2.32, 95% CI: 0.97 - 5.38) (Table 3).

Discussion

Our research focused on the prevalence and risks of ASM in rural dwellers of Abokobi, Ghana. The findings, especially, indicate that the rate of ASM was quite high among the residents. The current prevalence of 36% was close to the 32% reported by Mensah et al., [24] in a rural setting of a periurban district of Ghana and within the range of 24% to 79% (Sapkopat et al., [25]) from African LMICs. Evidence from other studies on ASM from high income countries (HICs) showed

comparably less prevalence between 3% to 22% [26], a situation which might be attributed to the free trade of antibiotics in rural communities of African LMICs [27].

The study reported the most commonly used antibiotic for self-medication to be amoxicillin (53%) and the least, ciprofloxacin (3%). This was similar to those published by Ateshim et al., [23] and Donkor et al., [15]. Amoxicillin is a well-known antibiotic which is easily available and accessible to both urban and rural dwellers compared to ciprofloxacin. In Ghana, like other LMICs, antibiotics are generally available to the public, by being sold over-the-counter by both trained pharmacists and untrained chemical sellers or through peddling, thus making them relatively easy to acquire without prescription [28]. This ease with which residents purchase antibiotics might be due to the laxity in the enforcement of the legislation on acquisition of antibiotics prevailing in rural settings of many LMICs. For example, about 23% of the rise in the volume of retail sales of antibiotics worldwide was among poor Indians, where regulations to control the sale of the medication over-the-counter were poorly enforced [29]. Again, the increase in the number of pharmacies, other medication outlets and the non-prescription sales of antibiotics have been reported in many countries in sub-Saharan Africa like Nigeria [30], Rwanda [31], Tanzania [32] and Eritrea [33].

It is therefore suggested that targeted interventions including strict law enforcement, and constant creation of public awareness on rational use of antibiotics should be implemented to reduce the sale of these medications without prescription and from dubious sources, especially within rural settings of African LMICs.

The leading self-reported health problems that necessitated ASM in the current study area were gastrointestinal tract problems such as diarrhea, vomiting and nausea. This was synonymous with findings of a study from the Northern parts of Ghana [34]. Gastrointestinal tract related health problems within rural communities are sometimes linked to environmental deficiencies such as inappropriate solid waste disposal practices and defecation in open spaces [34]. Indeed a report from the local government assembly [35] identified similar problems of indiscriminate waste management practices in the study area and defecation in open fields. Pollution of the community solid waste stream with human excreta and exposure to same, might cause gastrointestinal as well as other respiratory tract symptoms among residents, which might necessitate ASM. Amoxicillin, the most common antibiotic used among the rural dwellers in the study, can sometimes be wrongly used to treat some of these health problems [36].

Our study also reported that residents with tertiary education were less likely to engage in ASM. This suggests that those with tertiary education might be aware of the legislations stipulating antibiotics as prescription-only medicines, or understand the implications of ASM on the development of antimicrobial resistance, side effects or other reasons not directly captured. Thus, education might play a critical role in controlling the problem of ASM in rural settings of African LMICs. It is therefore suggested that governments and other stakeholders in pharmaceutical industries in LMICs should target their information, communication and education efforts on antibiotics acquisition and usage to rural dwellers with low levels of education, since these were more likely to engage in ASM.

In this study, participants who were non-subscribers to the NHIS had higher likelihood to engage in ASM. This finding was consistent with those of Hounsa et al., [37] in Ivory Coast and Ellis et al., (2010) in India among rural dwellers[38]. In 2003, Ghana began the provision of Universal Health Coverage (UHC) to the citizenry by establishing a NHIS to abolish the then "cash and carry" system which was originally introduced in the 1980s [39]. This means that participants who were non-subscribers to the NHIS were more probable to self-purchase antibiotics from unapproved medicines outlets which might further predispose them to the dangers of ASM.

In a related study, Fenny et al., [40] showed that respondents who subscribed to health insurance were more likely to seek care from community healthcare centers for appropriate prescription of antibiotics as compared with non-subscribers. The increased chances of self-utilization of antibiotics in the absence of an appropriate clinical need could result in the development of antimicrobial resistance.

Altogether, it would be useful for the government and stakeholders in the pharmaceutical industry to target education and sensitisation on the NHIS and to expand enrollment in rural community settings of southern Ghana. Again the law enforcement capabilities that ensure the sale of prescription only medications and prevent the peddling of antibiotics in rural settings have to be improved. Health promotion measures aimed at behavioural change on prudent use of antibiotics need to be carried out, especially within rural settlements of LMICs, to prevent the problem of ASM and associated drug resistance and side-effects.

Limitations of study

First, this cross-sectional study used a researcher-assisted survey to determine the prevalence of ASM, hence the likelihood of bias in recall cannot be over-looked within the past twelve months. Secondly, the study is unable to predict causality because of the study design used.

Strengths of the study

The above limitations notwithstanding, the study had the following strengths: firstly, this is the first study in Ghana to investigate ASM among rural dwellers of Accra, according to the best of our knowledge, to understand the extent of the problem and recommend appropriate interventions. Secondly, with a general scarcity of evidence on the risks of ASM, it is

considered that our approach to data collection and interpretation is a unique strength which relates to most rural areas of LMICs.

Conclusion

The prevalence of ASM is quite high in rural dwellers of Accra, Ghana. There is a higher probability for persons with higher education and those who subscribe to health insurance policy not to engage in the practice. Therefore, health education on the appropriate use of antibiotics is recommended. The appropriate use of treatment guidelines for antibiotic therapy may significantly decrease the practice of ASM. There is an urgent need for the government to effectively communicate its policy on antimicrobial use, expand enrollment into the NHIS as well as equip regulatory bodies to enforce existing policies / regulations on the access to antibiotics. Lastly, improving access to education for the majority of the rural dwellers can significantly reduce ASM practices.

Declaration of Competing Interest

The authors declare that they have no competing interests.

CRediT authorship contribution statement

James-Paul Kretchy: Conceptualization, Formal analysis, Resources, Writing – original draft, Writing – review & editing. **Stephen Kwame Adase:** Conceptualization, Visualization, Data curation, Formal analysis, Resources, Writing – original draft. **Martha Gyansa-Lutterodt:** Writing – review & editing.

Availability of data and materials

All relevant data are presented within the manuscript. The dataset used for the analysis can however, be obtained from the corresponding author upon reasonable request.

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Disclosure

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