Self-Medication with Antibiotics and Its Predictors among the Population in Khartoum Locality, Khartoum State, Sudan in 2018

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Authors' contributions

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ABSTRACT

Background: Self-medication is a personal self-initiated behaviour of diagnosis of a disease and self-treatment of its symptoms and signs.
Objective: To identify the prevalence of self-medication with antibiotics and the diseases commonly treated with antibiotics, the most commonly used antibiotics, the sources of obtaining it and the predictors of self-medication with antibiotics.
Study Design: This was a cross-sectional, descriptive study.
Place and Duration of Study: This study was conducted in Khartoum Locality, Khartoum State, Sudan during April 2018.
Methods: 246 adults (130 males, 116 females) over 18 years were included in the study. A closed-ended, pretested and pre-validated questionnaire was used to interview the participants.
Data was analysed using SPSS Version 23.0. Descriptive statistics were presented in tables and figures. Logistic regression was conducted to identify the predictors of self-medication with

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antibiotics. Ethical approval and voluntarily signed consent were obtained prior to embarking on the study.

Results: 148(60.2%) participants practiced self-medication with antibiotics, 111(75%) of whom obtained the antibiotics over the counter in community pharmacies. The most commonly used antibiotic was amoxicillin/clavulanic acid (38.5%). The major reason behind taking antibiotics without prescription was long distances to healthcare facilities (43.2%). The commonest symptom which encouraged self-medication with antibiotics was abdominal pain (27%). Females were 3.55 times more likely to use self-medication with antibiotics than males. Participants who lacked health insurance cards were 2.65 times more likely to practice self-medication with antibiotics.

Conclusion: The prevalence of self-medication with antibiotics is alarmingly high in Khartoum Locality. Over the counter purchase of antibiotics was the main route of self-medication. Gender and lack of health insurance were significant predictors of self-medication. Mass education through different media and policy reform are recommended.

1. INTRODUCTION

Self-medication is a personal self-initiated behaviour of diagnosis of a disease, self-treatment of symptoms and signs [1]. It could be an occasional behaviour or a continued use of certain prescribed drug without consultation of a physician [1]. Self-medication with antibiotics for treatment of diseases is a common behaviour in low and middle-income countries, where the prevalence ranged between 45-98% [2]. The competition between pharmaceutical companies prompts them to avail low-priced antibiotic brands accessible for purchase over the counter, however, self-medication is increasing in the absence of restricted rules to govern antibiotic delivery system [2]. Based on several behavioural factors, people started self-medication by presenting their symptoms and signs to the pharmacists and neglecting the underline causes of their diseases [3,4]. Some low and middle-income countries have medicine vendors of low knowledge about antibiotic resistance and thus contribute to self-medication in the absence of a strong drug inventory system of procurement, storage, and distribution and insufficient number of the skilled care providers [5]. The inappropriate use of antibiotic leads to drug resistance, which renders current regimens ineffective in the management of diseases from many sources as contaminated food and water such as gastroenteritis caused by Shigella Species, airborne diseases and nosocomial infection [3,6,7] Antibiotics in Sudan are not classified as prescription-only medications. The laxity of governing access to antibiotics increases the economic burden on the health services and the incidence of resistant bacterial strains to common antibacterial drugs [2,5,7].

During the last decade, the trend of over the counter sales of antibiotics was alarmingly high and remains the most common means of obtaining antimicrobial drugs in Sudan [8-10]. Khartoum State witnessed several population movement and influxes from states with different types of economically deprived populations carrying their local cultural practices [11,12]. In the context of the change of social texture of population in Khartoum State, the study was aiming to identify a recent picture on the prevalence of self-medication with antibiotics and the diseases commonly treated with antibiotics, the most commonly used antibiotics, the sources of obtaining it and the predictors of self-medication with antibiotics among in Khartoum Locality, Khartoum State, Sudan 2018.

2. MATERIALS AND METHODS

2.1 Study Design and Area

This was a cross-sectional study conducted in Khartoum locality during April 2018. Khartoum locality is one of the seven localities of Khartoum State, Sudan. The Khartoum locality is divided further into 15 administrative units, which were included in the study and together accommodate 5,271,321 people.

2.2 Eligible Study Population

The eligible participants in this study were adults aged 18 years and above, in accordance with the Sudan Constitution. Participants who were taking antibiotics at the time of the study and pregnant women were excluded.

2.3 Sample Size and Sampling Technique

The self-medication with antibiotics had shown commonly among penicillin groups, approximately 80% [13,14], therefore; the calculated sample size was 246 which determined by the following mathematical equation for proportions considering the prevalence (p) at 0.8:

$$n = \frac{Z^2 pq}{d^2}$$

Where, Z at 95% CI = 1.96 and the marginal error (d) = 0.05. The 15 administrative units of Khartoum Locality were considered as clusters. The sample size was divided proportionally to the population at each cluster and therefore simple random sampling was carried out in each.

2.4 Data Collection Tools and Methods

The study tool was a closed-ended, pretested and pre-validated questionnaire. It was composed of two sections: the first section was about demographic characteristics and the second for practices of self-medication with antibiotics in terms of type of antibiotics used, reasons behind self-medication with antibiotics, diseases commonly treated by self-medication with antibiotics and sources of obtaining antibiotics. Face-to-face interviews were carried out for the eligible participants.

2.5 Data Analysis

Data was cleaned, entered and analysed by the Statistical Package for Social Sciences (SPSS) Version 23.0 for Macintosh OS X. Descriptive statistics were presented in tables and figures. Since the independent variables were preceded by self-medication with antibiotics, analysis of proportions was used by logistic regression [15], and odd ratios were regarded as the outputs of significance to identify the predictors of self-medication among gender, age groups, level of education, occupation; marital status and having health insurance.

2.6 Ethical Considerations

The study was conducted after obtaining ethical approval from the ethics committee of the Department of Community Medicine, Ibn Sina University. The study objectives, beneficence and non-maleficence were explained to the participants and voluntary signed consent was obtained prior to embarking on the study.

3. RESULTS

3.1 Study Population Characteristics

In this study, males and females accounted to 52.8% and 47.2% respectively and most of the participants were in the age group of more than 30 years (70.3%) [Table 1]. Almost three-quarters of the study population earned below $100 per month [Table 1]. Regarding education and occupation, 211 (85.8%) of the participants had higher education and 178 (72.4%) were having some sort of working position [Table 1]. The participants who had no health insurance cards accounted to 156 (63.4%) and those who had some relatives in the health sector were 157 (63.8%) [Table 1].

3.2 Practice of Self-Medication with Antibiotics

It was found that 148 (60.2%) of the participants practicing self-medication with antibiotics within the previous 12 months [Table 2] and 75% of these participants obtained the antibiotics over the counter [Fig. 1]. The probability of self-medication with antibiotics in this study was higher among females (74.1%), university graduates (59.2%), unemployed participants (66.2%) and singles (61.0%) [Table 2]. The most commonly used antibiotic by the participants was found to be amoxicillin/clavulanic acid (trade name: Amoclan), by 38.5% of participants who practiced self-medication with antibiotics, followed by ampicillin/cloxacillin (11.5%) and ciprofloxacin (8.1%). Those who did not recall the name of the antibiotics amounted to 31 participants (12.6%) [Table 3]. The major reason behind taking antibiotics without prescription was long distances to healthcare facilities (43.2%), followed by expensive doctors` consultations (21.0%), previous experience of antibiotic self-medication with similar antibiotics (19.6%) and advice from friends and neighbours to use certain antibiotics (16.2%). [Table 3]. The most common symptom treated by self-medication with antibiotics in this study was abdominal pain, by 40 participants (27.0%), followed by cough and respiratory infection (23.0%) and sore throat (19.6%) [Table 3].

Table 1. Characteristics of the study population

Characteristics (n=246)		Frequency	%
Gender	Male	130	52.8
	Female	116	47.2
Age	18-30 years	73	29.7
	More than 30 years	173	70.3
Monthly income	Less than 100 $	182	74.0
	100 $ and more	64	26.0
Education	Below University	35	14.2
	University and above	211	85.8
Occupational status	Not working	68	27.6
	Working	178	72.4
Marital Status	Married	110	44.7
	Not married / not in union	136	55.3
Health Insurance	Yes	90	36.6
	No	156	63.4
Have relatives in health sector	Yes	157	63.8
	No	89	36.2

Table 2. Pattern of self-medication with antibiotics among the study population

| Variable		Antibiotic self-medication frequency (%)		
Pattern of self-medication with antibiotics (n=246)		Yes (n=148)	No (n=98)	Total (n=246)
Gender	Male	62 (47.7%)	68 (52.3%)	130 (52.8%)
	Female	86 (74.1%)	30 (25.9%)	116 (47.2%)
Age	18-30 years	44 (60.3%)	29 (29.7%)	73 (29.7%)
	More than 30 years	104 (60.1%)	69 (29.9%)	173 (70.3%)
Monthly income	Less than $100	110 (60.4%)	72 (29.6%)	182 (74.0%)
	$100 or more	38 (59.4%)	26 (40.6%)	64 (26.0%)
Education	Below University	23 (65.7%)	12 (34.3%)	35 (14.2%)
	University and above	125 (59.2%)	86 (40.8%)	211 (85.8%)
Occupational status	Not working	45 (66.2%)	23 (33.8%)	68 (27.6%)
	Working	103 (57.9%)	75 (42.1%)	178 (72.4%)
Marital status	Married	65 (59.1%)	45 (40.9%)	110 (44.7%)
	Not married / not in union	83 (61.0%)	53 (39.0%)	136 (55.3%)
Health insurance	Yes	43 (47.8%)	47 (52.2%)	90 (36.6%)
	No	105 (67.3%)	51 (32.7%)	156 (63.4%)
Have relatives in health sector	Yes	92 (58.6%)	65 (41.4%)	157 (63.8%)
	No	56 (62.9%)	33 (37.1%)	89 (36.2%)
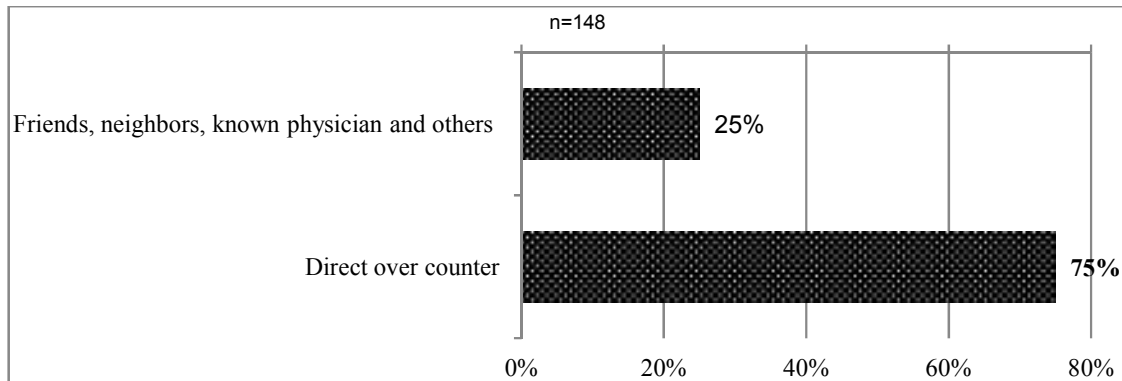
Fig. 1. Distribution of study population in Khartoum Locality, Khartoum State, Sudan by sources of obtaining antibiotics for self-medication, 2018

Table 3. Practices of self- medication with antibiotics among study population in Khartoum State, Sudan in 2018

Practices of self-medication with antibiotics (n=148)		Frequency	%
Antibiotics used	Amoxicillin/Clavulanic acid	57	38.5
	Ampicillin/Cloxacillin	17	11.4
	Ciprofloxacin	12	8.1
	Erythromycin	10	6.8
	Azithromycin	9	6.1
	Tetracycline	9	6.1
	Cefixime	3	2.0
	Don't know the name	31	21.0
Reasons behind self-medication with antibiotics	Far distance to health care unit	64	43.2
	Expensive doctor's consultation	31	21.0
	Previous experience of self-treatment	29	19.6
	Friend's advice	24	16.2
Diseases commonly treated by self-medication with antibiotics	Abdominal pain	40	27.0
	Cough & respiratory tract infection	34	23.0
	Sore throat	29	19.6
	Common cold	27	18.2
	Urinary tract infection	15	10.1
	Ear infection	3	2.0

Table 4. Factors predicting self-medication with antibiotics among study population in Khartoum State- Sudan 2018

Factors	Sig*	Odds ratio	95% C.I lower	95% C.I upper
Gender (Female)	$P < 0.001$	3.547	2.019	6.232
Age (18-30 years)	$P = 0.99$	1.007	0.576	1.760
Monthly income (< $100 per month)	$P = 0.89$	1.045	0.585	1.868
Education (Below University)	$P = 0.47$	1.319	0.623	2.792
Occupational Status (Not working)	$P = 0.23$	1.425	0.795	2.554
Marital Status (Married)	$P = 0.76$	0.922	0.552	1.541
Lack of Health insurance	$P = 0.003$	2.645	1.499	4.666
Relatives in Health Sector	$P = 0.51$	0.834	0.489	1.424

*Logistic regression

3.3 Factors Associated with Self-medication with Antibiotics

The factors significantly associated with self-medication with antibiotics were gender ($P < 0.001$) and lack of health insurance ($P = 0.003$). Females were 3.55 times more likely to self-medicate with antibiotics than males (95% CI: 2.019 - 6.232). Participants who were not having health insurance cards were 2.65 times more likely to practice self-medication with antibiotics (95% CI: 1.499 - 4.666) [Table 4].

4. DISCUSSION

The prevalence of self-medication with antibiotics remains alarming. At 60.2%, the study demonstrates a similar prevalence to studies conducted in Tanzania [16] and Southeastern Europe [17]. Higher prevalence rates were found in studies conducted in Argentina [18] and Saudi Arabia [19]. The trend of antibiotics self-medication remains steady since the last decade, with different forms of compliance to medication doses [8-10,20].

Self-medication with antibiotics was commoner among under-30s, singles and unemployed individuals in this study, although the relationship was insignificant. This could be explained by the fact that they cannot fund their treatment in a clinical setting independently, as they may be still be students or recent graduates searching employment. The prevalence of self-medication with antibiotics was also appreciably higher among individuals earning below 100 USD per month. A rather surprising finding in this study was the probability of self-medicating with antibiotics was higher among university graduates, which is likely due to low

employability rates among university graduates. Such inertia thus prevents them from being able to afford the subsequent expenses of consultations and laboratory testing, ultimately prompting the behaviour of self-medication.

The most common antibiotic used by the study participants who practiced self-medication with antibiotics was amoxicillin/clavulanic acid under the trade name, Amoclan. This brand of antibiotics is effective against different urinary tract infections caused by *Escherichia coli* and *Klebsiella pneumoniae* [21], but due to its misuse, *Escherichia coli* developed resistance to amoxicillin/clavulanic acid [22]. Amoxicillin/clavulanic acid is inexpensive and a first-line therapy in many low and middle-income countries, which could explain its predominant use. Some participants in this study self-medicated without knowing the name of the antibiotic. This could be due to advice from their friends or local pharmacists [23,24]. Antibiotics in this study were primarily obtained over the counter in community pharmacies. The sale of antibiotics remains unregulated in Sudanese pharmacies and drug stores, thus explaining the popularity of these sources. This finding resembles that of a study conducted in Cameroon, in which 62% obtained antibiotics without prescription from community pharmacies [25]. Long distance to health care was the most common reason for self-medication with antibiotics in this study. Travelling far distances to access health care is a strong factor which enhances self-medication in low and middle income countries [26]. The second reason for self-medication in this study was the expensive fees of doctors' consultations, likely due to inability to afford consultations [27]. The poor economic status of the country and the political instability led the individuals to prioritise the financial distribution to other important domestic needs. Previous experience of self-treatment for similar disease is one of the major reasons behind self-medication with antibiotics in this study, which was also found to be the common factor in Ethiopia [28]. Most low and middle-income countries including Sudan adopted primary health care policies that ensure the provision of affordable and accessible health care and reduce the economic burden of disease on the patients [29]. However, failure to achieve universal health coverage might be one of the reasons for practicing self-medication.

Abdominal pain, cough and respiratory tract infections were the common diseases which prompted the participants to self-medicate with antibiotics in this study, followed by sore throat, common cold and urinary tract infection. A systematic review in Middle East countries had shown that flu and cough and sore throat were commonly self-medicated symptoms [30]. Respiratory tract infections have also been commonly treated by self-medication with antibiotics in multiple studies across Africa [25,31]. Sore throats are mostly of viral origin and the community should be aware that it is self-limiting. Protocols in Sudan state that a throat swab for culture and sensitivity is indicated if a sore throat is accompanied by a fever above 38 degrees Celsius, tonsillar exudate and submandibular lymphadenopathy in the absence of cough [10].

The first significant predictor of self-medication with antibiotics in this study was being a female. Several studies had shown significant relationship of females and self-medication with antibiotics while others were not [8,10,32]. The second significant predictor for self-medication with antibiotics in this study was lacking health insurance. Individuals lacking health insurance intended to practice self-medication with antibiotics. Health insurance is a protective policy against out-of-pocket expenses [10,11,14,33]. The majority of the study participants was unemployed, and therefore cannot pay for health insurance policies. The beneficial strategies to overcome the practice of self-medication with antibiotics are policies and laws prohibiting the over-the-counter sales of antibiotics, as recommended by the World Health Organization [34,35].

5. STUDY LIMITATIONS

The study was conducted over a period of four weeks and within a single locality in Khartoum State, Sudan. This was due to the poor economic climate during the time of this study, which prevented the conduction of this study at a wider scope, which the authors believed would yield more accurate results. Also, the authors acknowledge that the results collected may have been influenced by recall bias from the participants and this type of study is hugely dependent on the information they provide. Furthermore, Despite these issues, given the sampling technique and the large number of participants, the authors believe that the results are an appropriate estimate of the prevalence of self-medication with antibiotics.

6. CONCLUSIONS

The prevalence of self-medication with antibiotics was alarming in Khartoum Locality. Over the counter purchase of antibiotics was the main route of self-medication. Gender difference and lack of health insurance were significant predictors of self-medication. Mass education through different media and policy reform are recommended to restrict self-medication and reduce over the counter use of antibiotics.

CONSENT AND ETHICAL APPROVAL

The study was conducted after obtaining ethical approval from the ethics committee of the Department of Community Medicine, Ibn Sina University. The study objectives, beneficence and non-maleficence were explained to the participants and voluntary signed consent was obtained prior to embarking on the study.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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