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Research Article

The Irrational Use of Antibiotics Among Doctors, Pharmacists and the Public in River Nile State, Sudan

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Abstract

Background: Inappropriate antibiotic prescription, dispensing and self-medication are alarmingly high worldwide. The problem is more so in developing countries, including Sudan, where resistance to life-saving drugs is emerging.

Objective: to assess the prevalence of irrational use of antibiotics among doctors, pharmacists and the public in River Nile State (RNS), Sudan.

Methodology: a descriptive cross-sectional study was conducted, in March 2014 through April 2014. The study population was 278 individuals, composed of 100 doctors, 78 pharmacists selected randomly from hospitals, pharmacies and health centers, besides 100 adults from the community. Three different interviewer-administered standardized pre-tested questionnaires were used for data collection.

Results:antibiotic misuse is common practice among both medicals as well as the public in RNS. This was evidenced by the facts that 92% of doctors prescribed antibiotics without culture and sensitivity results, more than 93% of pharmacists dispensed antibiotics as over the counter medications and that 89% of participants used antibiotics without consulting a doctor. More than 90% of the misused antibiotics werebeta-lactams and macrolides and the most common indication for their use was cough and common cold.

Conclusion: Irrational use of antibiotics is a widespread practice in RNS among all stakeholders. Therefore, health care policy makers and care providers should have antibiotic policy and clear to follow obligatory guidelines and to ensure that the public and every prescriber/dispenser conforms to that policy. Moreover, increasing awareness about the appropriate antibiotic use among all stakeholders is of paramount importance.

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1. Introduction

Since their discovery in the 1940s, antibiotics have been imperative to the modern health care system. They are not only used to treat serious infections but also to prevent surgical wound infection and as prophylaxis forimmune-compromised individuals [1]. There is a worldwide progressive increase in antibiotic consumption, particularly in developing countries [1]. In fact, antibiotics are the most commonly used and misused medications [2, 3]. In some developing countries, it is estimated that 20 percent of antibiotics are used in hospitals and other healthcare facilities, whereas, 80 percent are used in the community, either prescribed by healthcare providers or purchased directly by consumers or caregivers without prescription [4]. It is a known fact that the greater the volume of antibiotics used, the greater the bacterial resistance prevails. This is evidenced by the decline in the stock of effective antibiotics available for treating serious infections. Unfortunately, resistance to all first-line and last-resort antibiotics is rising [1].

The irrational use of antibiotics is not only lethal to some patients but also jeopardizing to the economy of the country; as the cost of antibiotic resistance is huge even in developed countries, let apart low and middle-income countries(LMICs). For instance, in the U.S., the direct and indirect costs of microbial resistance is estimated as more than 50 $ billion annually [1]. In a resource-limited country, such as Sudan, reducing the health care expenses for irrationally used antibiotics is of paramount importance for health economics as well as for individual patients.

Investigating irrational use of antibiotics implies monitoring, evaluation, and suggesting modifications in doctor's prescription habits, pharmacist's dispensing practice and the community usage at large, so as to rationalize the use of antibiotics [5, 6].

To achieve this goal in antibiotic usage, it is important to provide health policy makers by high-quality research addressing this topic. Therefore, we aimed by this study to determine the magnitude of the irrational use of antibiotics among all stakeholders in River Nile State, Sudan and to urge recommendations that help solve this challenge.

2. Methods

2.1. Settings

The study was conducted in the main cities of RNS, namely Atbara, Ed Damer, Berber and Abu Hamadduring the period from the 1st of March through April, 30th, 2014. RNS

covers an area of 124,000 km^2 and is populated by about 1,300,000 individuals, 60% are residing in rural areas.There are about 11 referral hospitals, 15 rural hospitals and more than 80 health centers and dispensaries. Besides, there are about 300 pharmacies in RNS. The workforce is about 400 doctors with different career grades, whereas the pharmacists are about 100.

2.2. Study population

This descriptive cross-sectional study included 278 participants, consisting of 100 doctors selected randomly from the five hospitals in RNS, namely, Atbara Teaching Hospital, Alsalam University Hospital, The Military Hospital, The Police Hospital , Atbara Medical Complex, Ed Damer Hospital, Berber Hospital, as well as many Health centers. These health facilities were selected by simple tossing technique from the list of facilities in RNS.Seventy-eight pharmacistsworking in RNS pharmacies, both public and private, were also included. Besides, one hundred individuals, aged 20 years and above, were selected randomly from the community of RNS.It is to be mentioned that, antibiotics are commonly dispensed as over the counter (OTC) medications inboth public as well as private pharmacies.

2.3. Data Collection tools

Three different questionnaires were constructed for doctors, pharmacists, and patients to gather socio-demographic characteristics, knowledge, attitudes and practices towards prescription, dispensing and self-medication of antibiotics respectively.

The questionnaires were standardized, pre-tested and validated to gather the required data from participants.

2.4. Data analysis methods

Obtained data were validated, entered and double checked and analyzed using SPSS v.20 computer program.Descriptive statistics was applied to data. Frequencies, means, and standard deviations were calculated.

2.5. Ethical issues

An informed written consent was obtained from each participant prior to enrollment. The objective of study was fully explained and that participation was optional.Confidentiality of participants and data was secured. An ethical approval was obtained from the Ethical Committee of Faculty of Medicine- Nile Valley University.

3. Results

3.1. Overview

This study included 100 treating doctors, 78 dispensing pharmacists and 100 individuals from the local community of RNS. Individuals were interviewed separately for their practices about the irrational use of antibiotics. Overall, there was high prevalence of antibiotic misuse by both medicals as well as the public. This was evidenced by the facts that92% of doctors prescribe antibiotics without culture and sensitivity results, more than 93% of pharmacists dispense antibiotics as over the counter medications and that 89% of participants use antibiotics without consulting a doctor.

3.2. Socio-demographic characteristics of study population

There were 171 (62.5%) females and 107 (37.5%) males, giving a female to male ratio of 1.7:1. Most practicing doctors (92%) and pharmacists (96.0%) were baccalaureate holders, the rest were masters or Ph.D. holders.

While most doctors were working at public hospitals (78.0%), most pharmacists (91.1%) were working at private pharmacies. Moreover, all pharmacists were assisted by drug sellers, among them, 50.0% had neither license nor certificate for practice (drug sellers were not interviewed). Table 1 displays the socio-demographic characteristics of study population.

3.3. Antibiotic practices among doctors

Among participating doctors, 87.0% prescribe antibiotics based on clinical judgment, while only less than 10.0% used culture and sensitivity results to guide treatment. Therefore, broad-spectrum antibiotics were preferable for 64.0% of doctors vs. 8.0% for narrow spectrum antibiotics. Beta-lactams were the most commonly prescribed

antibiotics (89.0%). Table 2 shows the common practices of treating doctors towards antibiotic prescription.

3.4. Antibiotic practices among pharmacists

Most pharmacists (93.6%) dispensed antibiotics without prescriptions, or based on their own diagnosis (93.5%) for patients' complaints. Moreover, 89.8% of pharmacists stated that they permit their assistants to dispense antibiotics without prescription. More than 60% of pharmacists admitted that they dispensed antibiotics as incomplete dose based on patients' request. Table 3 reveals the common practices of pharmacists towards antibiotics dispensing.

3.5. Antibiotic practices among the public

A minority of participants from the community (11.0%) obtained their antibiotics through prescription by doctors, while 55.0% got them directly from pharmacies.

The most common cause for using antibiotics (82.0%) was cough and common cold. In addition, 43.0% discontinued their treatment when improved, whereas, 41.0% shifted to another antibiotic when there had been no response to their illness (Table 4).

4. Discussion

In Sudan, there are few published studies about the irrational use of antibiotics [7, 8]. While, in River Nile State, this is the first investigation uncovering the magnitude of this health-threatening problem. It is obvious, in this study, that antibiotics are widely misused in our settingsby all stakeholders, including physicians, pharmacists and the public. Reported promoters for antibiotic misuse include lack of knowledge, absence of clear antibiotic policies and regulations, in addition to the powerful pharmaceutical marketing [9, 10]. These same factors may be applied to our situation. Doctors should be aware to prescribe antibiotics according to the principles of antimicrobial stewardship.The Antimicrobial Stewardship Clinical Care Standard aims to ensure that a patient with a bacterial infection receives optimal treatment with antibiotics. Optimal treatment means treating patients with the right antibiotic to treat their condition, the right dose, by the right route, at the right time and for the right duration based on accurate assessment and timely review [11].

Table 1: The socio-demographic characteristics of study population. River Nile State, Sudan 2014 (n=278).

Category	Characteristic	Variable	n	%
Doctors	**Sex**	Male	38	38.0
		Female	62	62.0
	Age group	20 – 29	62	62.0
		30 - 39	28	28.0
		40-49	5	5.0
		50-59	4	4.0
		≥ 60	1	1.0
	Professional Career	Specialist	8	8.0
		Registrar	8	8.0
		Dentist	15	15.0
		General practitioner	42	42.0
		House officer	27	27.0
	Place of work	Public hospital	78	78.0
		Private hospital	10	10.0
		Primary health care center	12	12.0
Pharmacists	**Sex**	Male	26	33.3
		Female	52	66.7
	Age group	20 – 29	42	53.6
		30 - 39	25	32.1
		40-49	6	7.2
		50-59	5	7.1
	Place of work	Hospital pharmacy	7	8.9
		Private pharmacy	71	91.1
	Qualifications	Bachelor degree	75	96.0
		Masters degree	3	4.0
	Employing drug sellers	Yes	78	100.0
	Qualifications of drug sellers	Diploma of pharmacy	39	50.0
		No license/certificate	39	50.0
Participants from community	**Sex**	Male	43	43.0
		female	57	57.0
	Age group	20 – 29	56	56.0
		30 - 39	24	24.0
		40-49	13	13.0
		50-59	5	5.0
		More than 60	2	2.0
	Level of education	Illiterate	15	15.0
		Secondary	35	35.0
		College	50	50.0

Table 2: The common practices of treating doctors towards antibiotic prescription in River Nile State, Sudan 2014 (n=100).

Practice	Variable	n	%
Basis for antibiotic prescription in your practice	Clinical diagnosis	87	87.0
	Culture result	8	8.0
	Experience/trend in hospital	5	5.0
Basis for antibiotic selection for a specific patient/illness	Your own experience in dealing with the disease	60	60.0
	Use the most potent antibiotic at hand	17	17.0
	Culture result	7	7.0
	Senior's experience	15	15.0
Preference of antibiotic spectrum	Broad spectrum	64	64.0
	Narrow spectrum	8	8.0
	No specific preference	28	28.0
The most commonly prescribed group of antibiotics in your everyday practice	Beta-lactams	89	89.0
	Macrolides	8	8.0
	Quinolones	2	2.0
	Aminoglycosides	1	1.0
Estimated frequency of using culture and sensitivity in everyday practice	Never requested before	15	15.0
	Less than 25% of cases	45	45.0
	More than 25%and up to 50%	27	27.0
	More than 50% and up to 75%	11	11.0
	More than 75%	2	2.0
Indications for requesting culture and sensitivity in your everyday practice	Failure to find out a clinical diagnosis	38	38.0
	Poor or no response to prescribed antibiotic	47	47.0
	Never request culture	15	15.0
Barriers for using culture and sensitivity services	Unsatisfactory laboratory results	43	43.0
	Poor economic status of patients	38	38.0
	No specific cause	19	19.0

More than half of doctors in this study were females this may reflect the current situation of female predominance in the medical professions. Whether gender has an effect on pattern of prescription is a point that is to be determined by further research. Younger age groups (below 30 years) constituted more than half of study population, and most of them were either house officers or general practitioners. This fact may attribute to their improper prescription practices due to lack of adequate knowledge and experience in the absence of training workshops about the rational use of antibiotics;

Table 3: The common practices of pharmacists towards antibiotic dispensing in River Nile State, Sudan 2014 (n=78).

Practice	Variable	n	%
Frequency of dispensing antibiotics without prescription	**Yes**	73	93.6
	No	5	6.4
Permission for drug sellers to dispense antibiotics without prescription	**Yes**	70	89.8
	No	8	10.2
Frequency of dispensing antibiotics based on pharmacist's own diagnosis for patients	**Yes**	73	93.6
	No	5	6.4
Frequency of pharmacists allowing drug sellers to dispense antibiotics based on seller's diagnosis for patients	**Yes**	70	89.7
	No	8	10.3
The most common dispensed antibiotics without prescription	**Beta-lactams**	61	78.2
	Macrolides	17	21.8
Pharmacist's estimation for patients getting antibiotics without prescription	**Less than 25%**	16	20.5
	26%-50%	34	43.6
	51%-75%	25	32.1
	More than 75%	3	3.8
Pharmacists specifying duration of antibiotic course	**Yes**	62	79.5
	No	16	20.5
Pharmacists dispensing antibiotic as incomplete dose	**Yes**	48	61.5
	No	30	38.5

therefore, empirical coverage by broad spectrum antibiotic may seem a safe way for some of them.

In this study, most of participant doctors were public employees in hospitals or health centers, where most patients were covered by health insurance, facilitating access to low price antibiotics. This, seemingly, low economic burden on patients may encourage doctors to prescribe irrationally. However, the overall cost of this practice on the health system economy is devastating.It is also evident from this study that only a minority of doctors request culture and sensitivity services, whereas the majority use only their clinical judgment when prescribing antibiotics to their patients. Moreover, 15% of doctors had never requested culture and sensitivity test for their patients before. For instance, the culture and sensitivity test is available and costs lesser than one dose of a commonly prescribed antibiotic (ceftriaxone). Therefore, about two third of doctors prescribe broad-spectrum antibiotics, mostlybeta-lactams and macrolides, for their patients, a situation

Table 4: The common practices of community participants for antibiotics in River Nile State, Sudan 2014 (n=100).

Practice	Variable	n	%
The main source for getting antibiotics	Doctor	11	11.0
	Same antibiotic used for a similar previous illness	25	25.0
	Directly from pharmacy	55	55.0
	Any antibiotic available at home	9	9.0
The most common indications for using antibiotics	Cough and common cold	82	82.0
	Wounds	13	13.0
	Other illnesses (e.g. sore throat and tonsillitis).	5	5.0
The most commonly used antibiotics	Azithromycin	27	27.0
	Amoxicillin	20	20.0
	The combination of amoxicillin with clavulanic acid	11	11.0
	Do not know/remember	42	42.0
Preference for route of administration	Oral	63	63.0
	Parentral	37	37.0
	No specific preference	10	10.0
Patients on chronic medications	Yes	16	16.0
	No	84	84.0
Time for treatment discontinuation	When feels better	43	43.0
	When stock finishes	24	24.0
	Based on doctor's prescription	33	33.0
What to do if first used antibiotic was not effective	Refer to doctor	49	49.0
	Shift to another antibiotic	41	41.0
	Repeat the same course of antibiotic	10	10.0

that is similar to doctors' practice in Greece [12]. This high antibiotic prescription practice is higher than that reported in the U.S and Canada, where over-prescription is about 50% [13].

We believe that, this empirical and irrational use of antibiotics basically violates the Hippocratic Oath for doctors that states "I will prescribe regimens for the good of my patients according to my ability and my judgment and never do harm to anyone", because by so doing doctors would harm not only individual patients but also the whole community.

The role of pharmacists in antibiotic misuse in this study is remarkable. Pharmacists in RNS were mostly bachelor holders, most of them were working in private pharmacies,

and half of pharmacists were assisted by non-qualified drug sellers. These facts may attribute to antibiotic misuse: indicating lack of appropriate knowledge.Profitability was a major concern for private pharmacies rather than rationalizing antibiotic use. This was evidenced by the fact that almost all pharmacists (93.6%) and drug sellers dispensed antibiotics not only without prescription but also based on their own diagnosis for individual patient'scomplain. This high inappropriate prescription was similar to a study in India (94%) [14] and Veitnam (90%) [10] but higher than that reported from Zimbabwe (39%) [15], Saudi Arabia (78%) [16] and Syria (87%) [17]. Added to this malpractice, is dispensing of incomplete dosage of antibiotics, which they justified by patient's convenience. This is similar to the practice reported from Egypt [18].

In this study, more than half of community individuals obtained antibiotics directly from pharmacies, a situation that is similar in Khartoum, Sudan [7], and many other countries [19–23]. In this regard, the presence of regulations prohibiting malpractice would help reduce easy access to life-saving medications.

Cough and common cold were the most indications for using antibiotics in this study, a situation that is similar to other developing countries [24–29].

This practice hinders the fact that antibiotics should not be used to treat mild ailments, but rather to treat serious infections [1]. This misconception for using antibiotics for common cold and other viral infections may be rectified by health education for the community.

Almost half of public participants discontinued medications when symptoms improved, but if not improved, more than 40% shifted to another antibiotic through self-medication. Self-medication in this study is similar to a study conducted in Khartoum [8].

This study has some limitations. The small sample size, especially for the public, may not allow generalizability of the results to the whole population of RNS. This limited sample size was mainly due to logistic shortages. However, this sample size included 20%-25% of the doctors' working force and almost 90% of practicing pharmacists in RNS. Therefore, we assume that these two important cohorts were representative for their populations. However, a study with a larger sample size is recommended.Other limitationswere the subjectivity of the questions, recall problems and the effect of social norms. In this regard, the researchers assured participants about the voluntariness nature of the study, absence of identifiers for participants and confidentiality of their responses.It would be more objective if prescriptions from treating doctors, who participated in this study, were revised for the frequency of antibiotics prescribed for patients, and that pharmacists dispensing practices were assessed in reality. Despite

these limitations, this study is comprehensive and novel, as it investigated antibiotic practices among all stakeholders: doctors, pharmacists, and the public.The second point of strength is that this study is the first one documenting the irrational use of antibiotics in RNS, therefore, it may constitute a database for many studies to come.

In conclusion, irrational use of antibiotics is a widespread practice in RNS among all stakeholders. Therefore, health care policy makers and care providers should have antibiotic policy and clear to follow obligatory guidelines and to ensure that the public and every prescriber/dispenser conforms to that policy. Moreover, increasing awareness about the appropriate antibiotic use among all stakeholders is of paramount importance.

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