

Knowledge and Attitude of Rational use of Antibiotics among General Practitioners, Khartoum Locality, Sudan

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Abstract:-

➤ Background:

This cross-sectional-based study was conducted at Khartoum locality, Khartoum, using data collected. We accomplished the study because of its importance and effect on both human health and the economy worldwide. There is a strong correlation between bacterial resistance and the over-usage of antibiotics among prescribers and the community. On the other hand, it increases the awareness of bacterial resistance among the community, especially the prescribers, who are handling the responsibility of unnecessary use of these agents.

➤ Purpose:

The study aimed to minimize the antibacterial agents prescription and hence bacterial resistance among health facilities, as best as. This goal could be achieved through tackling doctors' awareness and attitudes towards the resistance issues. One more advantage is to enhance the practice of the doctors, making them always confident to prescribe antibiotics with considering the avoidance of unnecessary prescriptions.

➤ Methodology:

The study was conducted by distributing questionnaires to 75 doctors working at 15 different primary health centers. Knowledge and attitude were assessed through closed-ended statements. Knowledge has been assessed by reviewing the responses toward statements including the definition of irrational use of antibiotics, supportive laboratories investigations should be requested, safe antibiotics during pregnancy, antibiotics that can damage the liver and or kidney, and antibiotics-drug interactions.

In regards to attitude, health professionals have been asked about several domains like the severity of the problem, the role of doctors in the irrational use of antibiotics, and barriers between doctors and applying the rational use of antibiotics concept.

We gave scores for every statement choice, 2 points for the correct answer, 1 for the answer 'I don't know, and 0 for the incorrect answer. Total marks of each questionnaire collected, afterward, knowledge evaluated as good, moderate, or poor. Similarly, the attitude assessed after points collection as positive, neutral, or negative.

➤ Results:

The number of years spent in medical practice for the health professionals who participated in this study has been estimated. 92% have less than five years of medical experience, 6.7% have been practiced for 5-10 years, while 1.3% have been practiced for ten years. 33% of the total number of health professionals had 16-20 patients per day during the duration of the study.

After marking and analyzing knowledge statements, results showed that 65% of doctors had poor knowledge, 31% got the moderate assessment, while 4% were good. For the attitude, the majority showed a neutral attitude (42%), doctors with a good attitude were 29%, while doctors with a poor attitude were 29%.

➤ Conclusion:

The knowledge about antibiotics of health professionals in the Khartoum locality, Sudan, has shown to be poor.

Attitude towards the concept of rational prescription of antibiotics has shown to be neutral.

Keywords:- Antibiotics; Attitude; Knowledge; Khartoum; Sudan.

I. INTRODUCTION

World health organization (WHO) defined the rational use of medicine as, “the medication received by the patients appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community” [1].

The evolutionary discovery of antibiotics has contributed to the massive decrease in mortality due to their therapeutic and preventive role. Resulting in overall improvement of health [2].

Antibiotics resistance is a serious concern globally, resulted in an enormous financial burden. Keeping in mind the issue of the increased mortality and morbidity attributed to antibacterial resistance shows how serious the problem is [3]. Annual antibiotic resistance-related death is massively high and anticipated to be as high as 10 million deaths per year by 2050 [4]. Use of antibiotics unnecessarily has yielded this problem by making organisms vulnerable to resistance acquisition [5].

In developing countries like our country, the development of antimicrobial resistance could be linked to factors like using the antibiotics without a doctor's prescription, i.e. self-medication, and incomplete course of treatment [3, 5]. One more factor expected to worsen the problem in such a population is the insufficient awareness of the antibacterial resistance [2]. Studies showed that patients' pressure and desire to get antibiotic agents are influential factors on their treating health professional's decision making and prescription [6].

The WHO expressed the term antimicrobial resistance as the development of a situation where the antibiotic becomes no longer effective against the organism, that once was competent toward the disease or epidemic caused by that organism. Consequently, the infection becomes more aggressive and contagious, increasing the death rate [7].

The cornerstone in the process of improving our antibiotic-related practice is to tackle the knowledge and awareness of antibiotics, as well as the consequent resistance that develops from irrational use of them [8, 9]. WHO was created several tactics to withstand the problem, reflecting the significance of antimicrobial resistance. In line with WHO efforts, many developed countries have applied a strategy called Stewardship, which has been recognized to encourage the practice of rational use of antibiotics [10].

Considering the seriousness of the situation, as evidenced by the facts mentioned earlier, we decided to conduct this study. Data obtained from this study can evaluate our rational use of antibiotics practice, adding baseline data

for future studies. Moreover, the study could build strategies similar to the successful ones created in the developed countries to overcome the problem.

II. MATERIAL AND METHODS

A. Study design and sample size

It is an observational cross-sectional study conducted in the Khartoum locality. The study was carried out in the period between January and March 2015. Khartoum locality has been chosen for the fact it is the capital city of Sudan. Data carried out will be almost representative of the community due to its high population density compared to other localities. First of all, the Khartoum locality was divided into five geographical regions (North, East, West, South, and Centre). In the next step, three primary health centers were picked randomly within each area, making the total number of PHCs selected to be fifteen. Total coverage of health professionals working at primary health centers selected within Khartoum locality applied. The total number of health professionals working at the primary health centers during the study was 75. A questionnaire with closed-ended statements was given to each doctor separately. This procedure preceded with a stage of testing the validity of the questionnaire by using a pilot study, using 15 questionnaires. The data obtained from questionnaires represented the domains knowledge and attitude of health professionals towards the rational use of antibiotics.

B. Data Analysis

The data were entered and proceed using Microsoft office excel version 2013. Descriptive frequency tables were analyzed using Statistical Package for Social Sciences (SPSS) version 23 software computer package.

C. Ethical consideration

Permission obtained from the health centers administration approved and signed, followed by consent taken at an individual level from health professionals.

III. RESULTS

Seventy-five health professionals have participated in this study. 92% of them had less than five years of clinical experience, 6.7% had 5-10 years of experience, and 1.3% practiced more than ten years of experience. Regarding patient frequency, 6.7% of the health professionals were seeing 5-10 patients per day, while 28% were taken care of 11-15 patients per day, at the same time, 33% looked after 16-20 patients per day while 32% were dealing with more than 20 patients per day. The attitude of health professionals toward the rational use of antibiotics using several statements in the questionnaire evaluated. Attitude addresses using three domains.

1/ Awareness of the severity of the problem:

Doctors who responded to the statement ‘irrational use of antibiotics has nothing to do with mortality, morbidity rates, and economy worldwide’ with AGREE were 16%, 74.7% responded with DISAGREE, while 9.3% were UNCERTAIN. Responses for the statement ‘Antibacterial

resistance usually does not correlate to the use of antibacterial agents’ were 9.3% for AGREE, 86.7% for DISAGREE, and 4% for UNCERTAIN. 66.7% of doctors responded to the statement ‘Antibiotics resistance may result from irrational

use of antibiotics in other sectors’ with AGREE, 12% responded with DISAGREE, while 21.3% responded with UNCERTAIN. **Table 1**

Table (1): Awareness toward the severity of the problem

Awareness domain	Frequency (percentage)		
	Agree	Disagree	Uncertain
1/ irrational use of antibiotics has nothing to do with mortality, morbidity rates and economy worldwide.	12 (16%)	56 (74.7 %)	7 (9.3 %)
2/ Antibacterial resistance usually doesn’t correlate to the use of antibacterial agents.	7 (9.3%)	65 (86.7%)	3 (4%)
3/ Antibiotics resistance may result from irrational use of antibiotics in other sectors (agricultural, aqua cultural and animal sectors)	50 (66.7%)	9 (12%)	16 (21.3%)

2/ Awareness toward role of the doctors in the development of irrational use of antibiotics:

For the statement ‘doctors considered the first line of defense in facing resistance like a problem’, 84% responded with AGREE. 13.3% responded with DISAGREE, while 2.7% responded with UNCERTAIN. 49.3% of health professionals Agreed with ‘Doctors can diagnose bacterial infection and hence prescribe antibiotics based only on the

clinical picture of the patient’, 48% of them responded with DISAGREE, 2.7% were UNCERTAIN. 93.3% of health professionals responded to the statement ‘Doctors restriction to national and global antibiotics prescription guidelines will prevent resistance and its consequences’ with AGREE, 4% responded with DISAGREE, while 2.7% were UNCERTAIN.

Table 2

Table (2): Awareness toward role of the doctors in the development of irrational use of antibiotics.

Awareness domain	Frequency (percentage)		
	Agree	Disagree	Uncertain
1/ Doctors considered as the first line of defense in facing resistance like problem.	63(84 %)	10 (13.3 %)	2 (2.7 %)
2/ Doctors can diagnose bacterial infection and hence prescribe antibiotics based only on clinical picture of the patient.	37 (49.3 %)	36 (48 %)	2 (2.7 %)
3/ Doctors restriction to national and global antibiotics prescription guideline will prevent resistance and its consequences.	70 (93.3 %)	3 (4 %)	2 (2.7 %)

3/ Awareness toward possible barriers behind not adhering to the rational use of antibiotics:

For the statement ‘Doctors do not request supportive investigations because it is expensive, 81.3% responded with AGREE, 16% responded with DISAGREE, while 2.7% were UNCERTAIN. 30.7 % of doctors responded to the statement ‘Doctors do not request supportive investigations due to Rush of the patients’ with AGREE, 64% responded with DISAGREE, while 5.3% responded with UNCERTAIN. 29.3% of doctors responded with the statement ‘Doctors do not request supportive investigations because it is time-consuming’ with AGREE, 69.3% responded with DISAGREE, while 1.3% responded with UNCERTAIN. 40% of doctors responded to the statement ‘Doctors do not request supportive investigations because It’s not highly specific and may give false results’ with AGREE, 57.3% responded with DISAGREE, while 2.7% were UNCERTAIN. **Table 3**

Knowledge of health professionals towards antibiotics and rational use of antibiotics addressed using four domains.

1/ knowledge of doctors about the rational use of antibiotics definition:

For the statement ‘Irrational use is when antibiotics are prescribed unnecessarily, 97.3% responded with AGREE, 2.7% responded were DISAGREE. 38.7% of doctors responded to the statement ‘Irrational use is when antibiotics administration is delayed in critically ill patients’ with AGREE, 49.3% responded with DISAGREE, while 12% responded with UNCERTAIN. 66.7% of the doctors responded to the statement ‘Irrational use is when the spectrum of antibiotics is either too broad or too narrow’ with AGREE, 21.3% responded with DISAGREE, while 12% were UNCERTAIN. 58.7% of the doctors responded with AGREE to the statement ‘Irrational use is when the dose is too low or too high, on the other hand, 26.7% responded with DISAGREE, 14.7% responded with UNCERTAIN. 72% of health professionals responded to the statement ‘Irrational use is when the duration of treatment is too short or too long’

with AGREE, 18.7% responded with DISAGREE, 9.3% were UNCERTAIN. 54.7% of doctors responded to the statement 'Irrational use is when antibiotics treatment delayed despite available microbiological culture data' with AGREE, 16% responded with DISAGREE, while 29.3% were UNCERTAIN. **Table 4**

2/ knowledge of doctors about certain antibiotics safety during pregnancy:

For the statement, Amoxicillin is safe during pregnancy, 62.7% responded with AGREE, 14.7% responded were DISAGREE, while 22.7% were UNCERTAIN. 40% of doctors responded with AGREE to the statement Macrolides are safe during pregnancy, 37.7% responded with DISAGREE, while 22.7% responded with UNCERTAIN. 33.3% of the doctors responded to 'Nitrofurantoin is safe during pregnancy, with AGREE, 26.7% responded with DISAGREE, while 40% were UNCERTAIN. **Table 5**

Awareness domain	Frequency (percentage)		
	Agree	Disagree	Uncertain
1/ Doctors do not request supportive investigations because it is expensive.	61 (81.3 %)	12 (16 %)	2 (2.7 %)
2/ / Doctors do not request supportive investigations due to Rush of the patients	23 (30.7 %)	48 (64 %)	4 (5.3 %)
3/ Doctors do not request supportive investigations because it is time consuming.	22 (29.3 %)	52 (69.3 %)	1 (1.3 %)
4/ Doctors do not request supportive investigations because It's not highly specific and may give false results.	30 (40 %)	43 (57.3 %)	2 (2.7 %)

Table (3): Awareness toward possible barriers behind not adhering to the rational use of antibiotics.

Knowledge domain	Frequency (percentage)		
	Yes	No	I do not know
1/ Irrational use is when antibiotics are prescribed unnecessarily	73 (97.3 %)	2 (2.7 %)	0 (0 %)
2/ Irrational use is when antibiotics administration is delayed in critically ill patients	29 (38.7 %)	37 (49.3 %)	9 (12 %)
3/ Irrational use is when the spectrum of antibiotics is either too broad or too narrow	50 (66.7 %)	16 (21.3 %)	9 (12 %)
4/ Irrational use is when the dose is too low or too high	44 (58.7 %)	20 (26.7 %)	11 (14.7 %)
5/ Irrational use is when duration of treatment is too short or too long	54 (72 %)	14 (18.7 %)	7 (9.3 %)
6/ Irrational use is when antibiotics treatment is not started in spite of available microbiological culture data	41 (54.7 %)	12 (16 %)	22 (29.3 %)

Table (4): knowledge of doctors about rational use of antibiotics definition.

Knowledge domain	Frequency (percentage)		
	Yes	No	I do not know
1/ Amoxicillin is safe during pregnancy.	47 (62.7 %)	11 (14.7 %)	17 (22.7 %)
2/ Macrolides are safe during pregnancy.	30 (40%)	28 (37.3 %)	17 (22.7 %)
3/Nitrofurantoin is safe during pregnancy.	25 (33.3 %)	20 (26.7 %)	30 (40 %)

Table (5): Knowledge of doctors about certain antibiotics safety during pregnancy.

3/ knowledge of doctors about possible organ injuries related to certain antibiotics:

For the statement ‘sulfonamide may promote liver damage, 46.7% responded with AGREE, 12% responded with DISAGREE, while 41.3% were UNCERTAIN. 44% of doctors responded to the statement ‘tetracycline may promote liver damage.’ with AGREE, 21.3% responded with DISAGREE, while 34.7% responded with UNCERTAIN. 65.3% of the doctors responded to the statement streptomycin may promote liver damage’ with AGREE, 13.3% responded with DISAGREE, while 21.3% were UNCERTAIN. 65.3% of the doctors responded with AGREE to the statement ‘aminoglycosides may promote kidney damage.’, on the other hand, 14.7% responded with DISAGREE, 20% responded with UNCERTAIN. 56% of health professionals responded to the statement ‘Fluoroquinolones may promote kidney damage’ with AGREE, 13.3% responded with DISAGREE, 30.7% were UNCERTAIN. **Table 6**

4/ knowledge of doctors about possible antibiotic-drugs interaction:

For the statement ‘There is a drug-drug interaction between Penicillin-Methotrexate, 30.7% responded with AGREE, 18.7% responded with DISAGREE, while 50.7% were UNCERTAIN. 41.3% of doctors responded to the statement ‘There is a drug-drug interaction between Cephalosporin-Anticoagulants’ with AGREE, 20% responded with DISAGREE, while 38.7% responded with UNCERTAIN. 36% of the doctors responded to the statement ‘There is a drug-drug interaction between Aminoglycosides-Diuretics’ with AGREE, 14.7% responded with DISAGREE, while 49.3% were UNCERTAIN. 45.3% of health professionals responded to the statement ‘There is a drug-drug interaction between Tetracycline-Digoxin’ with AGREE, 9.3% responded with DISAGREE, 45.3% were UNCERTAIN. 33.3% of health professionals responded to the statement ‘There is a drug-drug interaction between Tetracycline-Lithium’ with AGREE, 12% DISAGREED, while 54.7% were UNCERTAIN. 30.7% of doctors responded to the statement ‘There is a drug-drug interaction between Macrolides-Statins’ with AGREE, 18.7% responded

with DISAGREE, while 50.7% were UNCERTAIN. 58.7% of health professionals responded to the statement ‘There is a drug-drug interaction between Macrolides-Statins’ with AGREE, 5.3% responded with DISAGREE, 36% were UNCERTAIN. 58.7% of health professionals responded to the statement ‘There is drug-drug interaction between rifampicin-COCP’ with AGREE, 5.3% responded with DISAGREE, 36% were UNCERTAIN. **Table 7**

On the final step of evaluating the knowledge and attitude, points were given for every single statement on the following pattern: 2 points for the correct answer, 1 point for the ‘UNCERTAIN’ answer, 0 marks for the wrong answer. Then the total points of the knowledge about antibiotics were calculated. We used the scale of poor, moderate, and good evaluations. Doctors who got 80 or more were evaluated as good. Others who got between 60-80 got moderate evaluation. While doctors who got less than 60 got poor evaluation. Regarding attitude, the same marking method was done. The final assessment used by applying positive, neutral, and negative attitude scales. With doctors who got more than 80 in the attitude towards the rational use of antibiotics evaluated as good, doctors within 60-80 score considered having a neutral attitude. Doctors who scored less than 60 considered having a negative attitude.

The study showed Poor knowledge of health professionals toward antibiotics and the rational use of antibiotics concept in Khartoum locality, 2015. **Figure (1)**

Attitude towards the rational use of antibiotics in Khartoum locality, 2015 was evaluated as neutral. **Figure (2)**

IV. DISCUSSION

This study aimed to assess and attitude of health professionals toward the rational use of antibiotics concept.

Their knowledge about antibiotics and their side effect, drug interactions, and consequences of overprescription was evaluated.

Table (6): knowledge of doctors about possible organ injuries related to some antibiotics.

Knowledge domain	Frequency (percentage)		
	Yes	No	I do not know
1/sulfonamide may promote liver damage.	35 (46.7 %)	9 (12 %)	31 (41.3 %)
2/ tetracycline may promote liver damage.	33 (44 %)	16 (21.3 %)	26 (34.7 %)
3/streptomycin may promote liver damage.	49 (65.3 %)	10 (13.3 %)	16 (21.3 %)
4/aminoglycosides may promote kidney damage.	49 (65.3 %)	11 (14.7 %)	15 (20 %)
5/fluoroquinolones may promote kidney damage.	42 (56 %)	10 (13.3 %)	23 (30.7 %)

Regarding the knowledge aspect of this study is poor, as 65% of health professionals who participated in this study were in this category of assessment. Knowledge of doctors about antibiotics toward the rational use of antibiotics definition assessed as part of this aspect. Knowledge regarding antibiotics resistance contributing factors is shown to be average among Jamaican doctors [11]. On the other hand, comparing our situation with a neighboring country like Egypt shows a big difference, regarding the knowledge of their doctors, toward the rational use of antibiotics which showed to be good [12]. Findings have been observed in the Gambia, their health professional's knowledge about antibiotics was evaluated as good [13]. Doctors in Sierra Leone were knowledgeable as well [14]. This observation could be attributed to better policies and interventions regarding antibiotics prescription.

When we compare our findings to Mozambique, where the study showed that more than half of their health professionals have poor knowledge, we consider it similar [4].

Also, knowledge about antibiotics prescription in specific situations like upper respiratory infection (URTI) was assessed as part of overall knowledge. In another neighboring country, here we talk about Ethiopia. Researchers have conducted a study to assess both attitude and knowledge about antibacterial agents. It found that Ethiopian doctors had poor knowledge regarding the role of antibiotics in few minor viral illnesses [2].

We have taken few examples, this time in the Asia continent. In a country like Iran. The knowledge was evaluated as good when the study tackled the doctor's knowledge about antibacterial agents [9]. Pakistani doctors showed to be knowledgeable regarding the proper use of antibiotics and antimicrobial resistance [15]. In a study carried out in Malaysia, knowledge about antibiotics prescription for URTI among general practitioners, evaluated as moderate [16].

For European settings, in a country like Greece, the knowledge of their health professionals regarding indications of some antibiotic prescription and the management of certain infections has been assessed to be sufficient [8].

Regarding the attitude of health professionals towards the rational use of antibiotics, our study revealed a neutral attitude towards this concept. The antibiotics understanding was assessed using several domains, including the awareness of the severity of the problem, awareness toward their role in the development of irrational use of antibiotics, and awareness toward possible barriers behind not adhering to the rational use of antibiotics.

The attitude of doctors is positive and proper when assessed in a nearby country like Egypt [12]. Our attitude toward such a global problem was better than the attitude evaluated in Ethiopia, where it was estimated to be poor, specifically toward the antibiotic role in few circumstances like common cold and sore throat [2]. The attitude of antibiotics prescription for URTI was evaluated as positive by a study carried out in Malaysia [16].

Taking a look at the findings regarding both knowledge and attitude towards the rational use of antibiotics make us somehow confident to provide our country with some recommendation. Firstly, we recommend following antibiotics prescription international guidelines to reduce the risk of developing antimicrobial resistance. Furthermore, by offering microbiology-oriented training for infectious disease physicians and clinical pharmacists, such intervention could be a problem-solving strategy, especially within hospitals settings. Educational intervention strategies directed toward prescribers would yield an additive effect upon successful application of the rational use of antibiotics. On the national level, policy changing step is recommended. It will provide control over antibiotic prescription, at least controlling the over counter use of the antibiotics. In addition to that, such policies would facilitate antibiotics prescription guidelines and protocols implementation.

Table (7): knowledge of doctors about possible antibiotic-drugs interaction.

Knowledge domain	Frequency (percentage)		
	Yes	No	I do not know
1/ There is a drug-drug interaction between penicillin-methotrexate	23 (30.7 %)	14 (18.7 %)	38 (50.7 %)
2/ There is a drug-drug interaction between cephalosporin-anticoagulants	31 (41.3 %)	15 (20 %)	29 (38.7 %)
3/ There is a drug-drug interaction between aminoglycosides-diuretics	27 (36 %)	11 (14.7 %)	37 (49.3 %)
4/ There is a drug-drug interaction between tetracycline-digoxin	34 (45.3 %)	7 (9.3 %)	34 (45.3 %)
5/ There is a drug-drug interaction between tetracycline-lithium	25 (33.3 %)	9 (12 %)	41 (54.7 %)
6/ There is a drug-drug interaction between macrolides-statins	23 (30.7 %)	14 (18.7 %)	38 (50.7 %)
7/ There is drug-drug interaction between rifampicin-COCP	44 (58.7 %)	4 (5.3 %)	27 (36 %)



Figure (1): Overall assessment of Knowledge of health professionals toward rational use of antibiotics in Khartoum locality, 2015.

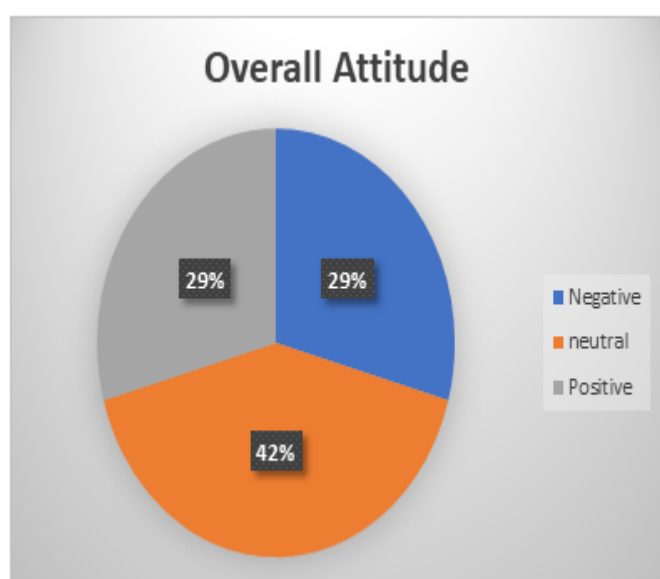


Figure (2): Overall assessment of Knowledge of health professionals toward rational use of antibiotics in Khartoum locality, 2015.

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SOURCE OF INFORMATION

Most of the medical information (90%) used to create close-ended statements in this study was obtained from pharmacology textbooks. Books used were:

- Duncan Richards and Jeffrey Aronson, Oxford handbook of practical drug therapy, first edition.
- Francis O'Grady, Antibiotics and Chemotherapy, seventh edition.
- W.B. Hugo, Pharmaceutical microbiology, sixth edition.

The minority of medical information (10%) used to build close-ended statements of this study were obtained from:

- Rational medicine organization website (<https://www.rationalmedicine.org/2017/12/13/rational-use-of-antimicrobials/>)
- WHO-funded program in Thailand, which is called Antibiotic Smart Use (ASU).

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