



## A survey of patterns, attitudes, and beliefs of house staff physicians concerning antibiotic use in Khartoum state hospitals

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### ABSTRACT

Background: Although well-defined principals of rational antibiotic use are available, inappropriate prescribing patterns are reported worldwide. Accurate information on the usage of antimicrobials, including factors associated with and influencing their use, is valuable for improving the quality of prescription practice. In this survey study, some data about the prescribers' knowledge and attitude about antibiotic use was addressed. Method: A total of 250 questionnaires were distributed randomly to house staff physicians working in different hospitals in Khartoum state during Jan to Feb 2010. Results: 43.6% of respondents prescribed antibiotics according to guidelines, and only 59 (32.6%) refer to BNF or SNF. More than half of participants prescribed antibiotics with their trade and generic names. Ciprofloxacin is the most frequent antibiotic prescribed at different specialties. Conclusion: that a variety of complex reasons govern the attitudes of antibiotics. Inadequate recognition of the infectious agent is the main reason of irrational antibiotic prescribing. Amoxicillin is the most antibiotic prescribed empirically.

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### Introduction

While antimicrobial drugs are responsible for some of the most dramatic improvements in medical therapy in history, these medicines are also the only class of drug whose efficacy diminishes with their wide-scale use in hospital-based and outpatients settings. The increased use of antimicrobial drugs has coincided with the emergence of antimicrobials resistance, which constitutes an important clinical, economic, and public health problem.<sup>1-2</sup> It is accepted that there is relationship between resistance and the use of antibiotics, antibiotic use contributes to emergence of antimicrobial resistance by selective pressure.<sup>3</sup> It has been demonstrated that a great deal of antimicrobial use is either unnecessary or inappropriate and that decreasing this use is effective in curtailing resistance. These facts have promoted many to call for improvements in antimicrobial practices and growing attentiveness to the rational use of antimicrobials since 1990s. Therefore, led to the creation of position statements and guidelines from national and international organization.<sup>4-6</sup>

Because changes in antimicrobial prescribing patterns will necessitate changes in physician behavior, it is important to better understand what physicians know about antimicrobial agents and use, how they acquire and maintain that knowledge, and what factors influence their prescribing of antimicrobials. Targeting physician behavior and understanding of these underlying factors will permit the development of more effective interventions and plan future strategies for the deployment of antibiotics and control of resistance.<sup>7-8</sup>

The worldwide increase in use and resistance to antibiotics is of great concern. In developing countries, antibiotics are described for 44-97% of patients in hospital, often unnecessarily or inappropriately. Several socio-economic and behavioral factors are thought to contribute to inappropriate use of antibiotics and, consequently, to increased incidence of bacterial

resistance in developing countries.<sup>9-11</sup> Sudan as many of developing African countries, suffering from misuse of antimicrobials and therefore emergence of resistance.<sup>12-13</sup> Many publications have documented the emergence of antibiotic resistance and many pathogens had become resistant to many classes of antibiotics in many hospitals. Work conducted to determine the levels of aerobic bacterial contamination and antibiotic resistance to commonly used antimicrobial agents in the operating theatres and surgical wards of five major hospitals in Khartoum state (Saudi Hospital, Turkish Hospital, Alban Gedid Hospital, Chinese Friendship Hospital and Ibrahim Malik Hospital) showed the majority of bacterial strains tested (*staphylococci*, *Escherichia*, *pseudomonas* and *proteus*) have exhibited marked multiple-drug resistance against ampicillin, tetracycline, streptomycin, chloramphenicol, co-trimoxazole, gentamycin, erythromycin, penicillin, cloxacillin, nalidixic acid, nitrofurantoin, ceftazidime, cephalixin, ciprofloxacin, ofloxacin, methicillin and amikacin.<sup>14</sup> Another study performed in Khartoum teaching hospital investigated the level of antibiotic resistance of aerobic nosocomial isolates to commonly used antimicrobial agents demonstrated that overall resistance of different urinary pathogens was 46% to gentamicin, 68% to ciprofloxacin and 67% to cotrimoxazole.<sup>15</sup> Recent study in two surgical wards settings Ibn Sina hospital showed that the rate of antibiotic resistance in strains of gram positive and gram negative bacteria was very high to cephalosporin, Co-amoxiclav and ciprofloxacin in different incidence periods and did not significantly decreased even after implementation of intervention strategy.<sup>16</sup>

Health services in Sudan are mainly delivered by primary health care centers and hospitals. Hospitals include governmental teaching hospitals and private hospitals. The pattern of antibiotics prescribing and attributed in primary health services had been described previously.<sup>17</sup> The present study

surveyed the knowledge, attitudes, beliefs of prescribers about antibiotics use in different hospitals in Khartoum state. An understanding of these can form a rational basis for future interventions to encourage doctors to modify their prescribing habits.

#### Method:

##### Study design and Population:

This is descriptive cross sectional hospital based survey performed between Jan - Feb 2010. Participants were randomly selected from different governmental and private hospitals. The survey was administered to house doctors working in different specialties and sub-specialties in different hospitals in Khartoum state. Practitioner interviewed by means of questionnaire included 16-item antimicrobial quiz developed by primary investigator. Demographic information about the practitioners' hospital and specialty were included. Practitioners were asked mainly about the criteria and rationality which governing interviewee when prescribing antibiotics. A variety of questions such as the basis of antibiotic prescribing and did he refer to any references or guidelines and did the prescribers wrote antibiotics by generic or trade name and did he/she consider price and/or quality and manufacturing company of antibiotic on prescribing and what was the most antibiotic prescribed in his/her specialty. Questions about the rationality prescribed script and monitoring of his/her patient. The survey questionnaires were distributed and collected back by medical students of Omdurman Islamic University batch (15/16) during their training course in community medicine. The data collected were analyzed using Excel 2007 and SPSS version 16.0.

#### Results:

Of 250 questionnaires distributed, 181 (72.4%) completed the survey. 157 (86.7%) were from governmental hospitals and 24 (13.3%) were from private hospitals. Table (1) showed the details of hospital departments and sub-specialties where had been interviewed:

The antibiotics has been prescribed in all hospital levels whether emergency, hospital wards or refer clinics. On questioning about the basis of prescribing antibiotics to the patient, 43.6% of respondents claimed that they prescribed antibiotic according to guidelines and 28.7% according to some or all of the asked options. Figure (1):

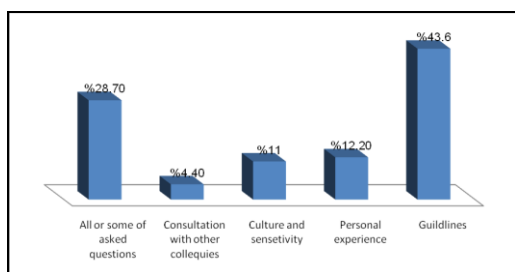


Figure (1): Basis of prescribing antibiotics

Only 32.6% (59 participants) were referring to a reference such as Sudan National Formulary (SNF) or British National Formulary (BNF), and the remaining were not referring to any reference. More than half of the participants (54.1%) write antibiotics with their trade and generic names and 28.2% write antibiotics as trade name only and 17.1% write antibiotics with their generic names. Table (2) explains some factors and variables in prescribing antibiotics:

66% of the respondents answered they were write a prescription containing concentration, dose regimen, duration,

and name and signature of prescribers. 24% answered they were write some of those items and the remaining 10% just write one of the mentioned items. 20.4% of prescribers answered they monitor their patients in all cases, and 61.3% monitoring the patients in some cases and 18.3% were not monitoring patients after issued prescription. On prescribing antibiotics 95.6% explain indications and usages of antibiotics and also expectation from antibiotics. 87.3% of prescribers explain side effects to their patients and 78.5% refer back to patient to follow side effects after prescribing antibiotics. Table (3) summarizes the most frequent antibiotics used as first and second choices by participants in their different specialties treatments:

Special 56 questionnaires were designed and distributed into different surgical hospital departments, inquiring about the reasons and situations of prescribing prophylactic antibiotics and the most frequently antibiotics used as a prophylaxis in their specialty. As shown in table (4), to reduce post-operative wound infection was the main reason for antibiotics prescribing (90.5%), and abdominal surgery was the highest operations needed antibiotics usage (95%):

Figure (2) shows the overall ranking proportions of antibiotic classes used as prophylaxis in the surgical hospital settings surveyed.  $\beta$ -lactam cephalosporins ranked first with 53%, followed by  $\beta$ -lactam-penicillins (26%) and quinolones (14%). Among cephalosporins, ceftriaxone was accounted for more than half antibiotic group prescribed (51.8%), then cefuroxime (25%). About 30% of respondents prescribed metronidazole in combination with other classes against expected anaerobic infections.

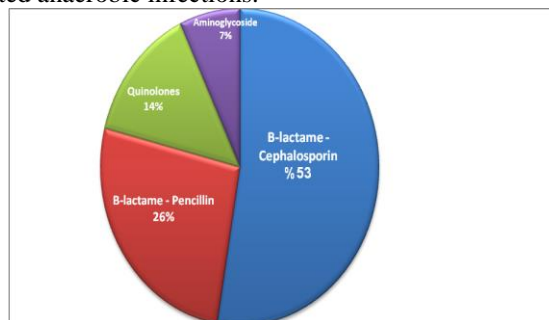


Figure (2): Most antibiotic classes prescribed in different surgical departments.

**Discussion:** The major consideration of proper usage of antimicrobial agents, which is the main concern of modern medicines, is to select the optimal agent at the proper dosage and duration. Secondary, but still important concerns are to minimize the percentage of resistance and to provide health services at a reasonable cost. Although the overall accomplishments have been outstanding, there is considerable evidence about that antimicrobial agents were often abused and used irrationally<sup>18-19</sup>. The world Health Organization (WHO) believes that much of such expenditure is misapplied, as irrational use of drugs is prevalent especially in developing countries and many studies indicate that about one third of all hospitalized patients receive antimicrobial therapy, which accounts between 3% and 25% of all prescriptions, and up to 41% of the drug budget of hospital care.<sup>20-21</sup>

In this study results presented here most of the participants interviewed were in medical, surgical and pediatric departments (20.5%, 17.1% and 16% respectively). The practitioner in these departments prescribed antibiotics for a variety of complex reasons. The main reason of irrational antibiotic prescribing is inadequate recognition of infectious pathogen, unfortunately, in

our hospitals only 11% of practitioners prescribed antibiotics according to culture and sensitivity results and this may lead to prescription of unnecessary drugs. The high proportions of antibiotics prescribed on surgical wards due to afraid of risk of autogenously infections (76.9%), and also to reduce post-operative infections (90.5%). Many studies confirmed that the high rate of antibiotics described in surgical wards may be due to difficulties in diagnosis surgical infection.<sup>22</sup> Ideally good antibiotic prescribing practice should reflect the use of most effective, least toxic, and least costly antibiotic for the precise duration of time needed to cure the infection. In this study, 81.9% of respondent say they consider efficacy and resistance in prescribing antibiotics and 14.9% consider only price as determining factor on prescribing antibiotics, while 42.5% consider manufacturing company. 93.3% consider toxic effects and 77.3% consider drug interactions and multiple therapies in their prescribing habits. According to the WHO, a rational prescription must meet certain criteria such as appropriate indication, appropriate patient, appropriate drug, appropriate information and appropriate monitoring.<sup>23</sup> 66% of our study respondents claimed that they were write a complete antibiotic prescription, while 20.4% % only monitoring their patients after all cases of antibiotic prescribing and 95.6% give information to their patients. Only 17.1% write antibiotic with their generic names and 32.6% were referring to reference on prescribing. This study confirms the view that the most frequently prescribed antibiotic in hospitals was amoxicillin, either alone or combined with clavulanic acid as (Co-amoxiclave) represent about 46.5% and this similar to antibiotic choices in primary health centers but different in that ciprofloxacin is more frequently prescribed in hospitals (47.5%) than in primary health centers (5.73%). Third generation cephalosporins usage rate are the same in both primary health care centers and hospitals settings (13%).

However, intravenous (IV) third generation cephalosporins were the main prophylactic antibiotics used in surgical hospital departments. The overuse of expensive broad-spectrum intravenous agents and ecological impact of prescribed drugs on the hospital micro-flora has contributed to high level of expenditure in health care management the indirect cost of IV therapy include preparation, administration, and monitoring of injections or infusion, which also affect nursing, medical, and/or pharmacy time.<sup>24</sup> Indeed, third-generation cephalosporins are being widely used in surgical hospital departments for empirical and prophylactic antibiotics. International guidelines suggest that the most suitable antibiotics for prophylaxis are first-generation (cefazolin) or second generation (cefuroxime) cephalosporins.<sup>25-26</sup> The third- generation (ceftriaxone) cephalosporins are more expensive and promote the emergence of resistant strains, and they should not be used for routine prophylaxis in surgery.<sup>27-29</sup> Our survey showed instead a very high, and probably, inappropriate, prescription of these groups of antibiotics. Our finding of high consumption of  $\beta$ -lactam cephalosporins is consistent with other publications which confirmed that  $\beta$ -lactam cephalosporins were determined as the most frequent and the irrationally used antibiotics.<sup>12,30</sup> Our study has some limitations. We question the prescribers about their prescribing pattern and behavior and we do not validate their information by auditing their antibiotic prescriptions. This approach may induce personal and memory bias and limits the possibility to verify the accuracy of information provided by prescribers. Also small samples size surveyed, and the data obtained may not form a representative

sample of all Sudanese hospitals as it limited only to Khartoum state.

#### Conclusion:

This study confirms the view that a variety of complex reasons govern the attitudes of antibiotics prescribing and the main reason is a cultural one and goes beyond doctor's knowledge. Inadequate recognition of the infectious agent is the main reason of irrational antibiotic prescribing. The most frequently prescribed antibiotic empirically in hospitals was amoxicillin.

#### Recommendation:

Continuous surveillance studies of antibiotic use are needed to provide a useful insight into pattern of prescribing and potentially reporting a more focused audit on specific agent and specialties, and may leads to changes in prescribing practice within the same hospital over a time or indeed highlighting differences between hospitals. Also surveying antibiotic prescribing in hospitals is important to detect the current situation and for policy-making to change incorrect practices.

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This paper is a based on data collected by medical students of Omdurman Islamic University batch (15/16) during their training course in community medicine.

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**Table (1): Details of hospital departments and sub-specialties interviewed:**

Department / Sub-Specialty	Frequency	Percentage
Medicine	37	20.5%
Surgery	31	17.1%
Pediatric	29	16.0%
Obstetrics & Gynecology	16	8.8%
Gastroenterology	13	7.2%
Cardiology	10	5.5%
Ear, Nose and Throat	9	5.0%
Dentistry	9	5.0%
Dermatology	6	3.3%
ophthalmology	6	3.3%
Neurology	6	3.3%
Malignancy	6	3.3%
Chest	3	1.7%
TOTAL	181	100%

**Table (2): Factors affecting prescribing habits:**

Factor / Variable	YES (%)	NO (%)
Consider efficacy and price in prescribing antibiotics	177 (97.8%)	4 (2.2%)
Consider price only in prescribing antibiotics	27 (14.9%)	154 (85.1%)
Consider efficacy and resistance before prescribing antibiotics	148 (81.8%)	33 (18.2%)
Consider manufacturing company	77 (42.5%)	104 (57.5%)
Consider toxic effects of prescribed antibiotics	170 (93.3%)	11 (6.1%)
Consider drug interactions and multiple therapies	140 (77.3%)	41 (22.7%)

**Table (3): Antibiotics of choice frequency**

Antibiotic	Frequency (%)
Ciprofloxacin	86 (47.5%)
Co-amoxiclave	85 (47%)
Amoxicillin	83 (45.9%)
Penicillin G	53 (29.3%)
Clarithromycin	52 (28.7%)
Gentamycin	46 ( 25.4%)
3 <sup>rd</sup> generation cephalosporins	24 ( 13.3%)
Erytromycin	21 (11.6%)
Penicillin V	13 (7.2%)
Cephlexin	13 (7.2%)
Azithromycin	10 ( 5.5%)
Clindamycin	5 (2.8%)

**Table (4): reasons and situations of prescribing antibiotics in surgical departments:**

Reason/Situation	Number of Respondents	percentage of Respondents	Yes (frequency)	Yes (%)	NO (frequency)	NO (%)
Reasons for antibiotics prescribing						
Reduce post-operative wound infections	42	75.0%	38	90.5%	4	9.5%
Risk of autgenous infections	39	69.6%	30	76.9%	9	23.1%
Pre-operative clean surgery	40	71.4%	29	72.5%	11	27.5%
Main surgical operation for antibiotic usage						
Abdominal operations	40	71.4%	38	95.0%	2	5.0%
Cardiac surgery	33	58.9%	27	81.8%	6	18.2%
Orthopedic surgery (HIP, Knee, etc...)	33	58.9%	23	69.7%	10	31.3%