British Journal of Pharmaceutical Research
4(1): 101-112, 2014

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Use of Antimicrobial Medicines among University Students in Sierra Leone

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Authors' contributions

This work was carried out in collaboration among all authors. Authors MOA and LM designed the study, collected the data, performed the statistical analysis and collated the findings. Author MOA wrote the protocol and the first draft of the manuscript. Author KPO managed the literature searches and participated in the final write-up. All authors read and approved the final manuscript.

Research Article

Received 13th July 2013
Accepted 30th August 2013
Published 5th October 2013

ABSTRACT

Aims: Misuse of antimicrobial medicines is a major contributory factor to development of resistant strains of micro-organisms, therapeutic failure and increased healthcare costs in many countries. To identify pattern of antimicrobial use among undergraduate students of the University of Sierra Leone and to determine possible gaps in their understanding of appropriate use of these therapeutic agents.
Study Design: A cross-sectional survey of the students using a structured questionnaire and a stratified random sampling method to obtain the respective number of students from each college.
Place and Duration of Study: Registered undergraduates in the three Colleges of the University of Sierra Leone, between March and June 2012.
Methodology: A 25-item structured questionnaire was administered on a random sample of four hundred and eighteen (418) undergraduates of the University. The instrument explored respondents' pattern of self-medication with antimicrobials, knowledge of the indications for use and sources of supply.
Results: Most students reported having self-medicated with antimicrobials at various times and there were gaps in their understanding of the medicines; with about 67% having

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some knowledge of correct indications for use. Majority of them (70%) obtained the medicines on demand from open drug markets without prescriptions and the medicines were used for such ailments as common colds and diarrhea. Previous experiences of treating similar symptoms ranked highest as the factor affecting demand and penicillins topped the list of commonly used antimicrobials. Most of the students did not complete full regimen of the medication for reasons of cost, long duration of treatment and side effects.
Conclusion: There were knowledge gaps in the proper use of antimicrobial medicines and unrestricted access to prescription drugs was a major factor of misuse. The existing drug laws in the country should be strengthened to control indiscriminate sale and distribution. Basic courses on rational medicine use may need to be incorporated in the general studies programme of the University; with emphasis on the consequences of indiscriminate use of antimicrobial medicines.

Keywords: Antimicrobial medicines; rational medicine use; students; Sierra Leone.

1. INTRODUCTION

Antimicrobial medicines have been acclaimed as the greatest contribution to therapeutics in recent times, and they have been in common use as curative agents for many infections [1]. The significance of these medicines is more evident in developing countries where infective diseases predominate and these agents are most frequently used, though the misuse is equally rampant. Antimicrobial agents are designed to inhibit or kill the infecting organism with minimal effect on the recipient at recommended doses. Usually, the term is used to designate synthetic as well as naturally obtained drugs that attenuate microorganisms. On the other hand, antibiotics are defined strictly as the natural substances produced by microorganisms to suppress the growth or to kill other microorganisms at very low concentrations. Self medication with antimicrobial medicines is a global concern and this practice has received a lot of attention, principally because of the problems associated with indiscriminate use of these therapeutic agents [2,3]. Some of these problems include development of resistant strains of the micro organisms, therapeutic failure and unnecessary increase in the incidence of adverse drug reactions [4]. Bacterial resistance to one or more front line antimicrobials poses numerous challenges to healthcare and these may include patient morbidity and mortality with attendant loss in economy; possibly due to increased drug cost, prolonged duration of illness and more expensive disease control measures. Nevertheless, it is quite evident that antimicrobials are extremely important in the treatment of infectious diseases, and they have contributed immensely to the effectiveness of medical interventions but the issue of bacteria resistance has become worrisome in both developed and developing countries. The misuse of antimicrobials had been linked with large scale misconception of the nature of health challenges for which antimicrobials are specifically indicated. For instance, in some studies in the UK, 30% of adults believed that antibiotics can be used to treat coughs and common colds [5-8]. It was also revealed that 60% of Europeans did not know that antibiotics are ineffective against viruses. Health complications such as upper respiratory tract infections have been reported from overuse of antibiotics erroneously prescribed for common colds that were actually caused by viruses [9-11]. Generally, the use of antimicrobials for cold symptoms is not only high in developing countries but also in developed countries such as China, France and in the US [5,12]. Antimicrobial resistance poses a great challenge in developing countries where antibiotics are easily available and obtained without a prescription but the problem becomes more

intense with indiscriminate use and the existing poverty in such disadvantaged economy [5,6,13-16].

Self medication among University students is well documented in previous studies and findings have reported cases of irrational use of antimicrobial medicines with attendant consequences [2,3,17,18]. With the prevalent use of these medicines, patterns of use evolved that seemed far from ideal. The frontline antimicrobials are relatively affordable and health 'workers' widely recommend these medicines for most disease symptoms with or without diagnostic confirmation. Similarly, the use of these medicines has become pervasive as they are easily obtained from formal health facilities as well as unregulated sources in the community. Furthermore, these agents are usually taken with little or no attention to complete appropriate dosing or consideration for the quality or source of the products.

Generally antimicrobials are classified as prescription medicines; however, in countries where regulatory mechanisms on prescription medicines are not stringent there is a high risk of unnecessary, irrational and misuse of these therapeutic agents. This is particularly relevant to the distribution of medicines in developing countries including Sierra Leone. The present study therefore evaluated the pattern of use of antimicrobial medicines among undergraduate students of University of Sierra Leone within the context of inadequate control of the sale and purchase of these therapeutic agents.

2. METHODS

2.1 Study Setting

This study was carried out among registered undergraduates in the three Colleges of the University of Sierra Leone. The three colleges are Fouray Bay College (FBC), Institute of Public Administration and Management (IPAM) and College of Medicine and Allied Health Sciences (COMAHS). FBC was established in 1827 and it consists of the Faculties of Law, English, Arts, Social Sciences, Engineering and the Basic Sciences. IPAM was established in 1981 and trains students in Administration, Finance, Information Technology and Management Sciences. COMAHS was established in 1988 and trains Physicians, Pharmacists and Nurses at the degree level. Diploma programmes are also offered for Pharmacy Technicians and Nursing sciences.

2.2 Study Design

The study was conducted on a sample of 418 students selected from a population of 2,416 undergraduate students enrolled at the time of study in 2012.

The sample size was obtained using Cochran (1977) formula [19] assuming a 5% error and a 90% response rate. The cross- sectional survey was done using a pretested questionnaire self administered among the students between March and June 2012. A stratified random sampling method was used to obtain the respective number of students from each college based on the relative population size of each stratum.

2.3 Questionnaire Design and Data Collection

A structured questionnaire titled 'Pattern of antimicrobial use among university students' (PAUS) was used to collect data. It comprised three sections (A, B, C) and had 25 items with multiple options response format. This was to facilitate collation of the responses.

Section A solicited information on the socio-demographic variables while section B examined the knowledge of respondents and pattern of demand for and use of antimicrobial agents. Response items in section C examined the practice of self medication with antimicrobials and these include the general belief about the indications and sources of the antimicrobial medicines used.

The PAUS was ascertained to be reliable and valid. First, a test-retest was conducted with the administration of the instrument on 20 students of the university, who were not part of the study sample. The administration was done over two weeks. A Pearson correlation of the responses yield r = 0.693, which was significant (P = .05). For construct validity, the PAUS was reviewed by three experts in Tests and Measurement and two senior colleagues in Clinical Pharmacy. Their observations and comments led to some changes in the wordings and arrangement of the items. They regarded the items as adequate regarding the construct of the study.

The questionnaires were administered to respondents from each of the faculties in their respective classes with the assistance of the authors. All the registered undergraduate students of the university were eligible to participate in the study but categories of students on certificate, diploma and postgraduate programmes of the university were excluded from the survey. However, participation was voluntary. Completed questionnaire were collected in class, and later scored.

2.4 Data Analysis

The data obtained were analysed using statistical package for social sciences (SPSS) Version 16. Descriptive statistics, including frequencies and percentages were used to summarise the data.

3. RESULTS

A total of 288 (68.9%) respondents reported self medicating with antimicrobials of which 136 (47, 2%) were males and 152 (52. 8%) were females. Most of the respondents 275 (95.5) were in the age range 17-30 years. Respondents from each College of the University were FBC, 182 (49.9%); IPAM 129 (35.3%) and COMAHS 54 (14.8%) drawn in proportion to undergraduate student enrollment in the Colleges.

A high percentage of respondents (288; 78.9%) had self medicated with antimicrobials at different times and 200 (69.4%) were able to identify antimicrobials from a list of options. Participants' response on uses of antimicrobials included treatment of bacterial infections (157; 67.3%) parasitic infections (47; 20.2%) viral infections (33; 14.2%) and management of pains (80; 34.3%). A good number of respondents obtained antimicrobials on demand and used the medicines to treat common cold or diarrhea (202; 70.1%). Other specific indications are listed [Table 1].

Table 1. Indications for which respondents self medicate with antimicrobial medicines

Indications for use of antibiotics (N=288)	Frequency (%)*
Common cold	229 (79.5)
Diarrhea	202 (70.1)
Stomach pain	134(46.5)
Menstrual pain	107 (37.2)
Prevention of pregnancy	60 (20.8)
Boil	110 (38.2)
Open wound	73 (25.3)
Sexually transmitted infections	101 (35.1)
Cough	150 (52.1)
Sore throat	198 (68.8)
Typhoid	149 (51.7)
Malaria	78 (27.1)

**Sum of percentages may exceed 100% because of multiple responses.*

Most respondents (189; 65. 6%) did not adhere to the full regimen of antimicrobials but stopped taking the medication whenever they appeared to feel better. Findings on the attitude of respondents when the effect of the antimicrobial in use was not adequate showed that some (4; 8.2%) continued with the same antimicrobial(s) while others (10; 20. 4%) bought a different antimicrobial. However, a few respondents (3; 71.4%) preferred to consult a physician if the symptoms were not resolved. Penicillins were the most common antimicrobials bought without prescriptions. These included ampicillin and cloxacillin combinations (220; 76. 3%) followed by amoxycillin (215; 74.7%) and ampicillin 184 (63. 9%). Demand for some other antimicrobial medicines are presented [Table 2].

Table 2. Types of antimicrobial medicines commonly purchased by respondents

Antibacteria	Frequency (%)*
Amoxycillin	184 (63 .9)
Amoxycillin	215 (74 .7)
Ampicillin & Cloxacillin (Ampiclox^{R})	220 (76 .3)
Tetracycline	160 (55 .5)
Doxycycline	116 (40 .3)
Co-trimoxazole (Septrin^{R})	175 (60 .8)
Metronidazole	183 (63 .5)
Streptomycin	43 (14 .9)
Gentamycin	52 (18 .1)
Erythromycin	103 (35 .8)
Ciprofloxacin	109 (37 .8)
Chloramphenicol	116 (40 .3)

**Sum of percentages may exceed 100% because of multiple responses.*

Previous experiences of treating similar diseases (216; 75%) ranked highest as the factor influencing use of antimicrobials without prescriptions from qualified medical personnel, as presented in Table 3. Also significant was the advice from persons who had treated similar illnesses in the past (171; 59 .3%). Other relevant issues were perceived seriousness of illness (180; 62 .5%), cost and delay experiences in consulting the doctor (81; 28. 1%) and easy access to purchase the medicines without appropriate prescriptions (89; 30 .9%). Lack

of stringent control in the sale of antimicrobial medicines without prescription was a significant factor of irrational drug use in Sierra Leone.

Table 3. Factors influencing self medication with antimicrobial medicines among the students

Factors	Frequency (%)*
Previous experience with treating similar diseases	216 (75.0)
Illness considered not serious for medical consultation	180 (62.5)
Advice from other persons who have treated similar conditions with antibiotics	171 (59.3)
Perceived knowledge of the antibiotic and the disease condition(s)	109 (37.8)
Access to antibiotic without medical prescription	89 (30.9)
Advice from Doctor, Pharmacist or Nurse, without a written prescription	87 (30.2)
Medical consultation is expensive coupled with excessive delay	81 (28.1)

**Sum of percentages may exceed 100% because of multiple responses*

A high percentage of respondents (231; 80. 1%) obtained the antimicrobials from patent drug stores or drug peddlers while 242 (84.0%) sourced their medicines from community pharmacies; most of which were managed by pharmacy technicians. Other respondents used left-over medicines from friends and relatives (162; 56.3%) while some people (66; 22. 9%) sourced their medicines from hospital pharmacies [Table 4].

Table 4. Sources of antimicrobial medicines used in self medication (N =288)

Sources	Frequency (%)*
Community Pharmacy	242 (84 .0)
Patent drug store	170 (59 .0)
Drug peddlers	231 (80 .1)
Left over drugs from friends & relatives	61 (21 .1)
Hospital Pharmacy	162 (56 .3)
	66 (22 .9)

**Sum of percentages may exceed 100% because of multiple responses.*

Table 5 presents the various ways by which respondents made their requests to purchase the antimicrobials without prescription. Common requests included a mention of the usual name of the antimicrobials (239; 83%) or a description of the symptoms of illness to the vendor (153; 53. 1%). Other means of procurement by the students included presenting a piece of paper with the name of the medicine (85; 29 .5%), a description of the shape, colour or size of the medicine (66; 22 .9%) or presenting a sample or package of the medicine from previous prescriptions or purchases (45; 15.6%).

Some of the respondents (n=92) experienced side effects on self medication with antimicrobials and these included nausea and vomiting (39; 42. 4%), diarrhea (37; 40 .2%) rashes or hypersensitivity reactions (25; 27. 2%) and visual disturbances (14; 15 .2%). In general, the respondents perceived that irrational use of antibiotics was not desirable (183; 63 .5%) while others recommended the practice of self-medication for illnesses that are chronic in nature or conditions that do not appear serious enough to be life threatening (73; 25%).

Table 5. Type of requests by respondents to purchase the antimicrobial medicines N =288

Requests	Frequency (%)*
Mentioning the name of the antibiotic (s)	239 (83.0)
Describe the symptoms of illness to the seller	153 (53.1)
Presenting a piece of paper with name of antibiotic	85 (29.5)
Description of the physical characteristic of the antibiotic	66 (22 .9)
Showing a sample or package of the antibiotic from previous prescription/ purchase	45 (15 .6)

**Sum of percentages may exceed 100% because of multiple responses.*

4. DISCUSSION

The findings of this study showed that majority of respondents obtained antimicrobial medicines without authorised prescriptions from qualified health personnel; and they engaged in irrational use, especially when there was no laboratory test of antimicrobial sensitivity. In fact, most respondents sought medical help only if they perceived the illness as life threatening. In some cases, respondents discontinued the antimicrobials at will or switched over to other presumably stronger type. Literature confirms that such practices could increase the development of resistant strains of microorganisms [20]. Similarly, some studies have shown that in developing countries, antimicrobials may be obtained without prescriptions from qualified medical personnel, even though the drug regulatory agencies in the countries designate these medicines as prescription-only [21].

While some of the respondents could identify the antimicrobial medicines by name there seemed to be gaps in the understanding of correct uses of these therapeutic agents, for instance, treatment of viral infections, common cold and prevention of pregnancy were believed to be possible reasons for using an antimicrobial agent. Some respondents even mentioned its use in the management of pains especially dysmenorrhoea and stomach pains. Responses of students in this respect constitute gross misuse of antimicrobials. Ampicillin, Cloxacillin and Metronidazole, singly or in combinations, were found to be commonly used in menstrual pains and to prevent pregnancy though the basis of this assertion could not be supported from literature. However, in a study among school teachers in New Zealand, Norris *et al*.,(2009) reported the use of antibiotics to relieve pains, colds and flu [22]. Self medication with antimicrobials for cases of diarrhea rated high and this seems to be a usual trend with this demographic population as reported in similar studies [2,17,18]. The use of antimicrobials in this regard is inappropriate. In fact, the WHO reported that most antimicrobials are not only ineffective against some organisms that cause diarrhea but may aggravate the situation on the long run. The use of these therapeutic agents in the treatment of diarrhea has also been recognised as contributory to the acquisition of drug resistance by disease causing organisms [23-25]. Furthermore, adherence to dosage regimen of antimicrobial medicines was not adequate as majority of respondents discontinued the medication at the sign of relief or they switched among different brands or classes of the medicines. Sharing the medicines with other people who may appear to have similar ailments is also not a safe practice. These undesirable practices could result in tolerance or resistance to therapy as associated infections caused by the same microorganism(s) may even require different classes of antimicrobials depending on the sensitivity pattern of the pathogen and locality of the patient. Previous studies have shown the development of resistance to antimicrobials as a result of self-medication, indiscriminate use and the

administration of sub-therapeutic doses [26-29]. In a bid to address public misconceptions about the use of antimicrobials a number of campaigns had been developed and implemented in most countries [30-32]. For instance, the 'Know Your Medicine' campaign launched in Malaysia, was centred on antibiotics. This campaign was geared to educate, prepare, and horn the skills of the public for rational medicine use and health information services [33]. In addition, Belgium not only organised several media campaigns to alert the public on the problem of antimicrobial resistance but also developed guidelines for ambulatory care physicians [34].

Most of the antimicrobials used by the respondents were obtained from community pharmacies and from open drug market. Apparently the antimicrobials were sold on demand without a prescription written by qualified medical personnel. This is quite worrisome as most of the community pharmacies and drug stores in Sierra Leone were managed by pharmacy technicians and sales staff with limited knowledge of medicine indication, dosage regimens and contraindications. Expectedly most of the vendors lacked the competency in giving the appropriate medication and counsel when consulted. This concern was also raised in previous studies [35, 36]. Students also obtained antimicrobials from itinerant drug peddlers and this could expose them to the risk of using expired and counterfeit medicines.

This study was limited by the fact that, it did not ask questions that will directly evaluate respondents' ability to indicate the particular antimicrobials they had used for specific ailments or the combinations they had used at random or switched over to in cases of therapeutic failure. Such responses would have helped in addressing the issue of the implicated antibiotics used for wrong indications. Similarly, frequency of self medication with these therapeutic agents and cost implications were not documented in this study. Notwithstanding, future studies may need to look into these equally significant aspects more comprehensively.

There may be the need for a review of the drug laws in Sierra Leone, particularly with respect to enforcement of prescription policy in order to forestall indiscriminate sale of prescription medicines. On the other hand, concerted efforts should be made for improved health education and enlightenment campaigns among university students on safe medicine use and possible consequences of irrational use of antimicrobial agents in particular. Young adults in this demographic population are prone to take risks but with appropriate school health education, they could be empowered to take informed risks on health issues. In fact, health-related topics emphasising rational medicine use may be incorporated in the general studies programme of the university curriculum, and made compulsory for every student to provide health education outside the areas of studies. A cue may be taken from the design and successful implementation of the e-Bug project embarked upon in some European countries. The project aimed to create awareness of rational use of antimicrobials as well as preventive health education among school children using class-room teaching materials, games and an interactive website dedicated for this purpose. The European e-Bug school project was embarked upon extensively in ten developed countries including Portugal and France [37-43]. The project was integrated with the school curriculum and designed to bridge gaps in the students' knowledge of antibiotics. Public enlightenment on the project included written information, mass campaign and school-based network. The campaign was sustained by collaborations among the academia and the authorities responsible for public health and education. The outcome of the e-Bug project showed that it is important to embark on health education programmes that would promote appropriate use of antibiotics for students.

5. CONCLUSION

Self-medication with antimicrobials is prevalent among undergraduates of various academic disciplines in the University of Sierra Leone. Generally, there seems to be a poor knowledge of correct indications for use and adherence to full regimen of antimicrobials commonly obtained over the counter without medical counsel. Education to help the students decide on the appropriateness of self-medication is required. Similarly, the drug regulatory agency in Sierra Leone may need to evolve stricter control of the sale and availability of antimicrobial medicines in the country, in a bid to curb indiscriminate use which may result in development of resistant strains of microorganisms in the environment.

CONSENT

The purpose of study was explained to the students and voluntary participation without any form of penalty was emphasised. Only those who consented after the briefing were enrolled to participate in the survey.

ETHICAL APPROVAL

Ethical approval section is not applicable in this sturdy. Data collection procedure for the survey was non-invasive and voluntary participation of students was emphasised.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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