Misuse of antibiotic among university and higher education students in Sudan a cross-sectional, July 2020.

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Abstract

Background: Misuse of antibiotics therapy refers to failure to end therapy, skipping of doses, re-use of left over. In Sudan, antibiotic resistance is notably high and is attributed to the overuse and misuse of antibiotics. A lot of studies reported improper antibiotic use among university students .

Methods and Materials: A cross-sectional analytical research was done among university and higher education student, using an online-based questionnaire to study misuse of antibiotics and it's relation to different geographical areas in Sudan. The data was analyzed by SPSS version 25.0.

Results: The majority of the participants were female (62%) and most of them had age more than 20 years. Assessment of antibiotics misuse revealed that many participants don't have adequate behaviour toward antibiotics use. Only 48% stated that they will visit doctor when feel diseased, 37% of the participants stop taking medication when feel better. Moreover 79% use antibiotics as prophylaxis.

Comparing antibiotic misuse between type of study groups and parents medical background , those who study a non medical field stop their antibiotic course when feel better more (P value <.001). taking antibiotic for common cold was more common in students outside medical fields and those whose parents have medical background.

Adjusted regression models showed significant association between using antibiotics without prescription and gender as females use more antibiotics than males 1.6 times. Completing antibiotics course was significantly associated with both type of study and age as medical students and higher age groups practice better.

Conclusion:

Our study provides a good idea about misuse of antibiotics among universities and higher education students regardless of residency area.

Background

Misuse of antibiotics therapy refers to failure to end therapy, skipping of doses, re-use of left over. In addition to antibiotics resistance, this behavior also can cause economic loss, increased incidence of treatment failure, and returned visits to the physician. Factors associated with antibiotic therapy misuse included consumer's knowledge and attitude toward antibiotics use for therapy, and physician's knowledge. During a study within the Northeast US , medical students emphasized the necessity for both education and feedback on antibiotics prescribing to control overuse or misuse; which was high among the population in general . Additionally, it had been reported that University students misuse antibiotics. Furthermore, in China, widespread prescribing of unnecessary antibiotics was reported especially those administered parentally.(1)

In Sudan, self-diagnosis is enhanced by the very fact that most drugs, including antibiotics and antimalarials, can be obtained at community pharmacies without prescription. Although regulations that categorize drugs as prescription only or suitable for over-the-counter sale exist in Sudan, regulatory authorities often lack the resources to enforce them. In Sudan, overall antibiotic resistance is notably high and is attributed to the overuse and misuse of antibiotics. Studies in Sudan showed that 73.9% and 81.8% of the general population in Khartoum State had used antibiotics or antimalarials without a prescription and medicines including herbs without medical consultation, respectively. The agents most ordinarily used for self-medication were found to be antibiotics, antimalarials, and analgesics. It was also reported that self-medication was significantly associated with age, income, sex, and level of education. (2)

A lot of studies have reported improper antibiotic use among students both of medical and non-medical colleges with self-medication and adequate lack of knowledge of antibacterial agents (indications, compliance to dosage regimen, specificity of agents to infective organism). While another study concluded that there was a distinct segment between theoretical input and clinical practices, what was being learnt by scholar differs from what was being practiced or they didn't seem to use the theoretical knowledge when it involved real-life situations. A more practical method should be used when educating the students particularly the knowledge of antibiotic use.(3)

Revelation has been set to be the only most noteworthy recorded headway in medical aid. Notwithstanding, the far and wide utilization of antimicrobials has been related with the increase of protection from these specialists. (4) In developing countries most illnesses were treated by self-medication. Developing countries like Sudan, Jordan, Trinidad and Tobago, and also developed countries like Spain, Greece, Russia, Romania, USA, Italy and Malta are experiencing self medication and irrational use of Antibiotics in their communities.(5) The major influence driving changes within the prevalence of resistance within the community seems to be the quantity of drug use, and different epidemiological models are proposed to explain the phenomena. strategies for better Antibiotics use are important for preserving , as far as possible, the effectiveness of antibiotics . Especially, there's a transparent got to improve the scientific understanding of the factors related to Antibiotics use. So far, most of the efforts for managing the utilization of antibacterial agents are directed toward the prescribers: guidelines, strategies, national and international antibiotics policies, and academic programs.(6)

Our study aim at identifying and estimate the magnitude of antibiotics misuse among university and higher education students in Sudan and provide recommendations if token from being under consideration to real life implementation , the problem will stand no more.

Methods: This was a cross-sectional study design to estimate misuse of antibiotics among university and higher education students in Sudan, We used an online-based questionnaire asking about last time the participants had an illness if they took antibiotics without doctor consultation or despite the doctor instructions they had them anyway , whether or not they discontinue the medication once they feel better , use antibiotics for common cold and as prophylaxis.

Random sampling method was adopted , all university and higher education students in Sudan whom consented to participate in the study were included , no exclusion criteria was set.

The questionnaire distributed through social media like WhatsApp and Facebook. Participants were encouraged to distribute the survey. Physical distribution was not achievable due to the lockdown in Sudan. The survey was done online by using Google survey (Google LLC, Mountain View, California, USA).

Ethical statement : written informed consent have been provided from the study participants and all data were fully anonymized hence ethics committee approval has been waived.

Results

This online cross-sectional study included 725 students from all over Sudan. The majority of the participants were female (62%) and most of them had age more than 20 years old. About 90% were university students and the rest were studying post graduate studies. Three quarters of the study participants are studying in medicine related fields. Up to 35% of participant's parents have medical background. More details about demographic characteristics are included in table 1.

Table 1: Basic demographic features

Gender: (%)	
Males	38.1
Females	61.9
Age: (%)	
Less than 20	30.3
More than 20	69.7
Education: (%)	
Undergraduate	90.3
Postgraduate	9.7
Study participants: (%)	
Medical	75
Non medical	25
Residency: (%)	
Northern states	3.4
Eastern states	35.3
Central states	55.9
Western states	5.5
Parents' education: (%)	
Primary	12.1
Secondary	31.2
Graduate education and above	56.7
parents medical background:(%)	35
Monthly income: (%)	
15000 or less	41.5
More than 15000	58.5

Assessment of antibiotics misuse revealed that many participants didn't have definite behaviour toward antibiotics use. Only 48% of participants stated that they will visit doctor when feel diseased. Also 37% of the participants stopped taking medication when felt better. Moreover, 79% of them used antibiotics as prophylaxis. More details in table 2.

Table 2: features of antibiotics use among participants.

What did you do last time you had a disease? (%)	
Used antibiotics	34.7
Did nothing	17.6
Visited a doctor	47.7
If you visited a doctor, what did you do then: (%)	
Had antibiotic although the doctor did not prescribe	28.7
The doctor prescribed me antibiotics	71.3
When you start taking antibiotics, the following is true : (%)	
Stop taking the drug when feeling better	36.8
Complete the course of antibiotics	63.2
From where do you get antibiotics: (%)	
I use old remaining stock	23.4
I buy them from pharmacy	76.6
Do you take antibiotics when you feel common cold symptoms: (%)	
Yes	21.1
No	78.9
Do you use antibiotics for prophylaxis: (%)	
Yes	78.9
No	21.1

When comparing antibiotic misuse between types of study groups and Parents' medical background, those who have studied a non-medical field stop their antibiotic course when feel better more than those who have studied a medical field (P value <.001). Moreover, taking antibiotic for common cold was more common in students outside medical field and those whose Parents have medical background. Details in table 3.

Table 3: comparison of antibiotic misuse between medical field and non medical field students, and Parent's medical background.

	Study participants			Parents' medical background		
	Medical	Non medical	P value	Medical	Non medical	P value
Having antibiotic without prescription	162 (32.9%)	65 (40.1%)	0.154	78 (34.6%)	149 (34.7%)	0.949
Stop antibiotics course when feeling better	109 (31.5%)	58 (53.2%)	<0.001	56 (34.5%)	111 (38%)	0.466
Getting new medications from pharmacy	233 (77.6%)	87 (73.7%)	0.392	108 (73.4%)	212 (78.2%)	0.273
Taking medication for common cold symptoms	260 (47.8%)	106 (58.6%)	0.012	142 (55.9%)	224 (47.6%)	0.032
Using antibiotics as prophylaxis	92 (16.9%)	61 (33.7%)	<0.001	67 (26.4%)	86 (18.3%)	0.011

East state residents showed higher tendency to take medication for common cold and use antibiotics as prophylaxis than those of middle states residents, details in table 4.

ble 4 : comparison of antibiotic misuse between different States .

	North states	East states	Central states	West states	P value
Having antibiotic without prescription	5(22%)	82 (35%)	(36%)	9 (27%)	0.114
Stop antibiotics course when feeling better	7 (43%)	68 (40%)	81 (34%)	9/ (45%)	0.49
Getting new medications from pharmacy	5 (38%)	36 (32%)	49 (21%)	6/ (37%)	0.211
Taking medication for common cold symptoms	12/ (50%)	147 / (58%)	218/ (55%)	21/ (53%)	0.014
Using antibiotics as prophylaxis	3/ (12%)	68/(27%)	74/ (18.5%)	5/ (13%)	0.023

Adjusted regression models showed significant association between using antibiotics without prescription and gender, as females use more antibiotics than males 1.6 times. Completing antibiotics course was significantly associated with both type of study and age as medical students and higher age group practice better. Getting medication from the pharmacy was associated with gender, as female use new pharmacy medications more than males. While completing the antibiotics course was associated with type of studies and age as medical studies and higher age are associated with more completing of the antibiotic course. Details in table 5 and table 6.

Table 5: Adjusted regression model for antibiotic use, following doctor medications and completing antibiotic course.

	Using antibiotics without prescription		Following doctors' medications		Completing antibiotics course	
	Odds ratio	P value	Odds ratio	P value	Odds ratio	P value
Gender	1.6	0.012	1.5	0.089	1	0.994
Age	1.05	0.772	1.13	0.638	1.99	0.002
Study participants	1.19	0.395	1.16	0.563	2.57	<0.001
Parent 's medical background ()	.97	0.868	1.39	0.194	1.08	0.709
Income	.98	0.909	1.43	0.129	1.39	0.101

Table 6: adjusted regression for getting medications from pharmacy, use antibiotics for common cold and using antibiotics as prophylaxis.

	Getting new medications from the pharmacy		Use antibiotics for common cold symptoms		Using antibiotics for prophylaxis	
	Odds ratio	P value	Odds ratio	P value	Odds ratio	P value
Gender	.548	0.022	1.1	0.616	.638	0.024
Age	1.83	0.016	.739	0.072	.634	0.025
Type of study	1.6	0.086	.619	0.009	.404	<0.001
Parents' medical background	.784	0.332	1.5	0.014	1.89	0.001
Income	1.15	0.546	.593	0.001	.687	0.048

Discussion

Self-medication with antibiotics is common among students of medical and non-medical disciplines.

In Sudan, the prevalence of self-medication with antibiotics among undergraduate students in Khartoum State is high.(2)

Results of another Sudanese study showed that

the prevalence of self-medication with antibiotics during the 6 month prior to the study was 41%, so this is confirming that self-medication with antibiotics is a frequent problem in Sudan and thus interventions are urgently required to reduce the frequency of antibiotics misuse.(5)

Worldwide, misuse of antibiotic is one of the most important challenges to health care system, because reduction of antibiotic resistance is achieved by controlled use of antibiotics.(1) This is a major health problem that emphasize the urgent need of adding some courses on rational antibiotic use in University curricula.(7)

In this online cross-sectional study,725 students from all over Sudan were included, three quarters of our study participants were studying medicine-related fields. Up to 35% of participants' parents have medical background and this may contribute to antibiotics misuse in a way of skipping doctor visit and go directly

to direct antibiotics consumption. In contrast, in a Chinese study most of students' parents had limited or no college education and with no medical background.(8)

Assessment of antibiotics misuse revealed that many participants didn't have adequate behavior toward antibiotics use may be due to decreased awareness about the adverse effects of unnecessary antibiotic use. Similar to Chinese study that showed medical students have high rates of antibiotic self-medication for self-limiting illnesses, symptom relief and prophylaxis; and this might be higher than the reported number since they may not report these behaviors because they were medical students and know this is inappropriate .

In our study eastern and middle states have comparably high level of antibiotic misuse unlike the Chinese study which showed that the less developed region(Guizhou Province) was significantly associated with higher antibiotic misuse behaviors.(9)

In Nigeria, there was good theoretical knowledge of antibiotic use and resistance, however, practice levels were poor since only 8.2% of respondents always consulted a doctor before starting an antibiotic.(4)

Similarly, in a study conducted in Sudan during 2019, participants had shown 44.44%, 34.3%, 20.3% and 1% good, poor, very good and excellent knowledge on resistance, respectively. About 34.3% of respondents have poor knowledge which was a huge number. However, only 24.8% of them had a good attitude; thus the attitude was average, which is not enough in a population of students who are studying health related fields and having good knowledge.(3)

In another Sudanese study, surprisingly despite respondents higher level of education, the majority of those who practiced self medication with antibiotics were university graduates and university students.(5)

In United Arab Emirates , medical students scored remarkably better than non-medical students on KAP of antibiotic use.(7)

In Saudi study, 67% of the respondents were unaware of the meaning of ABs resistance. 24% believed that ABs worked on viruses, 31% on cold and 21% can cure cough. Only 33% of them understand the meaning of ABs resistance, 45.8% agreed that ABs resistance is caused by using unwarranted ABs, and 55.4% agreed that it caused by incomplete course of Abs. (6)

Only 48% of our participants stated that they will visit a doctor when feel diseased. In a study done in Jordan, 61.4% of the medical students reported that they had seen physicians at least 1 time in the past 6 months from the time of the study, which was comparable to that of the nonmedical students (68.6%) and cold was one of the major reasons for visiting physicians among Jordan participants (26.4%). Both groups of students reported that they highly adhered to doctor instruction.(1)

In Chinese study.. 29% medical students reported at least one self-limiting illness in the prior month of the study time. Of those,21% went to see a doctor, of which 58% were prescribed antibiotics . Of the students

reporting illness of cold, 16.8% only went to see a doctor.(8)

37% of our participants stop taking medication when they feel better. When comparing antibiotic misuse between types of our study groups.. those who study a non medical field stop their antibiotic course when feel better more than those who study a medical field (P value <.001). While the majority of Jordan participants (65.3%) reported that they stopped using the medicine and saw physicians whenever the drug had no effect. Another study done in south Jordan revealed that half the participants used the antibiotic for three days or less depending mainly on the symptoms. In study done in Nigeria, 41% of their respondents never stopped taking their antibiotics when they felt better, 36.6% sometimes and 13.1% usually stopped taking their antibiotics when they felt better . .(4)

In Sudanese study during 2006, when a noticeable improvement in the illness occurred during self-treatment, respondents reported continuing treatment until the medication was gone is 71.8% which is a good percentage. Those who stopping treatment immediately after experiencing noticeable improvement were 28.2%.(2)

Another Sudanese study showed that the majority of those who self-medicated used antibiotics for a short duration of less than 5 days. (5)

In Saudi study, 58% respondents discontinued using ABs after completing the course while 42% discontinue ABs on alleviation of symptoms. (6)

In our study, 79% use antibiotics as prophylaxis and this is common among non medical (p value < 0.001) and 21% take antibiotics when they feel common cold symptoms. In study done in Sudan, 41% of those who self-medicated used antibiotics to treat cough and common colds.(5)

In china, of the students reporting illness of cold, 59.2% of them were self-medicated and one in seven participants used antibiotics for preventing a cold.(8)

In Saudi, almost 51% used ABs without physician prescription.(6)

In Jordan, the most predominant medicine classes that were self-used by all students in the past 6 months were variable and the antibiotics used by 21% of the participants.(1)

Moreover, taking antibiotics for the common cold was more common in our students outside medical fields similar to Jordan study where cold was an indication for which students take medications on their own with percent of 58.3%.(1)

In our study, taking antibiotics for common cold common among those whose parents work in the medical fields. This is inappropriate but may be that working in medical fields not nessecitae good knowledge and good delivery of right information to the families. In china, Logistical regression showed that students whose fathers had a higher education level, whose mothers had medical background, were more likely to stock antibiotics and self-medicate with antibiotics.(8)

Adjusted regression models in our study showed significant association between using antibiotics without prescription and gender as females use more antibiotics than males 1.6 times. In Chinese study, female students had significantly higher rates of stocking antibiotics.(8)

In Nigeria, more male respondents had a better knowledge of antimicrobial use and resistance than their female counterparts (70.4% vs. 55.1%; $P=0.035$) and this is statistically significant.(4) In Sudanese study, self-medication was slightly higher among females.(5) This is related to our finding that getting medication from the pharmacy was associated with gender as female use new pharmacy medications more than males.

In our study, completing antibiotics course was significantly associated with both type of study and age. So medical students do the right practice of completing the antibiotic course more than the non medicals, also higher age group practice better. In contrast, older age students in Chinese study had significantly higher rates of stocking antibiotics.(8)

In study done in Sudan 2006 , self medication with any of the antibiotics and/or antimalarials was shown to be significantly associated with age group ($p = 0.008$). (2) Another Sudanese study showed that the prevalence of self-medication was found to be inversely proportional to age. It was highest among those aged between 18 to 24 years.(5)

None of the variables such as gender, age, and education level showed statistical significance when compared with knowledge response regarding AB resistance in Saudi study. (6)

similarly, In study done in Sudan2019, students characteristics like age, gender have negligible impact on the students knowledge and attitude.(3)

limitations :

- 1/ physical distribution of questionnaire wasn't achievable due to Covid-19 lockdown.
- 2/ distribution of questionnaire in western and northern states was suboptimal, we think in addition to the lack of physical distribution , the number of universities is less compared to eastern and middle states .

Recommendations

- 1/it is critical to raise awareness about Abs misuse and AMR specially in non medical students.
- 2/Regulations and policies regarding Abs sale should be formulated and/or implicated.

Declarations

Author's Contribution: All authors participated in the manuscript editing and preparation. AMB/MEA were responsible for draft writing, conceiving the idea for the article and wrote the final manuscript. MA

analyzed the data of this study and participated in draft writing. All authors contributed to and approved the final report.

Declaration of Competing Interest: The authors declare no conflict of interest.

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