



A SURVEY OF PUBLIC KNOWLEDGE AND BEHAVIOR RELATED TO ANTIBIOTIC USE AND RESISTANCE IN COMMUNITY PHARMACIES IN KHARTOUM STATE

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Abstract: Antibiotic use is reviewed as a key driver for increase and spread of antibiotic resistance. The public play a key role in the emergency and spread of bacterial resistance. Patients' behavior, associated to their knowledge, attitudes and beliefs, may influence antibiotic prescribing. This survey explores knowledge, behavior and expectations of Sudanese general public with respect to antibiotic use and resistance. Method: A quantitative, cross-sectional survey based on a structured questionnaire include a sample of 300 participants represents the general public from Khartoum State interviewed during a 2- month period, from the 1st February to 31th of March in 2012. Statements on behavior and attitudes indicated that (70.0%) of respondents use antibiotics to get rid of the cold. (34.0%) of them agreed to stop taking antibiotics when feel better and (54.0%) left over antibiotics. Over half of the respondents (64.0%) had correct knowledge that antibiotics are effective against bacteria, but (40.0%) believe that antibiotics are effective against viruses. (82.0%) knew that bacteria can be resistant to antibiotics, and (72.0%) acknowledged that the use of antibiotics can increase the bacterial resistance. Most of the respondents (78.0%) obtained their information on antibiotic use from pharmacy personnel. Non-affordability of doctors' fees is the main reason for the patients surveyed (30.0%) to seek antibiotics in pharmacies. Our findings highlight the need to devise effective interventions to deal with self-medication with antibiotics in Sudan.

Keywords: Antibiotic prescribing, antibiotic usage, public knowledge.

INTRODUCTION

Antibiotic resistance has increasingly been recognized as a major issue in healthcare. During the last decennia; antibiotic resistance is on rise. Antibiotic use is reviewed as a key driver for increase and spread of antibiotic resistance¹. The public play a key role in the emergency and spread of bacterial resistance. Patients' behavior, associated to their knowledge, attitudes and beliefs, may influence antibiotic prescribing²⁻³. It is estimated that about 5% of prescriptions are not redeemed and that large quantities of prescribed drugs are not consumed⁴.

Although doctors perceive a high level of demand, the evidence that patients' expectations influence prescribing decisions is equivocal⁵. Several studies have shown patients' or parents expectations of antibiotic therapy, or expectations as perceived by the doctor, to be a determining factor for antibiotic prescribing and the proportion of prescriptions written even exceeds patients' expectations oftenly⁶⁻⁸. This suggests that doctors overestimate patients' expectations for prescriptions⁹. Understanding patients' knowledge, attitudes, and practices may facilitate more effective communication between the clinician and patient as well aid in the development of strategies to educate patients and public¹⁰. Several lines of evidence suggest

educational interventions directed towards patient and clinicians can increase patients' knowledge and awareness as well as the frequency with which clinicians prescribe antibiotic inappropriately. Knowing the magnitude of the problem and the groups who misuse antibiotics most frequently will help public health officials develop and fund intervention efforts, including public information campaigns¹¹⁻¹⁵.

In 2000, the WHO Report "Overcoming Antimicrobial Resistance" identified three key issues for public involvement: improving access to medical services, reducing unnecessary use of antimicrobial drugs and not sharing medication with other people or keeping part of course for another occasion¹⁶.

In developing countries the use of antimicrobials without a prescription is encouraged by the lack of laws restricting antibiotic sales or a failure to enforce those laws¹⁷⁻²⁰. In Sudan, antibiotics can be obtained easily from private retail pharmacies without prescription and pharmacists also advise and dispense antibiotics to patients. This is resulting in a high level of self-medication and antibiotic resistance^{21, 22}. With this survey we try to explore knowledge, attitude, behavior and expectations of Sudanese general public with

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respect to antibiotic use and resistance in order to guide decisions for future preventive measures.

MATERIALS AND METHODS

This was a quantitative, cross-sectional survey among a sample of the general Sudanese population who were visited community pharmacies in Khartoum State during a 2- month period, from the 1st February to 31st of March in 2012.

Sample size:

Approximately 300 pharmacy visitors were calculated as adequate sample target for people at study area during the study period. These visitors were randomly selected from 145 pharmacies as calculated by multi stage selected pharmacy calculation to be a representative for pharmacies of Khartoum State. 73, 42, 25 were the ratio of selection calculated to represent the 3 cities constitute Khartoum State (Khartoum city, Omdurman city and Khartoum North city respectively) with systemic interval of 3.

Data Collection:

The interview study based on a structured questionnaire, questions to tap this questionnaire were derived from a previous survey described in Sweden study,²³ and slightly rephrased and modified to suit the objectives and purposes of our study. No pilot study conducted to validate our modified questionnaire. The survey questionnaires were distributed and collected back by final year pharmacy student of National college of Medical and Technical Sciences (Batch 3) as a graduation research project. Interviewers obtained verbal consent from interviewer before administering the questionnaire. The interviewee informed why the information was being collected, and how it would be used, and read them a statement informing them that their participation was voluntary before the start of the interview and confirmed that their answers are anonymous and confidential. Approval for the study obtained from National College for Medical and Technical Sciences Ethical Committee.

Survey instrument:

The questionnaire addressing public knowledge, attitude and behavior regarding antibiotic use and resistance, targeted mainly patients and co-patients visited the selected sampled pharmacies. In the first part of questionnaire, 8 questions about the respondents' demographic data such as sex, age, educational level, number of children aged 3-6 years and experience with antibiotic use were noted. In the survey, respondents were asked whether they agreed or disagreed with 5 statements dealing with the behavior of public towards antibiotic medication and their attitude to access antibiotics, and another 5 statements addressing the knowledge of public about

the use antibiotics and resistance. The rest of questionnaire dealing with patient doctor relationship.

Each question could be responded with three choices: agree, disagree with general statements about antibiotics or do not know. Inappropriate behavior and attitude was defined as easily access to antibiotics and agreeing to take antibiotic for general symptoms for upper respiratory tract infection or re-use antibiotics without prescription and sharing antibiotics with others were considered as misbehavior. A knowledge score was determined by calculating and summing up the number of correct answers for the 5 knowledge questions which are represented in table (1).

Table.1: Questions on Behavior and Knowledge of antibiotic use

Behavior
Left-over antibiotics are good to keep at home in case they might be needed
It's good to be able to buy antibiotics without prescription and without having to see a doctor
It would be good to be able to buy antibiotics over-the-counter at the pharmacy/pharmacy assistance
If the nasal catarrh (snot) from a head cold is colored, you often need antibiotics to get rid of the cold.
If you feel better after half the treatment with antibiotics you can stop taking them.
Knowledge
Antibiotics are effective against bacteria
Antibiotics are effective against viruses
Bacteria can be resistant to antibiotics
The use of antibiotics can increase the resistance of bacteria to them
Inflammation of the ear in a 3-6 year-old child almost always needs to be treated with antibiotics

Data collected were analyzed using (SPSS version 16) for statistical analysis and Excel 2007. Descriptive measures presented include frequencies and percentages of respondent's demographics, attitudes/behavior and knowledge, regarding antibiotic use and bacterial resistance.

RESULTS

The sample consisted of 300 visitors to the selected community pharmacies: 162 female and 138 male. Of those 300, total 174 were in the age range of 21- 30 years. Half of respondent were distributed in Khartoum city. The Majority of respondents (86.0%) had a university education, but only (27.0%) had health related education or training. Of the 300 respondents, 279 (93.0%) had experience with antibiotic use, and 174 (58.0%) reported taking antibiotics more than 10 times before the interview. Table (2) shows the detailed demographic data of respondents.

Statements on behavior and attitudes indicated that (70.0%) of respondents use antibiotics to get rid of the cold. (34.0%) of them agreed to stop taking antibiotics when feel better and (54.0%) left over antibiotics. (Figure.1)

Table (2): Detailed demographic data of respondents

Demographic characteristic	Frequency	Percentage
Area		
Khartoum	150	50.0%
Omdurman	90	30.0%
Khartoum North	60	20.0%
Sex		
Male	138	46.0%
Female	162	54.0%
Age (Years)		
21 – 30	174	58.0%
31 – 40	42	14.0 %
41 – 50	48	16.0%
51 – 60	24	8.0%
61– 70	12	4.0%
Education		
Primary school education	6	2.0%
Secondary school education	36	12.0 %
University-higher education	258	86.0%
Health care related education / training		
Yes	81	27.0%
No	219	73.0%
Children aged 3-6 years in household		
None		
One	138	46.0%
Two	72	24.0%
Three or more	42	14.0%
Experience with antibiotic use	48	16.0%
Yes		
No	279	93.0%
Number of times used antibiotics		
Once	6	2.0%
Less than 10 times	120	40.0%
More than 10 times	174	58.0%

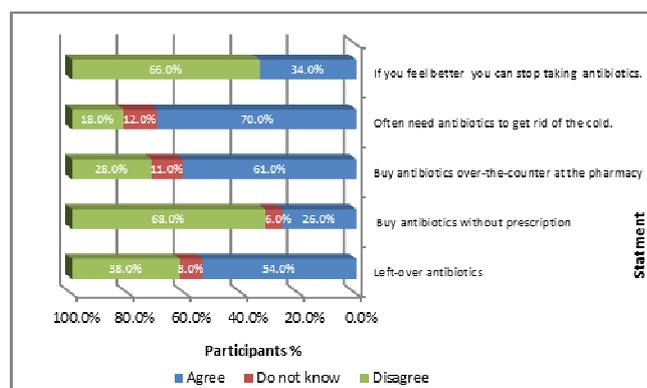


Figure (1): Relative frequency of participants, responses to statements concerning behavior towards antibiotic and antibiotic use.

Table (3): Respondents' knowledge about antibiotics use and resistance.

Knowledge Statement	Correct answers	
	N	%
Antibiotics are effective against bacteria	192	64.0%
Antibiotics are effective against viruses	120	40.0%
Bacteria can be resistant to antibiotics	246	82.0%
The use of antibiotics can increase the resistance of bacteria to them	216	72.0%
Inflammation of the ear in a 3-6 year-old child almost always needs to be treated with antibiotics	90	30.0%

Over half of the respondents (64.0%) had correct knowledge that antibiotics are effective against bacteria, but (40.0%) believe that antibiotics are effective against viruses. (82.0%) knew that bacteria can be resistant to antibiotics, and (72.0%) acknowledged that the use of antibiotics can increase the bacterial resistance. (Table 3).

Information and trust were evaluated in four statements on the topic 'patient-doctor relationship'. (66.0%) of the respondents agreed that doctors take their time to consider carefully whether antibiotics are needed or not. A higher proportion of respondents (78.0%) agreed with the statement pharmacy personnel often provide information on antibiotic use. A significantly higher percentage (80.0%) of respondents reported trusting the doctors prescribing an antibiotic than the doctor not prescribing an antibiotic (68.0%). Only (28.0%) of respondents disagreed with the statement ' I often know myself if I need antibiotics before I meet the doctor' against (61.0%) agreed they know that they need antibiotics before meet doctor'.

Different reasons were stated answering the question, 'why do you use antibiotics without referring to a doctor? The majority (59.0%) justify that because of their knowledge of simple and repeated symptoms. Figure (2) shows the details of reasons.

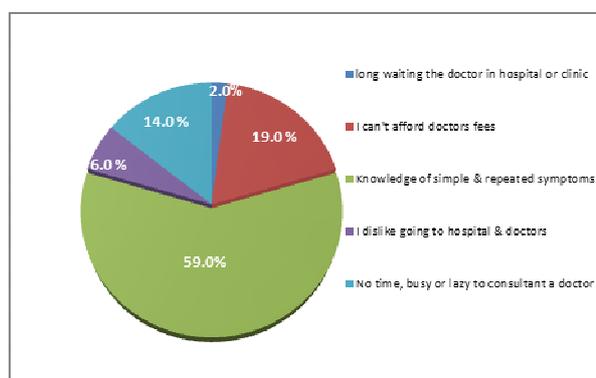


Figure (2): Reasons to use antibiotics without referring to a doctor.

On the other hand on answering the pharmacists why dispensing antibiotics without a prescription? Financial gain and patient cannot afford doctors' fees were the main reasons for pharmacists to dispense antibiotics without prescription (32.0% & 30.0% respectively). (72.0%) of pharmacists claimed that their patient symptom was the main basis of dispensing antibiotics to the patient without prescription. Figure (3) shows the sources of information of the pharmacist when he/she dispense antibiotics to the patients.

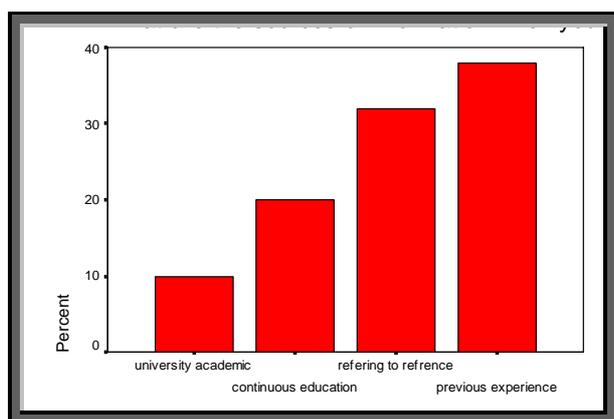


Figure (3): Sources of information of pharmacists on dispensing antibiotics to the patients

DISCUSSION

This survey suggests that patients represent a significant source of antibiotic misuse in the community. To determine the actual behaviors relating to antibiotic use, our results show that most (66.0%) of respondents who is taking antibiotics disagree to stop it when feel better. It is less high than similar study conducted in Hong Kong (78.0%).²⁴ Keeping leftover medications for future use was another source of misuse because these antibiotics are kept in uncontrolled conditions and potentially used later without a medical prescription. Our study revealed that it was practiced by more than half of respondents (54.0%). This percentage is more than other countries like Italy (41.0%), Spain (36.0%), Colombia (31.0%), Morocco (25.0%), and Turkey (23.0%)²⁵. It was possible to get antibiotics over-the-counter at the pharmacy by (61.0%). Acquiring antibiotics without a prescription from pharmacies in Khartoum State does seem to be a cultural artifact of the loosely regulated sales of antibiotics in Sudan. This practice was very common in subjects from 9 countries surveyed in a previous study,²⁵ even where this practice is illegal. This gray area of pharmaceutical practice deserves further investigation to know the relative importance of over-the-counter sales. But this is contradictory with another respondents answer who (68.0%) disagreed to buy the antibiotics without prescription.

These data reveal important misconceptions regarding knowledge of the general public have about the effectiveness of, and resistance to, antibiotics. Although most of the people (64.0%), correctly endorsed the view that antibiotics are generally effective against bacteria, nearly half of the respondents (40.0%) endorsed the view that antibiotics are effective against viruses. These public misconceptions on antibiotic effectiveness are most likely facilitated by high percentage (70.0%) of unnecessary antibiotic use to get rid of cold. The most important step in enhancing public knowledge on

antibiotics is to restrict unnecessary prescriptions and dispensing of them, thereby establishing evidence-based expectations about antibiotics treatment. More effective education interventions about appropriate antibiotic use, focusing on the treatment of conditions likely to have viral origin such as common colds and flu were needed. A study investing public views on antibiotic use among Dutch population exposed a comparable percentage of respondents (47.8.0%) were incorrectly identified antibiotics as being effective against viral infections.²⁶

Notable in this study is the high trust in the doctor who prescribed antibiotics (80.0%) which in accordance with a previous Swedish study (81.0%), but different in the doctors who do not prescribing antibiotics (68.0% vs. 87.0%).²³ The high trust in the doctor, whether he or she is prescribing or not, should be stressed in communication with the health providers and is important to note since trust seems to not be easily obtained by interventions.²⁷ The present data are similar to those found in other studies that suggest antibiotics self-medication may be due mainly to the belief that physician consultation is not necessary as they know the simple and repeated symptoms.²⁸⁻³⁰ However, our findings show that most patients (66.0%) think doctors take their time before prescribe antibiotics.

In the term of practice, the role of pharmacy personnel needs mentioning. They seems to have an important role to play in contributing to public knowledge about appropriate antibiotic treatment, as more of the respondents (78.0%) stated that they obtained information on antibiotic use from pharmacy personnel. This more or less similar to Swedish study (74.0%).²³ Non-affordability of doctors fees is the main reason for the patients surveyed (30.0%) to seek antibiotics in pharmacies. Another data obtained from unpublished study in Khartoum State shows that non-affordability coming as the second main reason (28.4%) after long waiting to the doctor (35.5%) to obtain antibiotics without refers to doctors. In this is unpublished study also pharmacies contribute the main source of antibiotics (35.9%).

Pharmacist previous experience is the main source of information for about (48.0%) when dispense antibiotics to the patient, followed by references (32.0%). Only (20.0%) of respondent's pharmacists continue their education after university. Limitation of this study as with most surveys, it is possible that respondents might give socially desirable answers, rather than their true opinions. Also we did not correlate between the education level and knowledge of antibiotic use and behavior.

CONCLUSION

Our findings highlight the need to devise effective interventions to deal with self-medication with antibiotics in Sudan, and suggest that there may be several opportunities to reduce unwarranted use of antibiotics and thus ultimately reduce further development of antibiotic resistance.

REFERENCES

- Nordberg P, Monnet DL, Cars O. Antibacterial Resistance. Background Document for the WHO Project: Priority Medicines for Europe and the World – a public Health Approach to Innovation. Geneva: WHO, 2004.
- Davey PG, Pagliari C, Hayes A. The patient's role in spread and control of bacterial resistance to antibiotics. *Clin Microbiol Infect* 2002; 8: 43-68.
- Mangione-Smith R, McGlynn EA, Elliott MN, McDonald L, Franz CE, Kravitz RL: Parent expectations for antibiotics, physician-patient communication, and satisfaction. *Arch Pediatr Adolesc Med* 2001; 155: 800-806.
- Beardon PHG, McGilchrist MM, McKendrick AD, McDevitt DG, Macdoland TM. Primary non-compliance with prescribed medication in primary care. *BMJ* 1993; 307: 846-8.
- Britten N. Patients' demands for prescriptions in primary care. *BMJ* 1995; 310: 1084-85.
- Cockburn J, Pit S. Prescribing behavior in clinical practice: Patients' expectations and doctors' perceptions of patients' expectations- a questionnaire study. *BMJ* 1997; 315: 520-3.
- Stivers T, Mangione-Smith R, Elliott MN et al. Why physicians do thinks patients expect antibiotics? What parents report vs What physicians believe? *J Fam Pract* 2003; 52: 140-8.
- Webb S, Lloyd M. Prescribing and referral in general practice: a study of patients' expectations and doctors' actions. *Br J Gen Pract* 1994; 44: 165-9.
- Cartwright A. Prescribing and the doctor-patient relationship. In: Pendeton D, Hasler J, eds. *Doctors-patient communication*. London: Academic Press, 1983.
- Kravitz RL, Callahan EJ, Paterniti D, Antonius D, Dunham M, Lewis CE. Prevalence and sources of patients' unmet expectations for care. *Ann Intern Med* 1996; 125: 730-7.
- Stephenson J. Icelandic researchers are showing the way to bring down rates of antibiotic-resistance bacteria. *JAMA* 1996; 275:175.
- Seppala H, Klaukka T, Vuopio-Varkila J, Muotiala A, Helenius H, Lager K, et al. Finnish study group of antimicrobial resistance. The effect of changes in the consumption of macrolide antibiotics on erythromycin resistance in group A streptococci in Finland. *Engl J M* 1997; 337: 441-6.
- Trepka MJ, Belongia EA, Chyou PH, Davis JP, Schwartz B. The effect of a community intervention trial on parental knowledge and awareness of antibiotic resistance and appropriate use in children. *Pediatrics* 2001; 107:E6.
- Finkelstien JA, Davis RL, Dowell SF, Metlay JP, Soumerai SB, Rifas-Shiman SL, et al. Reducing antibiotic use in children: a randomized trial in 12 practices. *Pediatrics* 2000; 108: 1-7.
- Belongia EA, Sullivan BJ, Chyou PH, Madagame E, reed KD, Schwartz B. a community intervention trial to promote judicious antibiotic use and reduce penicillin-resistance Streptococcus pneumonia carriage in children. *Pediatrics* 2001; 108: 575-83.
- World Health Organization Report on Infectious Diseases. Overcoming Antimicrobial Resistance (2000) World Health Organization Annual Report. <http://www.who.int/infectious-disease-report/2000/> (6 September 2006, date last accessed).
- Becker J, Drucker E, Enyong P, Marx P. Availability of injectable antibiotics in a town market in south-west Cameroon. *Lancet Infect Dis* 2002; 2: 325-6.
- Hsueh PR, Luh KT. Antimicrobial resistance in Streptococcus pneumonia, Taiwan. *Emerg Infect Dis*. 2002; 8:1487-91.
- Dua V, Kunin CM, White LV. The use of antimicrobial drugs in Nagpur, India. A window on medical care in a developing country. *Soc Sci Med*. 1994; 38:717-24.
- Multicenter study on self-medication and self-prescription in six Latin American countries. Drug Utilization Research Group, Latin America. *Clin Pharmacol Ther* 1997; 61: 488-93.
- Abdelmoneim Awad, Idris Eltayeb, Lloyd Matowe & Lukman Thalib Self-medication with antibiotics and antimalarials in the community of Khartoum State, Sudan. *J Pharm Pharmaceutical Sciences*, 2005; 8, 326-331.
- Salah I Kheder, Idris Eltayeb, Sania A I Shaddad, Esam Kheder. Effect of antibiotic rotation protocol on the development of hospital acquired infections in hospital surgical units in Sudan. *Sudan Medical Monitor* 2010; 5 (4) 165-173.
- Maline A, Asa V, Johanna Berg, Cecilia SL. A survey of public knowledge and awareness related to antibiotic use and resistance in Sweden. *J Antimicrob Chemother* 2010; 104: 1292-96.
- Jou JHS, Yau B, Choi KC, Chau CTS, Huang QR, Lee SS. Public knowledge, attitudes and behavior on antibiotic use: A telephone survey in Hong Kong. *Infection* 2008; 36 (2): 153-57.
- Jean CP. Patients' interviews and misuse of antibiotics. *Clinical Infection Disease*. 2001; 33 (3):S170-73.
- Jochen WL, Dennis B, Robert JM, Ralph G, Rogier M, Christopher C, Grret-Jan D. Public beliefs on antibiotics and respiratory tract infections. *British Journal of General Practice* 2007; 57 (545): 942-47.
- Mckinstry B, Ashcroft RE, Car J et al. Interventions for improving patients' trust in doctors and groups of doctors. *Cochrane Database Sys Rev* 2006; issue 3: CD004134.
- Mainous AG III, Cheng AY, Garr RC, Tilley BC, Everett CJ, McKee MD. Nonprescribed antimicrobial drugs in Latino community, South Carolina. *Emerg Infect Dis*. 2005; 11(6): 883-888.
- Mainous AG III, Diaz VA, Carnemolla M. Factors affecting Latino adults' use of antibiotics for self-medication. *J Am Board Fam Med*. 2008; 21(2):128-34.
- Coffman MJ, Shobe MA, O'Connell B. Self-prescription practices in recent Latino immigrants. *Public Health Nurs*. 2008;25(3):203-211.

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