International Journal of Current Medical and Pharmaceutical Research

IJCMPR

ISSN: 2395-6429

Available Online at http://www.journalcmpr.com

DOI: http://dx.doi.org/10.24327/23956429.ijcmpr20170134

RESEARCH ARTICLE

RATIONAL USE OF ANTIBIOTICS IN TABUK CITY AND EVALUATION OF THE PUBLIC AWARENESS, KSA

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ARTICLE INFO

Article History:
Received 10th April, 2017
Received in revised form 4th May, 2017
Accepted 15th June, 2017
Published online 28th July, 2017

Key words:
TABUK, KSA, antibiotic, infection, fever, microrganisms, respiratory , pattern, rational ,medicine.

ABSTRACT

Introduction: Irrational use of antibiotics is a worldwide problem that contributes to dramatically increasing resistance and causes significant mortality, morbidity and increased health-care costs.(1,2) The promotion of rational use of antibiotics in the community plays an essential and complementary role to rational use initiatives in health care facilities and food production, and is crucial to limit the spread of resistance worldwide.

Objectives:
1. To promote the proper use of antibiotics and awareness of public towards the importance of commitment to medical prescription.
2. To determine the factors leading to irrational use and review those that should help achieve research objectives.

Research design: A Cross-sectional study using a questionnaire method to collect data and also of making direct interviews to assess participants' awareness of the importance of antibiotics and abide by the instructions of the doctor

Conclusion: Self-medication, patient incompliance, inappropriate period of use of antibiotic and patient education of antibiotic are major factors lead to emergence of irrational antibiotic use. It was clearly obvious in this study the high rate of inappropriate use of antibiotics due to high percent of self-administration of antibiotics (60%) and non-adherence to instructions by physician despite insufficient background knowledge of its use.

INTRODUCTION

Antibiotics influence the overall bacterial flora and result in the selection of resistant types of bacteria (3). World Health Organization (WHO) estimates that more than half of all medicines are prescribed, dispensed or sold inappropriately, and half of all patients fail to take them correctly.

All use, whether appropriate or not, can promote the emergence of resistance in bacteria. Unfortunately, inappropriate and excessive use of antibiotics is common in both high and low income countries.(4,5) Awareness of clinical manifestations that help differentiate viral from bacterial infection and the use of guidelines can promote the appropriate management of infections like respiratory infections(6).In many Asian countries as well as in KSA antibiotics are available over the counter without prescription and very few countries are monitoring antibiotic use. It is also noticed that most people get their medicines from the private and informal sectors. Thus, it is not surprising that irrational use of medicines continues.(7,8,9)

A major global problem

Irrational use of medicine is a major problem worldwide, rational use of medicine requires that “patient receive medication appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate of time, and at the lowest cost to them and their community”. WHO advocates 12 key interventions to promote this rational use.(5) Prescribers recommend antibiotics for patients who don’t need them and patients do not always adhere to their treatment or take antibiotics for diseases for which they do not help. To reduce inappropriate use is key to keep antibiotics effective, and is an important element of a national action plan. At the same time, a large proportion of the world’s population lack access to effective antibiotics. To increase access to antibiotics is therefore also essential, but this needs to take place within a framework of rational use. Thus, it is important to note that the goal of rational use initiatives is not always to reduce antibiotic use, but instead to ensure that the use is appropriate. Poor provider knowledge and lack of treatment guidelines are important contributors to inappropriate use of antibiotics.

The promotion of rational use of antibiotics in the community plays an essential and complementary role to rational use initiatives in health care facilities and food production, and is crucial to limit the spread of resistance worldwide. Community approaches can help patients take an active role in their health and ownership for their actions. This is of extra importance considering that antibiotics are sold over the counter without the prescription in many parts of the world. Public awareness campaigns can be effective when sustained and properly adapted for local conditions. In the same way, public awareness campaigns can be important to promote food business operators, including retailers, to favor food produced in accordance with quality schemes and systems of production that apply the principles of prudent use. That is, that minimize the use of antibiotics and promote high standards of animal welfare.(10) Clinical pharmacists improve the quality of drug prescribing (e.g. dosing and drug application, avoidance of adverse drug events). Microbiologists facilitate high-grade infection medicine by ensuring the quality of microbiological diagnostics and pre-analytics, and by expertly evaluating and conveying microbial culture results. Bacterial resistance to antimicrobial agents has become a worldwide problem, both in hospitals and in the community. In Swedish spread of several clones of resistant pneumococci occurred, especially among preschool children.(11) In Sweden prescriptions to out-patients have accounted for more than 80% of antibiotic sales, of which approximately 60% were prescribed for upper respiratory tract infections (RTI) and 25% for genitourinary infections. (12,13,14) Irrational use of antibiotics is a serious global problem with harmful consequences. These consequences include unnecessary adverse events, rapidly increasing antimicrobial resistance (due to over-use of antibiotics) and the spread of blood-borne infections such as HIV and hepatitis B/C (due to unsterile injections) all of which cause serious morbidity and mortality and cost billions of dollars per year. In the second International Conference on Improving Use of Medicines in 2004 and World Health Assembly Resolution WHA60.16 in 2007 recognized difficulty of promoting rational use of antibiotics in fragmented health systems. They recommend a cross-cutting health system approach and the establishment of national programs to promote rational use of antibiotics, which would require much more investment than governments and donors have so far been willing to give.(15)

METHODS AND RESEARCH DESIGN

This research is a prospective cross-sectional survey conducted in Tabuk city, Kingdom of Saudi Arabia KSA. Sample was randomly selected from different areas of the city including malls, universities, primary health centers and schools. Sample size determined using sample size calculator assuming a margin of error of about 6% and confidence level of 90%. And the study was conducted over a period of eight weeks during late March to June 2017. Data collectors distributed a self-administered questionnaire to persons selected randomly from different places at different times of the day and different days every week .participation rate was low but at the end we collected near the desired number according to the sample size calculator. The questionnaire consisted of three parts; demographic information in relation to gender, age, nationality, education level, medical insurance and average income. Second part evaluated the general knowledge of the participants regarding disease definition, cure, infections, and antibiotics; its definition, use and indications. We puts even questions regarding general perception about knowledge and perceptions related to illness, treatment, infections, antibiotics and its use. Four questions of which to evaluate participant's actual knowledge about antibiotics and its use. These questions involved information regarding their knowledge about illness, treatment, indications and duration for antibiotic use, what they know about symptoms and etiology of infections. And their perception was written as an answer to an open-type questions. Questions including information regarding antibiotic effectiveness against bacterial, viral, fungal, parasitic, or mixed (for any microorganism) infection and duration of antibiotic use were in form of closed-type questions. We gave score to these questions (0–4); high score of 4 indicating a good knowledge, 2–3 points indicates moderate but less knowledgeable than those with 4 , and 0–1 point indicates a poor knowledge of antibiotics and its use. The third part consisted of questions evaluating the participant's behavior to medicines and their cooperation to doctors' instructions. Both close-ended with multiple choices and open-ended questions were used in the questionnaire. Open-ended questions is to evaluate the general awareness of the participant's and to provide in-depth information. Questions' language was simple, comprehensive and easily understood. Data collectors sat with the participants explain to them the aims, took the permission and clarify the questions for any non-understandable phrases. Data collected were programmed and put in tables, using Microsoft excel sheet 2013 and analyzed through excel graphs, also we exported the data to Statistical Package for Social Sciences (SPSS) version 18 , and analysis using both descriptive and comparative statistics were performed using frequencies evaluation and crosstabs ,Pearson's chi-squared (X2) test and correlations were established. A pvalue less than 0.05 was accepted and considered to be statistically significant.

RESULTS AND DISCUSSION

Irrational use has led society to antibiotic resistance, a serious health problem worldwide (16). There are many factors that lead to irrational use; Regimen non-adherence, inappropriate antibiotics use, lack in awareness and background knowledge about antibiotics, inappropriate patient education by the physician and antibiotic misuse. Factors studied in this research and thought to affect public knowledge of antibiotics involved gender, age, educational level, marital status, occupation and monthly income. Other factors like insufficient explanation by the physician, misunderstand or non-adherence to physician's instructions, self-medication and self-administration also were studied and reasons behind its presence were looked for. May be one of the important factors leading to self-medication of antibiotics is having them in the over the count and that they can be easily bought from the pharmacy without restrictions or the need for physician's prescriptions. Out of 270 were asked to answer the research questionnaire, 148 accepted and were involved in our study from both genders, and only 121 completed all the questions requested in the self-administered questionnaire.30% of the sample were university students, near two third of which were medical students. About 64% of participants had their bachelor degree and out of these post graduated respondents only 31.1% answered correctly and had a good knowledge about antibiotics and its use.39 % thought antibiotics is effective against all types of organisms and can cure any infection. More than 63% had answered incorrectly on the questions testing their knowledge of antibiotics. 17.5% of participants identified antibiotics as being effective against viruses. 43% of

participant were not sure or they think it is helpful in any infection by any microorganism whatever it was. Only one third of all sample answered correctly and knew that antibiotics are mainly used against bacterial infections. (p value 0.0001) Even though participants with decorate studies were less than 4% of the sample but near 75 % of them had a good knowledge about antibiotics (Table 1) .Increased educational level is associated with high level of awareness regarding illness and antibiotic use (P value 0.005) this is very important in decreasing the irrational use of antibiotics and thus decrease the antibiotic resistance. A comparative western studies showed that people living in rural areas are significantly with insufficient knowledge of antibiotics (17) this is mainly because of decreased level of education and poor income to afford for physician visit. More than 15% of respondents think fever is first sign of bacterial infection. While 29.6% don't know the symptoms of infection but still they do know it is caused by viral or bacterial infection 38%. (Table 2)

Gender differences had no correlation with level of knowledge 38.5% of the sample were males. Females were co-operative and more welcoming to complete the questionnaire more than males. Even though this difference but it is shown in this study that there is no significant difference in knowledge between males and females and no correlation between level of knowledge and gender type. On the other hand age related correlation was wondrous somehow as strangely it was noticed that more than 63% of all those who responded correctly to questions testing their knowledge of antibiotics and its use were of the age group 18-24 years old (university students) even though they were only one third of their same age group. While those aged more than 45 years of age had less knowledge about antibiotic use (spearman correlation 0.05, p value 0.06) but they tend to use antibiotics without prescription and they will be more non-adherent to their physicians' instructions than other age groups.

Table 2 Evaluation of participants' knowledge about antibiotics and its use; Score of 4 is used to indicate good knowledge (least is 0 maximum is 4)

Antibiotics are Effective against	N(%)
Bacterial infections	36(30)
Viral infections	21(17.5)
Fungal infections	1(.8)
Parasitic infections	2(1.7)
For any microorganism	52(43.3)
Don't know	8(6.8)
***Antibiotics are indicated and used in**	N(%)
Fever	7(5.7)
Sore throat	8(6.6)
Respiratory infection	19(15.7)
Bacterial and viral infection	40(33)
Don't know	26(22.2)
***Symptoms of bacterial infection**	N(%)
Fever	20(16.6)
Pain	12(9.8)
Headache	8(6.5)
Skin rash	2(1.7)
Rubor or warm area	2(1.7)
Fatigue	8(6.5)
Don't know	35(29.6)
Usual duration of antibiotic used	N(%)
1-3 days	31(26)
4-7 days	38(31)
7-10 days	3(2.5)
More than 10 days	0(0)
Don't know	39(32)
***Etiology of infection**	N(%)
Tumor	1(.8)
Viral or bacterial	45(38)
Weakness in body, fatigue	10(8.3)
Allergy	2(1.7)
Comorbid disease	15(12.5)
Don't know	19(15.7)

*open-type questions and respondents can write more than one answerand their response is not shown here completely.

People have different thresholds to pain and illness and noticeably not all use medicines to relief their symptoms. Testing the terminology knowledge of illness and treatment,

Table 1 Correlation between different age –groups and determining the effectiveness of antibiotic to which microorganisms

		Q5						
		bacteria	**viruses**	**Fungi**	**parasites**	**All microorganisms**	**Don't know**	**Total**
Age	18-24	23	9	0	2	27	2	63
	25-35	8	8	1	0	11	5	33
	36-45	6	1	0	0	8	0	15
	46-55	0	1	0	0	6	0	7
	More than 55	0	2	0	0	0	1	3
Total		37(30)	21(17.5)	1(0.8)	2(1.7)	52(43)	8(6.6)	121(100)

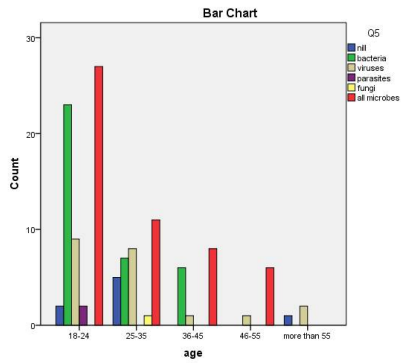

Figure 1 Age -related level of knowledge of antibiotics and its rational use determined by knowledge of its effectiveness aginst microorganisms:

participants varied in defining them, this variation is definitely due to variation in the background knowledge of each participants and variation in their previous experience of being ill , cured or not .Out of those who had good knowledge of antibiotics more than 16% defined illness as being disruption in the normal physiology of the human body. 44.4% of them define it as being week, tired, unwell or abnormal. On the other hand those with less or insufficient knowledge of antibiotics and its use mainly also defined illness as being week, tired, unwell or abnormal in more than 24%. 14 % of them think it is disruption of normal body physiology. Thus it is clear that they share the same perception of what illness is and what it may indicate, but what was noticed is that there is a good percent of those with less knowledge about antibiotic have a perception that illness means viral infection or being lethargic (table 3).

Table 3 Comparison between participants in how they define illness and their background knowledge of antibiotic

How illness is defined	participants with less knowledge n(%) tot. n 85	participants with good knowledge n(%) tot. n 36
Don't know	9 (10.6)	4 (11.1)
Viral attack to body cells	5 (5.9)	-
Pain	6 (7.1)	4 (11.1)
Sleep	2(2.3)	-
Transient phase	2(2.3)	2 (5,5)
Disruption in normal body physiology	12(14.1)	6 (16.6)
Felling tired or unwell	21(24.7)	16 (44.4)
Inability to continue daily activities	8(9.5)	4 (11.1)
Unhealthy state	9(10.6)	-
Problem	10(11.8)	2 (5.5)

In asking about their perception about treatment 22.7% of all define it as cure from illness. 15.5% think it is mainly pain relief while 14% said it is feeling better and relief of their symptoms. 5.7% they claimed that it relates to medication and that they don't like using medication or complete the full course of medication, 85 % of them had a poor knowledge of antibiotics and are non-adherent to physician's instructions.

Table 4 Frequency of participants according their behavior toward taking antibiotics without prescription

Do you take antibiotics without prescription?	N(%)	From where you bring your antibiotics?	N(%)
Always	23(19)	Pharmacy	62 (51)
Sometimes	29(24)	House hold	10 (8.5)
Never	69(57)	Friends	2 (1.7)
		sharing those of other family member	47(38.8)

Near one fifth of respondents19% stated that they always buy and self-administer antibiotics without physician's prescription. 24% said they had bought or used antibiotics without prescription once or more in life. They explained this as they had previous experience (around one quarter of the respondents). Also it was shown that the main sources of antibiotic supply without prescription were pharmacies 51%, family members sharing their own medicines 38.8% and being stored in the household 14.8%. Supplies from friends account only for less than 2% of participants. Many factors contribute to self- medication and self-administration, medical insurance showed a significant negative correlation .Non-insured participants (60 % of respondents) were more likely to buy their antibiotics from the pharmacies (Spearman correlation coefficient = -0.019) without a prescription by physician (Spearman correlation coefficient = -0.009) depending on their previous experiences. Other factors include profession with a significant positive relation (spearman correlation =0.000 sig. (2-tailed)) thus persons with medical profession are more likely to buy antibiotics from the pharmacies without prescription but they are more adherent to instructions on leaflet. (spearman correlation coefficient 0.156 with non-adherence). Marital status is a factor lead to self-medication and administration. Spearman correlation sig. 2-tailed =0.005). Noticeably they are more adherent to instructions on leaflet
Gender type is not affecting public behavior towards antibiotic use nor self-administration.

In the third part of this study which was consisted of three closed-type simple questions aimed to evaluate the participant's behavior to medicines and their cooperation and adherence to doctors' instructions.(Table 5)

Table 5 Respondents non-adherence to physicians' instructions

		Do you bring the medication prescribed by your physician?	Do you follow the physician's instruction on leaflet ?	Do you continue taking antibiotic for full course ?
N	Valid	148	148	148
	Missing	17	17	17
Answers:		1.36	1.31	1.50
yes		83(68.6)	77(63.6)	60(49.6)
No		38(31.4)	44(36.4)	61(50.4)
Mean		**.044**	**.042**	**.046**
Std. Error of Mean				
Median		1.00	1.00	2.00
Std. Deviation		.483	.466	.502
Variance		.233	.217	.252
Skewness		.574	.811	-.017
Std. Error of Skewness		.220	.220	.220
Range		1	1	1

It showed that more than half of the respondents were non-adherent to physician's instructions and near half don't complete the full course of antibiotic. These are significantly high percent really, putting in mind that antibiotics inappropriately used either by improper dosing, timing or course duration is a high risk factor for developing resistance to antibiotics. One third of participants' claimed they always bring the medication their doctor write for them to treat their infection but on the other hand 35.9% of respondents stated they stop antibiotic once they feel better or when the symptom relief. More than one third (40%) Don't complete a 24 hour dose and near a quarter they don't complete more than three days regimen. Figure 2 shows respondents' behavior regarding how many days long they complete of antibiotic course.

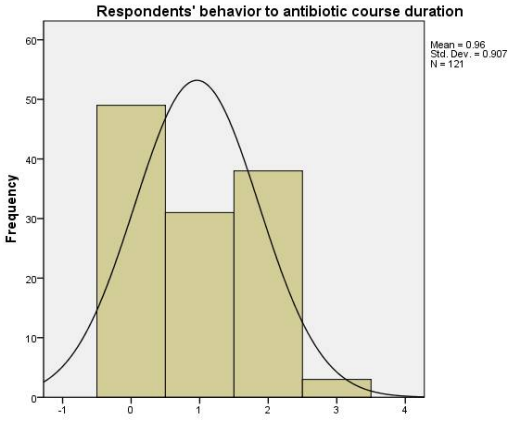

Figure 2 Frequencies of long duration of antibiotic use ;respondents' behavior: from left to right (less than 24 hours,1-3 days,4-7 days, and more than 7 days)

CONCLUSIONS

Self-medication, patient incompliance, inappropriate period of use of the antibiotic medicine and patient education of antibiotic are major factors led to the emergence of irrational antibiotic use. It was clearly obvious in this study the high rate of inappropriate use of antibiotics as a result of high percent of

self-administration of antibiotic medication even though the high rate of insufficient background knowledge of its use among population represented by more than two third of the study sample. Our study revealed important factors related to knowledge of antibiotics, one of which is educational level, low educational level is increasingly associated with inappropriate use of antibiotics due to lack of knowledge about antibiotics and its uses. A large percent of the respondents (43%) think it is used to treat any kind of infection by any organism (viral infections, bacterial, fungal or others), while (17.5%) think it is effective in treating just viral infections like common cold or viral upper respiratory infections. Moreover, people who are overestimating their knowledge of antibiotics depending on their experience mostly are non-adherent to physician's instructions and self-medication and administration. Non-adherent percentage reached 60 % (p value <0.05) of sample size which is significant and needs collaboration between health care policies makers and medical staff academics to increase the awareness of publics to antibiotics. Physicians as well as pharmacists are important role players in contributing to public knowledge of antibiotics and its use, and involving them in public education programs to increase rational antibiotic use in society and improve public behavior regarding antibiotic use is very important. Academics doctors are also an important part of community partnership increasing the awareness of rational antibiotic use by providing and offering educational courses and educational campaigns to the community to increase public knowledge of antibiotics.

Recommendations

Physician instructions' explanation by the physician himself and by the pharmacist who buy the medicine should be insisted to increase patients compliance and increase patient's knowledge about antibiotics uses and function. Related health policies should be revised and focus on provision of information about the rational use of antibiotics through the social media and other media like television educational programs. It is also recommended to restrict the use of antibiotics and control their exchange to be only by physician's prescription. Future studies counting the actual percent of self-medication and frequency of those buying antibiotics without physician's prescription from different pharmacies in Tabuk city is so helpful and necessary to determine the solutions and overcome this irrational behavior.

Acknowledgment

The authors would like to acknowledge financial support for this work from the Deanship of Scientific Research (DSR), University of Tabuk. Tabuk, Saudi Arabia, under grant no. S/0171/1438. Also we thank all those who helped in research success and all who participated and administered the questionnaire consecrating their time and effort for our study.
Last thing, we as the authors of this article declare no conflict of interest.

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