Antibiotics use and misuse in upper respiratory tract infection patients: Knowledge, attitude and practice analysis in University Hospital, Saudi Arabia

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Abstract

Objective: To assess the awareness and causes of antibiotics use and misuse in patients with upper respiratory tract infections.

Methods: This cross-sectional study was conducted at King Saud University, Riyadh, Saudi Arabia, from January 2014 to December 2015, and comprised patients suffering from upper respiratory tract infections. A well-established, self-administrated questionnaire was randomly distributed to the patients. The questionnaire consisted of 3 parts: demographic variables, knowledge, and beliefs, and behaviour towards antibiotic use and misuse. SPSS 21 was used for data analysis.

Results: Of the 400 participants, 193(48.25%) were males and 207(51.75%) were females. Besides, 182(45.5%) participants used antibiotics without prescription (p=0.050) and 43(10.8%) used the mover a pharmacist's advice (p=0.030). Also, 69(17.3%) participants forced the physicians to prescribe antibiotic (p=0.014), and 207(51.7%) patients stopped taking antibiotics when they felt better (p=0.007). Moreover, 180(45%) had the antibiotic stocks at home in case of emergencies. In addition, 67(16.8%) were ignoring the instructions when taking antibiotics (p=0.004). Furthermore, 48(12%) participants denied that an antibiotic could cause an allergic reaction (p=0.054) and the same number of participants believed that the effectiveness of the treatment would not be affected if a full course of antibiotic was not completed (p=0.029). In addition, 29(7.3%) participants with high educational level believed that all antibiotics did not have side-effects (p=0.002) and 71(17.8%) of them believed that if symptoms were improving the antibiotic course could be interrupted without completing (p=0.037).

Conclusion: Misconceptions existed about the use and indications of antibiotics.

Keywords: Antibiotics, Awareness, Misuse, Upper respiratory tract infection. (JPMA 67: 1387; 2017)

Introduction

Upper respiratory tract infections (URTIs) are the most prevalent infectious diseases in many societies and are one of the major reasons that patients visit the primary care clinics, especially in the winter. Both bacteriological and viral micro-organisms are aetiological factors contributing to the development of URTIs.[1] However, most of them are caused by viruses, in which antibiotics are not needed.[2-4] Respiratory system conditions are the most common cause for antibiotics prescription.[5,6] Several studies showed that physicians practice in prescribing antibiotics in such cases could be related to the physician's response to the patient pressure.[7-9] In addition, over-prescription practices have been attributed to vague diagnosis and the fear of inadequate level of health care. Antibiotics misuse in cases where no definite clinical benefits from them can lead to adverse effects.[10-12] The likelihood of antibiotics misuse by the public can be linked to the widespread glitches in the information about antibiotics. The general lack of knowledge and the poor awareness among the public with regard to the proper use of antibiotics and its indications have been documented.

There is a common misunderstanding that the use of antibiotics can help in faster recovery and in the prevention of further illnesses in common conditions like URTIs.[13,14] The knowledge, attitudes and behaviours differ from one community to another. Limited literature is available from the Middle East region addressing such topics,[14,15] and there is a large gap in the knowledge to understand the proper use of antibiotics. The current study was planned to assess knowledge, attitudes and beliefs regarding antibiotics use and its effectiveness for URTIs.

Patients and Methods

This cross-sectional study was conducted at the primary care department, King Khalid University Hospital, College of Medicine, King Saud University, Riyadh, Saudi Arabia, from January 2014 to December 2015, and comprised patients suffering from URTI. King Khalid University Hospital is one of the largest and leading university teaching hospitals in the country. The hospital provides

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primary, secondary and tertiary healthcare services to patients from across the country as well as the Gulf region.

Patients aged 16 years or above were included. Well-structured English language questionnaires were distributed among the participants.

The questionnaire was formed based on the questions taken from previous studies and edited to suit the objectives.[2,14,16,17] A pilot study was conducted to test the validity of the questionnaire. The final version of the questionnaire contained 33 questions divided into four main parts. The first part was about demographic features. The second part was designed to assess recent antibiotics usage in the last year, the reason of the usage, and whether it was used with or without a prescription. The third part contained 11 statements with (Yes-No-Not sure) options to assess participants' general knowledge and attitude towards antibiotics. Statements included role of antibiotics, harmful effects of antibiotics and completion of treatment course. The fourth part was designed to evaluate the behaviours towards antibiotics use. This part consisted of 9 statements about the antibiotics usage in common cold, patient's expectation from the physicians, patient's compliance, sharing and keeping antibiotics for emergency cases and others. Responses were taken also in Yes-No-Not sure pattern. One additional question was asked about the participants' source of information about antibiotics; the options were: from the doctor, pharmacist, internet, media, relatives or friends. A written consent was taken from all respondents before answering the questionnaires. Participants' anonymity was assured by assigning each participant with a code number for the purpose of analysis only. No incentives or rewards were given to participants. Data collection was conducted from December 2013 to February 2014. Data analysis was done using SPSS 21. The prevalence of antibiotic use, misuse and its awareness were determined by comparing outcome measures. Numerical variables were reported as the mean ± standard deviation. $P<0.05$ was considered significant.

Study was approved by the institutional review board.

Results

Of the 420 questionnaires distributed, 400(95.24%) completed questionnaires were included while the remaining 20(4.76%) were excluded due to incomplete filling or double answers. Of the participants, 193(48.25%) were males and 207(51.75%) were females. Participants were compared according to their demographic parameters: age, nationality, marital status, educational level, employment status, antibiotics usage per year, and

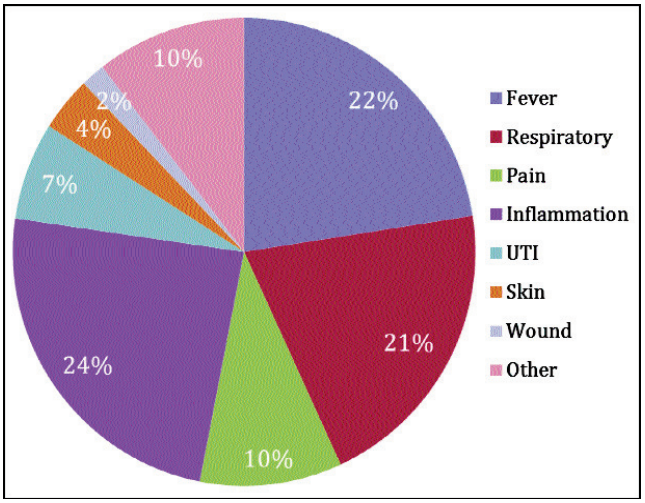

Figure-1: Participants reseaons for the use of antibiotics.

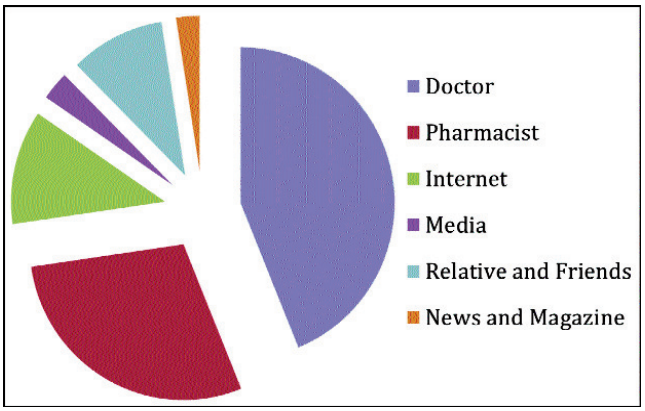

Figure-2: Participants' source of information about the antibiotics.

recent antibiotics usage within one year. Among the respondents, 150(37.5%) were in the age group of 26-35 years (p=0.320), 250(62.5%) were married (p=0.057), 230(57.5%) were well educated (college or university) (p=0.001), and 184(46%) were employed (p=0.001). About 281(70.3%) of the individuals used antibiotics recently (p=0.578) and 184(46%) used 2-4 times per year (p=0.408) (Table-1).

Moreover, 182(45.5%) participants were using antibiotics without prescription (p=0.050) and 43(10.8%) were using the antibiotics over a pharmacist's advice (p=0.030). Besides, 69(17.3%) of all age groups had forced the doctor to prescribe antibiotics, and 25(6.3%) of them were aged between 26-35 years (p=0.014). Furthermore, respondents who stopped taking antibiotics when they felt better were higher in the age group of 26-35 years, with a given percentage of 88(22%) out of 207(51.7%) (p=0.007). Moreover, 180(45%) participants agreed on

Table-1: Demographic characteristic of the participants.

Parameter	n (%)	Male n (%)	Female n (%)	P value
Age (years)				
16 – 25	83 (20.8%)	47 (11.8%)	36 (9%)	
26 – 35	150 (37.5%)	65 (16.3%)	85(21.3%)	0.32
36 – 45	89 (22.3%)	44 (11%)	45(11.3%)	
46 – 55	52 (13.3%)	23 (5.5%)	29 (7.3%)	
> 55	26 (6.5%)	14 (3.5%)	12 (3%)	
Nationality				
Saudi	377 (94.2%)	185 (46.1%)	192 (48.1%)	0.187
Non-Saudi	23 (5.8%)	8 (2%)	15 (3.8%)	
Marital Status				
Single	121 (30.3%)	60 (15.2%)	61(15.4%)	
Married	250 (62.5%)	125 (31.4%)	125(31.6%)	0.057
Divorced	15 (3.8%)	5 (1.3%)	10 (2.5%)	
Widowed	10 (2.5%)	1 (0.3%)	9 (2.3%)	
Educational level				
Elementary school or lower	49 (12.3%)	5 (1.3%)	44 (11%)	
Secondary school	27 (6.8%)	9 (2.3%)	18 (4.5%)	<0.001
High school	94 (23.5%)	40 (10%)	54 (13.5%)	
College or over	230 (57.5%)	139 (34.6%)	91 (22.8%)	
Employment status				
Employed	184 (46%)	142 (35.3%)	42 (10.5%)	
Unemployed	132 (33%)	11 (2.8%)	121 (30.3%)	<0.001
Student	60 (15%)	27 (6.8%)	33 (8.3%)	
Retired	24 (6%)	13 (3.2%)	11 (2.8%)	
Antibiotics usage per Year				
Once	123 (30.8%)	58 (14.5%)	65 (16.3%)	0.408
2 – 4 times	184 (46%)	95 (23.7%)	89 (22.3%)	
More than 4 times	93 (23.3%)	40 (10%)	53 (13.3%)	
Recently used antibiotics (One Year)				
Yes	281 (70.3%)	137 (34.3%)	144 (36%)	0.578
No	119 (29.7%)	53 (13.2%)	66 (16.5%)	

keeping the antibiotic stocks at home in cases of emergencies, with a higher percentage in the age group between 16-35 years (p=0.010). In addition, 67(16.8%) participants were found to be ignoring the instructions on the label when taking antibiotics (p=0.004) (Table-2).

Furthermore, 48(12%) participants denied that antibiotics could cause an allergic reaction (p=0.054). The same number of participants believed that the effectiveness of the treatment would not be affected if a course of antibiotic was not completed; of them, 25(6.2%) were males and 23(5.8%) were females (p=0.029). On the other hand, behavioural questions' results revealed that of 26(6.8%) male participants out of 41(10.3%) obtained antibiotics without prescription (p=0.042), and the same percentage was recorded for males getting antibiotics over a pharmacist's advice. Moreover, males and females who took antibiotics when they suffered with common cold represented 98(24.5%) and 76(19%), respectively (p=0.014). Moreover, 121(30.3%) of males and 104(26%) of females expected antibiotics to be prescribed by their doctor if they suffered from symptoms of common cold. However, 41(10.3%) males and 28(7%) females used to force the doctor to prescribe to them antibiotics when they felt sick (p=0.043). The majority of both genders 179(44.8%) showed significant result in keeping antibiotic stocks at home in case of emergency (p=0.006) and also using the leftover antibiotics for a respiratory illness 36 (9%) (p=0.001) (Table-3).

The logic of comparing participants' knowledge, beliefs and attitudes towards antibiotic use and awareness to antibiotic use without prescription is valid. It shows that the participants who were knowledgeable of antibiotics and knows the danger of using antibiotics without prescription tend not to use antibiotics without proper prescription. That holds true with participants' beliefs and attitudes.

The analysis of educational levels' indicated that 29(7.3%)

Table-2: Comparison of age group of participants with regard to knowledge, beliefs and attitudes towards antibiotic use and awareness.

			Age				
	Yes \ No		16-25 n (%)	26-35 n (%)	36-45 n (%)	46-55 n (%)	>55 n (%)	P value
Antibiotics used by prescription	No	182 (45.5%)	49 (12.3%)	62 (15.5%)	37 (9.3%)	20 (5%)	14 (3.5%)	0.050
Antibiotics used by pharmacist's advice	Yes	43 (10.8%)	17 (4.3%)	13 (3.3%)	6 (1.5%)	5 (1.3%)	2 (0.5%)	0.030
I force mydoctor to prescribe me antibiotics when I get sick	Yes	69 (17.2%)	21 (5.3%)	25 (6.3%)	17 (4.3%)	6 (1.5%)	0	0.014
I normally stop taking antibiotics when I start feeling better	Yes	207 (51.7%)	51 (12.8%)	88 (22%)	42 (10.5%)	16 (4%)	10 (2.5%)	0.007
I normally keep antibiotic stocks at home in case of emergency	Yes	180 (45%)	50 (12.5%)	71 (17.8%)	32 (8%)	20 (5%)	7 (1.8%)	0.010
I take antibiotics according to the instruction on the label	No	67 (16.8%)	9 (2.3%)	23 (5.8%)	13 (3.3%)	12 (3%)	10 (2.5%)	0.004

Table-3: Comparison of gender in relation with participant's knowledge, beliefs and attitudes towards antibiotic use and awareness.

	Yes \ No n (%)	Male n (%)	Female n (%)	P value
Antibiotics use without prescription	Yes 41 (10.3%)	26 (6.8%)	15 (4%)	0.042
Antibiotics can cause allergic reaction	No 48 (12%)	23 (5.8%)	25 (6.2%)	0.054
The effectiveness of treatment reduced if a full course of antibiotic is not completed	No 48 (12%)	25 (6.2%)	23 (5.8%)	0.029
When I get a cold, I used to take antibiotics to help me get better more quickly	Yes 174 (43.5%)	98 (24.5%)	76 (19%)	0.014
I expect antibiotics to be prescribed by my doctor if I suffer from symptoms of common cold	Yes 225 (56.3%)	121 (30.3%)	104 (26%)	0.032
I usually force my doctor to prescribe me antibiotics when I get sick	Yes 69 (17.3%)	41 (10.3%)	28 (7%)	0.043
I normally keep antibiotic stocks at home in case of emergency	Yes 179 (44.8%)	94 (23.5%)	85 (21.3%)	0.006
I use leftover antibiotic for a respiratory illness	Yes 36 (9%)	19 (4.7%)	17 (4.3%)	0.001

Table-4: Comparing the education level of participants with antibiotic awareness.

		Educational Level				
	Yes/ No n (%)	Elementary school n (%)	Secondary school n (%)	High school n (%)	College or University n (%)	P value
Antibiotics do not cause side effects	Yes 63 (15.8%)	18 (4.5%)	4 (1%)	12 (3%)	29 (7.3%)	0.002
Stop taking a full course of antibiotic on improving of symptoms	Yes 146 (36.5%)	26 (6.5%)	12 (3%)	37 (9.3%)	71 (17.7%)	0.037
Normally stop taking antibiotics when feeling better	Yes 207 (51.8%)	28 (7%)	14 (3.5%)	60 (15%)	105 (26.3%)	0.012

of the participants with high educational level (college and university) believed that all antibiotics do not have side-effects (p=0.002). Furthermore, 71(17.8%) of them considered that if their symptoms were improving they could interrupt the course of the antibiotic without completing it (p=0.037). As a result, their percentage was the highest among all educational levels in stopping the intake of the antibiotic after feeling better, i.e. 105(26.3%) out of 207(51.8%) (p=0.012) (Table-4).

Moreover, 122(30.61%) participants showed misuse towards antibiotics.

Inflammation was the cause of antibiotic use in 96(24%) participants, fever in 88(22%), respiratory factors in 84(21%), pain in 40(10%), urinary tract infections in 28(7%), skin diseases in 16(4%) and wound in 8(2%) (Figure-1). Furthermore, participants' sources of information about antibiotic were primarily doctors, followed by pharmacists. The other sources were the Internet, relatives and friends, the media, and news and magazine (Figure-2).

Discussion

Antibiotics' misuse can lead to a wide range of adverse consequences. The patients' knowledge and beliefs about antibiotics can dramatically affect the way they use these medications. Therefore, it is necessary to assess the extent of patients' knowledge in order to reach the right interventions, which in turn guide the patients' behaviours and usage toward these drugs.[14] This study demonstrates that the majority of the participants were using antibiotics frequently from two to four times per year. Furthermore, 281(70.3%) of the respondents had used antibiotics within the past year. In addition, the percentage reported in this study was even higher than the percentage reported by a study conducted in Oman by Jose et al.,[14] in which only 66% of the respondents had used antibiotics recently within the last year.[14] The causes for using antibiotics varied from one respondent to the other with higher percentages given to reason for

inflammation (24%), fever (22%), and respiratory illness (21%). In terms of knowledge, 55.8% of participants agreed that antibiotics could be used to treat viral infections in general compared to 46% as reported by Curry et al.[10] This confirms the lack of knowledge of the participants and their inability to recognise the differences between bacteria and viruses allied diseases. The reason behind this can be due to the use of the word "germs" when counselling and seeking a medical advice instead of using the words "bacteria" or "viruses".[2] Moreover, the majority of respondents believe that antibiotics can also be used to relieve pain and fever. When the participants were questioned directly about their behaviours towards antibiotics, 82.7% had the correct behaviour in disagreement to the statement about "I usually force my doctor to prescribe me antibiotics when I get sick". Nevertheless, 56.3% were expecting their doctors to prescribe them an antibiotic when suffering from common cold. This can be attributed to the large number of prescriptions for antibiotics in respiratory viral infections, which in most of the cases are self-limiting. This leads to the impact on the general belief that such medicines are effective against these diseases. Consequently, such incorrect belief contributes to the raising of the expectations that antibiotics are an appropriate treatment for common colds.[2] The vast majority of participants (88%) in the current study were more aware that if an antibiotic's full course was interrupted, the effectiveness will decrease; this finding was in comparison with a study conducted by Oh et al. in which 71.1% participants answered correctly.[2] However, 51.8% agreed that they would stop using antibiotics when they start feeling better. This showed the inadequacy of knowledge wherein most people do not understand the real cause and the actual significance of completing the antibiotic's full course.[2] The results of this study stressed the need for an urgent intervention by educating people through annual campaigns about antibiotics' uses, and the importance of compliance. Moreover, it is important to clarify the differences between bacteria and viruses, causes of common colds, and how to alleviate their symptoms apart from antibiotics' usage. The analysis of awareness based on demographics showed significant correlation between misuse and three main factors which are age, gender, and educational level. It was found that those in the age group between 26-35 years were behaving incorrectly more than the other age groups. Furthermore, it had been shown that after the age of 35, individuals become more aware and tend to have a more positive attitude towards antibiotics as their age progresses. This guides us to direct these campaigns to this age group in particular and the other age groups in general. Moreover, in this study females seemed to be behaving better than males in several ways like in using antibiotics without prescriptions, keeping stocks, and using leftover antibiotics. We can attribute this result to the females' nature where they are more careful and practical than men when it comes to their lives.[18] As reported, there is correlation between misusing antibiotics and high educational level. When the participants were questioned directly about their source of information about antibiotics, physicians were occupying the first place followed by the pharmacists. Therefore, it is also important to alert physicians to educate people about the rational uses of antibiotics, its adverse consequences, common cold aetiology, and its management. In addition, pharmacists should be willing to refuse any selling of an antibiotic without prescription. Moreover, health officials can set policies to limit these actions globally.

The strengths of this study are represented in several aspects. It was conducted in a tertiary care hospital that provides services to all citizens coming from different regions. The questionnaire was distributed equally between both genders. However, there are some limitations in the present study as well. First of all, most participants had high educational level, which can be due to shortage in the number of options provided in the questionnaire where diploma degree holders were not included. As a result, participants who held diploma might choose "college and university" option. Therefore, increasing the number of options would have defined another representative. Second, recall bias might affect the results as some of the questions depended on recalling. Moreover, the results depended on the honesty and the understanding of the respondents, as it was a self-reported questionnaire. Even though King Khalid University Hospital attracts a large number of citizens coming from different regions, this study can be generalised to Riyadh only as Saudi Arabia has different culture in various regions. Furthermore, it would be a supporting study to future researches conducted in other regions as health-related studies and policies supporting each other. Finally, we recommend starting a large-scale research covering the whole nation in order to represent the data optimally.

We recommend well-planned educational campaigns to raise the awareness of antibiotic uses and its adverse effects. Moreover, we recommend that similar studies should be held in different regions in Saudi Arabia. In addition, it is important to have a standard policies regarding antibiotics' selling, wherein getting any antibiotic without prescription should not be allowed.

Furthermore, since the majority of participants get their information from their doctors, educating patients by physicians about antibiotic uses, its role in treating aetiologies of URTIs and its adverse effects will have a great impact on patients' knowledge and behaviour. Major changes in prescribing practice supported by a national information campaign would be beneficial to reduce patient's expectation from antibiotics and to raise awareness about antibiotic resistance.

Conclusion

Misconceptions existed about the use and indications of antibiotics. This study highlights the need to educate patients regarding antibiotic use and the consequences of misuse. Which diseases actually require antibiotics, why full daily doses must be respected, risk of keeping part of a course for future uncontrolled use and need of a prescription for getting antibiotics from the pharmacist are some of the issues to be discussed with the patients. The majority of participants who show misuse were from age group 26-35, which makes them the main target for future awareness and educational programmes to improve the knowledge, attitude and behaviour towards antibiotic uses. Interaction is required between physicians and patients and involvement of both print and electronic media may help to improve the antibiotics knowledge and practices in community and consequently control the antibiotics misuse.

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References

1. Bosch AA, Biesbroek G, Trzcinski K, Sanders EA, Bogaert D. Viral and bacterial interactions in the upper respiratory tract. PLoS Pathog. 2013; 9: e1003057.
2. Ling Oh A, Hassali MA, Al-Haddad MS, Syed Sulaiman SA, Shafie AA, Awaisu A. Public knowledge and attitudes towards antibiotic usage: a cross-sectional study among the general public in the state of Penang, Malaysia. J Infect Dev Ctries. 2011; 5:338-47.
3. Zyoud SH, Abu Taha A, Araj KF, Abahri IA, Sawalha AF, Sweileh WM, et al. Parental knowledge, attitudes and practices regarding antibiotic use for acute upper respiratory tract infections in children: a cross-sectional study in Palestine. BMC Pediatrics. 2015;15:176.
4. Cals JW, Boumans D, Lardinois RJ, Gonzales R, Hopstaken RM, Butler CC, et al. Public beliefs on antibiotics and respiratory tract infections: an internet -based questionnaire study. Br J Gen Pract. 2007; 57:942-7.
5. Murphy M, Bradley CP, Byrne S. Antibiotic prescribing in primary care, adherence to guidelines and unnecessary prescribing - an Irish perspective.BMC Fam Pract. 2012; 13:43.
6. Brooks L, Shaw A, Sharp D, Hay AD. Towards a better understanding of patients' perspectives of antibiotic resistance and MRSA: a qualitative study. Fam Pract.2008; 25:341-8.
7. Shehadeh M, Suaifan G, Darwish RM, Wazaify M, Zaru L, Alja'fari S. Knowledge, attitudes and behavior regarding antibiotics use and misuse among adults in the community of Jordan. A pilot study.Saudi Pharm J. 2012; 20:125-33.
8. Awad A, Aboud E. Knowledge, Attitude and practice towards Antibiotic use among the public in KuwaitPLoS One. 2015; 10:e0117910.
9. Gualano MR, Gili R, Scaioli G, Bert F, Siliquini R. General population's knowledge and attitudes about antibiotics: a systematic review and meta-analysis. Pharmacoepidemiol Drug Saf. 2015; 24:2-10.
10. Curry M, Sung L, Arroll B, Goodyear-Smith F, Kerse N, Norris P. Public views and use of antibiotics for the common cold before and after an education campaign in New Zealand. N Z Med J. 2006; 119:U1957.
11. Rattinger GB, Mullins CD, Zuckerman IH, Onukwugha E, Walker LD, Gundlapalli A, et al. A Sustainable Strategy to Prevent Misuse of Antibiotics for Acute Respiratory Infections.Manzoli L.PLoS ONE. 2012;7:e51147.
12. Napolitano F, Izzo MT, Di Giuseppe G, Angelillo IF. Public Knowledge, Attitudes, and Experience Regarding the Use of Antibiotics in Italy. PLoS ONE. 2013; 8:e84177.
13. McNulty CA, Nichols T, French DP, Joshi P, Butler CC. Expectations for consultations and antibiotics for respiratory tract infection in primary care: the RTI clinical iceberg. Br J Gen Pract. 2013; 63:e429-36.
14. Jose J, Jimmy B, Alsabahi AG, Al Sabei GA. A study assessing public knowledge, belief and behavior of antibiotic use in an Omani population. Oman Med J. 2013; 28: 324-30.
15. Shariff A, Al Dhubiab BE, Al Nowis M, Al Haddad F, Al Omran N, Al Khuliteet H. Statistical investigation of patient factor in development of antibiotic resistance - A study in Eastern Province of Saudi Arabia. Int J Pharm Pharm Sci. 2013;5:151-6.
16. McNulty C, Boyle P, Nichols T, Clappison P, Davey P. Don't wear me out-the public's knowledge of and attitudes to antibiotic use. J Antimicrob Chemother. 2007; 59:727-38.
17. So Sun K, Seongmi M, Jung E. Public Knowledge and Attitudes Regarding Antibiotic Use in South Korea.J Korean AcadNurs.2011; 41:742-9.
18. Biswas M, Roy MN, Manik MIN, Hossain MS, Tapu STA, Moniruzzaman M, et al. Self medicated antibiotics in Bangladesh: a cross-sectional health survey conducted in the Rajshahi City. BMC Public Health. 2014; 14:847.