Knowledge, awareness, and attitudes toward antibiotic resistance and practice of self-medication among university students in Bangladesh: A cross-sectional study

Gowranga Kumar Paul, Md. Shalauddin Swapon, K. M. Kaderi Kibria

Abstract:
BACKGROUND: The prevalence of self-medication is high in Bangladesh due to easy access and poor regulatory controls over these drugs. Our study aimed to assess the attitude of university students in Bangladesh toward antibiotic usage, especially their knowledge and awareness about antibiotics and their resistance. We also evaluated the determinants behind their attempts at drug intake without prescription.

MATERIALS AND METHODS: A cross-sectional study was conducted in Mawlana Bhashani Science and Technology University that included information from randomly selected 200 students from 15 departments using a structured questionnaire. The statistical analyses were performed by using SPSS software (version 21) and R programming.

RESULTS: The study revealed that 61.0% of the students use self-medication at different times or always; 32.5% of the respondents keep antibiotics for future use, and 38% of the students think it is right to stop antibiotics when symptoms are improving. Half of the participants (47.5%) use antibiotics based on their previous experience. The criteria of antibiotic selection have a significant relationship with knowledge about antibiotic resistance (P = 0.017) and altered prescribed medicine without doctor’s advice (P < 0.001). The multivariate analysis indicates that respondents who know about antibiotic resistance select antibiotics from the community pharmacists with respect to their own experience 5.102 times higher than those who do not know about antibiotic resistance.

CONCLUSIONS: The study mainly explored the knowledge gaps of the students on the options that are responsible for antibiotic resistance in the community and found that students have mid-level knowledge (66%) about antibiotic resistance.

Keywords: Antibiotics, Bangladesh, knowledge, prescription, prevalence, resistance, self-medication, student

Introduction

Antibiotics have a profound public health impact on combating bacterial infections for a long time. However, pathogenic bacteria acquire resistance to these antimicrobials for several valid reasons. One of the most important is improper self-medication with a lack of knowledge in the low- and low-to-middle-income countries.[1] A study from secondary data showed that most people think antibiotic resistance is a global problem.[2] The pharmacy customers in Norway showed a mid-level knowledge of antibiotics and a strong knowledge of antibiotic resistance.[3] About 80% of the respondents agreed with the notion that the unnecessary use of antibiotics could
increase the resistance of bacteria. However, a study conducted in northern Uganda showed that a high proportion (75.7%) of the respondents practiced antimicrobial self-medication. A similar outcome was reported in Ethiopia (67.3%), southern Spain (41.0%), Iran (84.9%), and rural people in Lithuania (53.2%). Colombian people were found to buy amoxicillin by the advice of the drug seller. Most of them are male and take amoxicillin if they have respiratory problems. The common indication for antibiotic use in Spain was the common cold. Abdelkarem et al. revealed that previous experience with the disease was the main reason behind self-medication with antibiotics in the UAE. It was reported that the self-medication behavior can be reduced by social cognitive theory-based self-care intervention by enhancing awareness in target group.

Developing countries are more threatened by excessive use of antibiotics, nonhuman use of antibiotics, poor drug safety, insufficient monitoring, and factors related to the person and national deprivation. Bangladesh, a South Asian developing country with a high degree of antibiotic resistance, poses a regional and global threat.

The people of Bangladesh have an exiguous amount of knowledge about antibiotic resistance. Researchers found that almost 97.5% of the general people of Bangladesh have never heard of the term antibiotic resistance. Numerous studies have been conducted on the prevalence of antibiotic resistance in Bangladesh; no attempts had yet been made to effectively unify them. The present study attempted to interpret the knowledge, awareness, and attitude toward antibiotic self-medication and their resistance in university-level students in Bangladesh to point out the necessity to enhance the consciousness about antibiotic resistance among the students.

Materials and Methods

Research design
A cross-sectional study was conducted using a structured questionnaire. The information was collected using a structured questionnaire developed by a research team consisting of researchers having expertise in conducting questionnaire-based studies from August 2019 to January 2020. The inclusion criteria for participants were as follows: (i) students of Mawlana Bhashani Science and Technology University (MBSTU) and (ii) those who agree to participate in the interview and share their opinion. Students who are not willing to share their information were excluded from the study.

Study setting and sample size
In general, university students were supposed to be more conscious about antibiotic resistance in comparison to the common people with a lower level of education. There are 42 public universities in Bangladesh. MBSTU is the 12th government-financed public university and 2nd science and technology specialized public university in Bangladesh. The university was established in a remote area of Tangail district. Currently, the university has 15 departments, where 6 departments are under life science faculty. The students of this university come from different corners of the country, similar to most public universities. Hence, we primarily aimed to evaluate the knowledge base of the students of MBSTU, which will also point out the condition in other universities.

First, a pilot survey was conducted, and based on that information, the questionnaire was reformed in some cases. Finally, a sample of 200 students was randomly selected from different departments of MBSTU.

Data collection
The field investigator team comprised a research assistant conducting the personal interview. After obtaining the informed consent, the information was collected through a structured questionnaire and documented. We have maintained the confidentiality of their information strictly.

Outcome measures
To identify the relationship between the dependent variable and the independent variable, several statistical techniques were used. Correspondence analysis (CA) was performed to analyze the categorical data when the variables have the same categories. Chi-square test was performed in the correspondence table to show the relationship between the respective variables. Biplot of CA represents the association between the categories and different variables. Multivariate analysis exhibits a comparison among the category of the dependent variable with one or more than one independent variable. Multinomial logistic regression analysis was performed when the dependent variable is on a nominal scale, and more than one category was used. The entire analysis was done by a statistical software called Statistical Package for the Social Science (SPSS version 21.00, Chicago, IL, USA) and R programming.

Results

Frequency distribution of different variables
The students of MBSTU are from different districts of Bangladesh. We have included 200 students from 15 departments of MBSTU, who are from 7 districts of Bangladesh. The frequency distribution of the sample respondents is described in Table 1. The data show that 68.5% of the respondents are male, and the majority of them belong to the ages of 20–24 (67.5%). About half of the respondents (48.0%) think that the incomplete
Table 1: Frequency distribution of different variables

| Variables                          | Frequency (%) |
|-----------------------------------|---------------|
| Gender                            |               |
| Male                              | 137 (68.5)    |
| Female                            | 63 (31.5)     |
| Age                               |               |
| 18-20                             | 45 (22.5)     |
| 20-22                             | 66 (33.0)     |
| 22-24                             | 69 (34.5)     |
| >24                               | 20 (10.0)     |
| Cause of being antibiotic resistance |          |
| Self-medication                   | 38 (19.0)     |
| Not completing the dosages         | 96 (48.0)     |
| Using antibiotic repeatedly        | 43 (21.5)     |
| Others                            | 23 (11.5)     |
| Antibiotic satisfaction level      |               |
| Excellent                          | 6 (3.0)       |
| Satisfactory                      | 109 (54.5)    |
| Good result                       | 78 (39.0)     |
| No result                         | 7 (3.5)       |
| Reason to use antibiotic without prescription |         |
| Previous experience               | 95 (47.5)     |
| Mild disease                      | 11 (5.5)      |
| Save time and money               | 34 (17.0)     |
| Emergency use                     | 60 (30.0)     |
| Last use antibiotic               |               |
| <3 month                          | 36 (18.0)     |
| Between 3 and 6 months            | 49 (24.5)     |
| Between 6 to 12 month             | 27 (13.5)     |
| >1 year                           | 88 (44.0)     |
| Steps in adverse reaction of antibiotic |        |
| Did not face adverse reaction     | 83 (41.5)     |
| Consult with a doctor             | 68 (34.0)     |
| Consult with pharmacy stuff       | 12 (6.0)      |
| Stop taking antibiotic            | 15 (7.5)      |
| Nothing                           | 22 (11.0)     |
| Total                             | 200 (100.0)   |

did not face any adverse reaction after taking antibiotics. The rest of the respondents who encountered adverse reactions after taking antibiotics either got a consultation from a doctor (34.0%) or received consultation from pharmacy staff (6%) and stopped taking antibiotics (7.5%). However, in this situation, 11.0% of the respondents did not take any necessary steps.

Graphical representation of different factors of antibiotic use

It has been found that 32.5% of the respondents keep antibiotics for future use [Figure 1a]. Figure 1b shows that 34.0% of the respondents do not hear the term antibiotic resistance, whereas the rest of them (66.0%) know this term. Figure 1c illustrates that the majority of the total respondents use antibiotics last time for fever and around 10.05%, 8.04%, 9.55%, and 4.02% were for the common cold, diarrhea, typhoid, and asthma, respectively. In Figure 1d, the pie chart shows that 54.5% of the respondents think that “sometimes” self-medication with an antibiotic is not a problem. On the other hand, 39.0% of the respondents supposed that it is wrong to take an antibiotic by self-medication. While the remaining 6.5% of the respondents think antibiotic use by self-medication is always right.

Correspondence analysis

The correspondence table [Table 2] illustrates that 130 respondents (65.0%) strongly agreed with the opinion that people should use antibiotics prescribed by a doctor all the time. Similarly, 137 respondents (68.5%) strongly believe that the unnecessary use of antibiotics makes them inactive. Whereas, 153 students (76.5%) assert that people should not change the dosage of antibiotics without a doctor’s advice. However, 114 respondents (57.0%) strongly agree that excessive use of antibiotics on poultry and livestock might be responsible for the spread of antibiotic in the human body; and 113 students (56.5%) strongly agree that antibiotic resistance would arise if a full course of antibiotics is not complete. There is a strong relationship among different variables with the opinion of the respondents about antibiotics as $P < 0.001$ and the Chi-square test is 58.922.

The summary table [Table 3] is important, which provides the output of CA. From the summary table, the first dimension accounts for 2.9% of the total variable, the second dimension accounts for 2.8%, and so on. The total inertia found is only 5.9%, which is not a great deal of the whole inertia. The cumulative column gives the proportion that is accounted for the variability by the dimension. The first dimension is accounted for 49.8% of the total variability, the second dimension is accounted for 48.0% of the total variability, and so on. Here, 97.8% of the total variability is accounted for in
the first two dimensions. Finally, we observed from the correlation matrix that the obtained dimensions are not highly correlated. The correlation coefficient between dimension 1 and dimension 2 was 0.156.

The biplot in Figure 2, which was obtained from R programming, depicts a scatter plot of the coordinates with dimensions 1 and 2 for both knowledge-type variable and response category. Two points (inactive_AB and agree strongly) are very close to each other in the middle of the biplot, which concludes that the respondents strongly agreed with the opinion that unnecessary use of antibiotics makes them inactive. From the right side of the biplot, it has been shown that respondents are neutral about the opinion that excessive use of antibiotics on poultry and livestock is responsible

Table 2: Correspondence analysis to understand the knowledge about antibiotic resistance

| Variables                                                                 | Opinion                      | χ²   | P       |
|--------------------------------------------------------------------------|------------------------------|------|---------|
| People should use antibiotic prescribed by a doctor all the time          | Disagree strongly           | 14   |         |
|                                                                           | Disagree slightly            | 8    |         |
|                                                                           | Neutral                      | 11   |         |
|                                                                           | Agree slightly               | 37   |         |
|                                                                           | Agree strongly               | 130  | <0.001  |
| Unnecessary use of antibiotic makes them inactive                        | Disagree strongly           | 3    |         |
|                                                                           | Disagree slightly            | 9    |         |
|                                                                           | Neutral                      | 17   |         |
|                                                                           | Agree slightly               | 34   |         |
|                                                                           | Agree strongly               | 137  |         |
| People should not change the dosage of antibiotic without doctor advice   | Disagree strongly           | 1    |         |
|                                                                           | Disagree slightly            | 7    |         |
|                                                                           | Neutral                      | 18   |         |
|                                                                           | Agree slightly               | 21   |         |
|                                                                           | Agree strongly               | 153  |         |
| Excessive use of antibiotics on poultry and livestock is responsible for the spread of antibiotics in the human body | Disagree strongly           | 0    |         |
|                                                                           | Disagree slightly            | 8    |         |
|                                                                           | Neutral                      | 23   |         |
|                                                                           | Agree slightly               | 55   |         |
|                                                                           | Agree strongly               | 114  |         |
| Antibiotic resistance would arise if a full course of antibiotic was not complete | Disagree strongly           | 7    |         |
|                                                                           | Disagree slightly            | 7    |         |
|                                                                           | Neutral                      | 23   |         |
|                                                                           | Agree slightly               | 50   |         |
|                                                                           | Agree strongly               | 113  |         |

Table 3: Summary table of correspondence analysis

| Dimension | Singular value | Inertia | Proportion of Inertia | Confidence singular value | Correlation 2 |
|-----------|----------------|---------|-----------------------|---------------------------|---------------|
|           |                |         | Accounted for          | Cumulative                | SD            |               |
| 1         | 0.171          | 0.029   | 0.498                 | 0.498                     | 0.031         | 0.156         |
| 2         | 0.168          | 0.028   | 0.480                 | 0.978                     | 0.027         |               |
| 3         | 0.035          | 0.001   | 0.021                 | 0.998                     |               |               |
| 4         | 0.011          | 0.000   | 0.002                 | 1.000                     |               |               |
| Total     | 0.059          | 1.000   |                       |                           |               |               |

SD: Standard deviation
Discussion

Antibiotic resistance is emerging in Bangladesh, possibly due to much-reduced awareness. Our study reported the knowledge and awareness about antibiotic usage and causes of the antibiotic resistance of public university students in Bangladesh. Besides, the magnitude of self-medication practice and attitudes toward antibiotic use was identified among the respondents. The study revealed that 61.0% of the students use self-medication at times or always, which is lower than the respondents (67.3%) of Addis Ababa communities\textsuperscript{[6]} and higher than the respondents (25.4%) in the United States.\textsuperscript{[18]} However, it is comparable with the Saudi people (63.6%).\textsuperscript{[17]} Pirzadeh revealed that different factors influenced herbal self-medication including previous experience with similar symptoms, simple availability of the medications, mild diseases, good result, and lack of time. There are also some factors related to self-medication such as law, drug availability, education, family, society, and exposure to advertisements.\textsuperscript{[9]}

Khoshgoftar shows that “antibiotics are misused so often because of the belief that these are benign drugs.”\textsuperscript{[10]} The students of MBSTU were taking antibiotics for fever, whereas respiratory infection was the common cause in Colombian people.\textsuperscript{[19]} The study found that 32.5% of the respondents keep antibiotics for future use, which is relatively lower compared to Greek (55.0%)\textsuperscript{[19]} and Saudi Arab (44.7%).\textsuperscript{[17]} It is also found that 38.0% of the respondents think it is right to stop antibiotics when symptoms are improving, which is less than the study done among Saudi people that 71.1% reported that they had not finished the course of antibiotics because they felt better.\textsuperscript{[17]} The study revealed that more than 42.0% of the respondents use antibiotics for fever, which is approximately similar (41.2%) to the respondents of self-medication with antibiotics among the rural population in Greece.\textsuperscript{[20]}

This study expressed that 47.5% of the respondents use antibiotics based on their previous experience, which is relatively similar to the study done in Pakistan among university students (50.1%).\textsuperscript{[21]} Our study also shows that approximately 66.0% of the respondents use antibiotics at least once in the last 12 months, which is fairly high compared to the study of Norwegian pharmacy customers, about 30%.\textsuperscript{[11]} It is revealed from this study that the tendency of collecting antibiotics with advice by relatives instead of their own experience is 9.099 times higher for the respondents who know about antibiotic resistance. Hence, the students who know about antibiotic resistance generally take antibiotics with the help of a doctor’s advice. This is relevant to the study performed among Saudi people that the availability of antibiotics without prescription was
Paul, et al.: Antibiotic self-medication practice among university students

Table 4: Multinomial logistic regression to calculate odds ratio of risk factors associated with buying antibiotics

| Variable                                              | B     | SE    | Wald  | Significant | Exp (B) | 95% CI for EXP (B) |
|-------------------------------------------------------|-------|-------|-------|-------------|---------|--------------------|
|                                                        | Lower | Upper |       |             |         |                    |
| Doctor’s prescription                                  |       |       |       |             |         |                    |
| Intercept                                             | 3.270 | 0.945 | 11.965| 0.001       |         |                    |
| Knowledge about antibiotic resistance                 |       |       |       |             |         |                    |
| Yes                                                   | 0.244 | 0.860 | 0.080 | 0.777       | 1.276   | 0.237              |
| No<sup>a</sup>                                         |       |       |       |             | 6.879   |                     |
| Change the prescribed antibiotic without doctor’s advice|       |       |       |             |         |                    |
| Yes                                                   | 1.126 | 0.859 | 1.717 | 0.190       | 3.083   | 0.572              |
| No<sup>a</sup>                                         |       |       |       |             | 16.611  |                     |
| Follow antibiotic course as prescribed                 |       |       |       |             |         |                    |
| Yes                                                   | -2.572| 0.897 | 8.227 | 0.004       | 0.076   | 0.013              |
| No<sup>a</sup>                                         |       |       |       |             | 0.443   |                     |
| Community pharmacist                                   |       |       |       |             |         |                    |
| Intercept                                             | 1.020 | 1.084 | 0.885 | 0.347       |         |                    |
| Knowledge about antibiotic resistance                 |       |       |       |             |         |                    |
| Yes                                                   | 1.630 | 0.994 | 2.688 | 0.101       | 5.102   | 0.727              |
| No<sup>a</sup>                                         |       |       |       |             | 35.793  |                     |
| Change the prescribed antibiotic without doctor’s advice|       |       |       |             |         |                    |
| Yes                                                   | 0.415 | 0.937 | 0.196 | 0.658       | 1.514   | 0.241              |
| No<sup>a</sup>                                         |       |       |       |             | 9.501   |                     |
| Follow antibiotic course as prescribed                 |       |       |       |             |         |                    |
| Yes                                                   | -2.397| 1.025 | 5.467 | 0.019       | 0.091   | 0.012              |
| No<sup>a</sup>                                         |       |       |       |             | 0.679   |                     |
| Opinion of relative                                   |       |       |       |             |         |                    |
| Intercept                                             | -0.524| 1.422 | 0.136 | 0.713       |         |                    |
| Knowledge about antibiotic resistance                 |       |       |       |             |         |                    |
| Yes                                                   | 2.208 | 1.338 | 2.722 | 0.099       | 9.099   | 0.660              |
| No<sup>a</sup>                                         |       |       |       |             | 125.368 |                     |
| Change the prescribed antibiotic without doctor’s advice|       |       |       |             |         |                    |
| Yes                                                   | 0.099 | 1.059 | 0.009 | 0.925       | 1.104   | 0.139              |
| No<sup>a</sup>                                         |       |       |       |             | 8.795   |                     |
| Follow antibiotic course as prescribed                 |       |       |       |             |         |                    |
| Yes                                                   | -1.435| 1.119 | 1.644 | 0.200       | 0.238   | 0.027              |
| No<sup>a</sup>                                         |       |       |       |             | 2.135   |                     |

Model Fit: –2 Log Likelihood 58.138, LRT P (Know_ABR: 0.008, Course_AB: 0.175, Change_AB: 0.015), Classification overall percentage: 77.5. SE=Standard error, CI=Confidence interval; <sup>a</sup> indicates reference category.

found to be positively associated with self-medication (OR: 0.238, confidence interval: 0.17–0.33). The majority of the students strongly agreed with the opinion that unnecessary uses of antibiotics make them inactive.

Since this cross-sectional study collects information from a sample of 200 students from only one university, this may affect the precise conclusion. A nationwide representative sample from different universities would help overcome this limitation, but that requires significant funding. The results of the study could be more noteworthy if a sufficiently large sample was included. However, the results of the study could be used by the government to take nationwide initiative on the awareness program among the students on antimicrobial resistance to reduce the practice of self-medication.

**Conclusions**

This study marked out that the students have mid-level knowledge about antibiotics, especially about antibiotic resistance. This consequence indicates that students of MBSTU were not aware enough of antibiotic resistance. It is common for the students to use antibiotics by self-medication. The study also found that the respondents have some knowledge gap in several perspectives of antibiotic usages, such as 1. taking antibiotics based on previous experience, 2. leftover antibiotics for future use, and 3. changing antibiotics without a doctor’s prescription. To eradicate antibiotic resistance, people should follow the antibiotic course strictly following the prescription of a registered doctor. The inappropriate use of antibiotics should be stopped by enforcing regulation to drug sellers by the government authorities, initiating primary care points, and increasing...
the facilities of poor people in government hospitals. Finally, an effort by regular seminars and workshops about the negative impact of antibiotic resistance to aware the students as well as common people of the country can alleviate antimicrobial resistance.

Ethics approval statement
This research was approved by the Department of Statistics, MBSTU, Santosh, Tangail-1902, Bangladesh, and was conducted by one of the co-authors of this study for the partial fulfillment of his M. S. Degree requirement. Informed consent was obtained from all individual participants included in the study.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References
1. Harbarth S, Samore MH. Antimicrobial resistance determinants and future control. Emerg Infect Dis 2005;11:794-801.
2. Chaw PS, Höpner J, Mikolajczyk R. The knowledge, attitude and practice of health practitioners towards antibiotic prescribing and resistance in developing countries - A systematic review. J Clin Pharm Ther 2018;43:606-13.
3. Waaseth M, Adan A, Røen IL, Eriksen K, Stanojevic T, Halvorsen KH, et al. Knowledge of antibiotics and antibiotic resistance among Norwegian pharmacy customers - a cross-sectional study. BMC Public Health 2019;19:66.
4. Jifar A, Ayele Y. Assessment of knowledge, attitude, and practice toward antibiotic use among Harar city and its surrounding community, eastern Ethiopia. Interdiscip Perspect Infect Dis 2018;2018:8492740.
5. Ocana, Bwanga F, Bbosa GS, Bagenda D, Waako P, Ogwal-Okeny J, et al. Patterns and predictors of self-medication in northern Uganda. PLoS One 2014;9:e92323.
6. Bogale AA, Amhare AF, Chang J, Bogale HA, Betaw ST, Gebrehiwot NT, et al. Knowledge, attitude, and practice of self-medication with antibiotics among community residents in Addis Ababa, Ethiopia. Expert Rev Anti Infect Ther 2019;17:459-66.
7. Väänänen MH, Pietilä K, Airaksinen M. Self-medication with antibiotics – Does it really happen in Europe? Health Policy 2006;77:166-71.
8. Berzanskyte A, Valinteliene R, Haaier-Ruskamp FM, Gurevicius R, Grigoryan L. Self-medication with antibiotics in Lithuania. Int J Occup Med Environ Health 2006;19:246-53.
9. Pirzadeh A, Mostafavi F. Self-medication among students in Isfahan University of Medical Sciences based on Health Belief Model. J Educ Health Promot 2014;3:112.
10. Castro EJ, Arboleda GJ, Samboni NP. Prevalence and determinants of self-medication with antibiotics in a community of Santiago de Cali in Colombia. Rev Cubana Farm 2014;48:54-58.
11. Abdulkareem AR, Othman AM, Abuelkhair ZM, Ghazal MM, Alzoubi SB, El Zowalaty ME. Prevalence of self-medication with antibiotics among residents in United Arab Emirates. Infect Drug Resist 2019;12:3445-53.
12. Mohabbi B, Tol A, Sadeghi R, Yaseri M, Akbari Somar N, Doyore Agide F. The efficacy of social cognitive theory-based self-care intervention for rational antibiotic use: A randomized trial. Eur J Public Health 2018;28:735-9.
13. Barbosa TM, Levy SB. The impact of antibiotic use on resistance development and persistence. Drug Resist Updat 2000;3:303-11.
14. Yasmin R, Gyeltshen T, Islam R. Knowledge, attitude and practice of antibiotics usage among patients attending OPD of a dental college hospital in Dhaka, Bangladesh. J Med 2018;19:84-90.
15. Ahmed I, Rabbi MB, Sultana S. Antibiotic resistance in Bangladesh: A systematic review. Int J Infect Dis 2019;80:54-61.
16. Zoorob R, Grigoryan L, Nash S, Trautner BW. Nonprescription antimicrobial use in a primary care population in the United States. Antimicrob Agents Chemother 2016;60:5527-32.
17. El Zowalaty ME, Belkina T, Bahashwan SA, El Zowalaty AE, Tebbens JD, Abdel-Salam HA, et al. Knowledge, awareness, and attitudes toward antibiotic use and antimicrobial resistance among Saudi population. Int J Clin Pharm 2016;38:1261-8.
18. Khoshgoftar M, Zamani-Alvijeh F, Kasaian N, Shahzamani K, Rostami S, Nakhdedian Z, et al. The effect of public health educational campaign regarding antibiotic use and microbial resistance on knowledge, attitude, and practice in the Iran. J Educ Health Promot 2021;10:3.
19. Mitsi G, Jelastopulu E, Basiaris H, Skoutelas A, Gogos C. Patterns of antibiotic use among adults and parents in the community: A questionnaire-based survey in a Greek urban population. Int J Antimicrob Agents 2005;25:439-43.
20. Skliros E, Merkouris P, Papazafiropoulos A, Gikas A, Matzouranis G, Papafragou C, et al. Self-medication with antibiotics in rural population in Greece: A cross-sectional multicenter study. BMC Fam Pract 2010;11:58.
21. Zafar SN, Syed R, Waqar S, Zubairi AJ, Vaqar T, Shaikh M, et al. Self-medication amongst university students of Karachi: Prevalence, knowledge and attitudes. J Pak Med Assoc 2008;58:214-7.