

Article

Knowledge of antibiotics and antibiotic usage behavior among the people of Dhaka, Bangladesh

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Abstract: Bangladesh is a developing country with a very high prevalence of antibiotic resistance where irrational use of antibiotics is very common. This cross-sectional survey was conducted to assess the knowledge of antibiotics and antibiotic usage behavior (Antibiotic use, self-medication, adherence to therapy) among the people of Bangladesh. The association between participants' knowledge of antibiotics and their antibiotic usage behavior was also analyzed. A cross-sectional survey based on a structured questionnaire was conducted in the Dhaka district. The questionnaire included questions about demographic information, participants' knowledge of antibiotics, and their recent antibiotic usage. The data analysis involved the use of descriptive statistics and multivariable logistic regression. Very few participants knew that antibiotics are not effective against most common colds (16.8%), viruses (22.5%), and pains (41.7%). Most respondents (>75%) knew that excessive use of antibiotics and failing to complete a course may render antibiotics less effective in the future. However, only 56.1% were aware of antibiotic resistance. About half (46.6%) of the participants took antibiotics in the last six months, 20.5% of whom resorted to self-medication and 23.1% reported non-adherence to therapy. Greater knowledge of antibiotics was significantly associated with lower rates of self-medication ($p=0.037$). Misconceptions about antibiotics and antibiotic misuse are very common in Bangladesh. The findings suggest that misconceptions about antibiotics and antibiotic misuse are very common in Bangladesh. To mitigate these problems, interventions comprised of educational campaigns and redesigning of the healthcare system and policies should be undertaken.

Keywords: antibiotic use; antibiotic resistance; knowledge; cross-sectional study; Bangladesh

1. Introduction

Excessive and irrational use of antibiotics is one of the causes of antibiotic resistance evolution while lowering of antibiotic consumption serves to impede the spread of resistance (Read and Woods, 2014). Several patient-related factors are implicated in the spread of antibiotic resistance such as misconceptions regarding antibiotic use, self-medication of antibiotics, deviating from the appropriate dosage regimen, and influencing physicians' decisions in prescribing antibiotics (WHO, 2001). Therefore, unless public awareness is raised regarding the fundamental aspects of antibiotic action and usage, it is most unlikely that other measures in promoting the rational use of antibiotics will be very fruitful.

Bangladesh is a developing country with a high prevalence of antibiotic resistance where many of the first-line antibiotics have been reported to be mostly ineffective (Ahmed *et al.*, 2019). Although the government prohibits the use of antibiotics without prescriptions, non-prescription use of antibiotics is widespread due to a lack of implementation of such laws (Hoque *et al.*, 2020; Islam, 2006). Furthermore, most retail pharmacists in Bangladesh receive little or no training, and dispensing of drugs without prescriptions is very common (Ahmed *et al.*, 2017). In a study conducted in Rajshahi, It was also found that 23.6% of the dispensed antibiotics were by the request of the customers (Saha and Hossain, 2017). This indicates that the public plays a major role when it

comes to irrational antibiotic use in Bangladesh. While it is crucial to take regulatory measures to prevent non-prescription use as well as to train healthcare professionals, we believe identifying the gaps in public knowledge about antibiotics and implementing appropriate interventions to educate the people should be the very first step in promoting rational use of antibiotics and subsequent reduction of antibiotic resistance. Hence, this survey seeks to investigate 1) the knowledge of antibiotics among the people of Bangladesh, 2) the rates of antibiotic use, self-medication, and adherence to prescribed regimens, and 3) how participants' knowledge of antibiotics affects their antibiotic usage behavior. Although several studies have addressed antibiotic use and self-medication in Bangladesh (Chowdhury *et al.*, 2015; Fahad *et al.*, 2010; Sutradhar *et al.*, 2014), this is the first study to investigate the gaps in public knowledge and assess its impact on antibiotic usage behavior.

2. Materials and Methods

2.1. Study design and sampling

A cross-sectional survey was conducted from June to August of 2019 in Dhaka District—the capital of Bangladesh and the largest district in terms of population. Two of the six sub-districts of Dhaka (Dhaka City Corporation and Savar) were included in the survey. From each of the two regions, a random sample of the population was surveyed. Inclusion criteria for the selection of participants were: 1) adults age 18 years and above; 2) familiar with antibiotics; 3) provided written consent to participate in the survey. The sample size was determined using Raosoft® sample size calculator (Raosoft). Based on a 5% margin of error and a confidence level of 95%, the minimum required sample size was 385. However, we surveyed 450 people, and 429 were included in the final statistical analysis after some of the responses were excluded from analysis because of missing data.

2.2. The questionnaire

The questionnaire was comprised of three segments. The first part collected the basic demographic information (Gender, Age, and Education) of the participants. The second part contained ten questions and statements pertaining to antibiotic action, usage, and resistance intended to evaluate the knowledge of the participants. The participants had to select either of the three answer choices (Yes/No/Not Sure for questions; Agree/Disagree/Not sure for statements). Part three contained questions about the participants' use of antibiotics (Antibiotic use, self-medication, and completion of therapy) within the last six months. In this study, self-medication has been defined as the taking of antibiotics without a doctor's prescription, rather by self-initiative, or by the advice of family/friends, or retail pharmacists.

2.3. Statistical analysis

Data analysis was done in IBM SPSS, version 25. The demographic characteristics of the participants and their responses to individual questions were reported using descriptive statistics. To identify the association between participants' knowledge of antibiotics and their practices related to antibiotic usage (recent use, self-medication, and completion of therapy), multivariable logistic regression was performed. For this purpose, a knowledge score was determined based on the percentage of correct responses: 0-40% correct responses were defined as "Poor" knowledge, 50-70% correct responses as "Medium" knowledge, and 80-100% correct responses as "Good" knowledge. The regression model was adjusted for the demographic variables (gender, age, and education). A *P*-value of less than 0.05 was considered statistically significant.

2.4. Ethical considerations

The study was conducted following the guidelines of the Declaration of Helsinki (WMA). Ethical approval was obtained from the Biosafety, Biosecurity & Ethical Committee of Jahangirnagar University (Ref No: BBEC, JU/M 2019 (11) 4). Participants were made aware of the purpose of the study and written informed consent was obtained from them.

3. Results

3.1. Participants' characteristics

Out of the 429 participants, 55.2% were males and 44.8% were females. In terms of age, 56.9% were 18-35 years old, whereas 43.1% were older than 35 years. Also, 50.8% had some or complete undergraduate education. The demographic characteristics are presented in table 1.

3.2. Knowledge of antibiotics

In general, participants demonstrated a lack of knowledge regarding the action and efficacy of antibiotics (Table 2). For example, only 16.8% knew that antibiotics are not effective in common colds. Also, a large percentage of the participants believed antibiotics are effective against viruses (50.4%) or as painkillers (47.9%). Moreover, only 56.1% were familiar with the concept of antibiotic resistance. However, most participants had correct knowledge about the inappropriate use of antibiotics such as non-prescription use (85%), excessive use (80.2%), and non-adherence (76.9%).

3.3. Antibiotic usage behavior

The results of the multivariable logistic regression analysis of the association between the knowledge level of participants and their antibiotic usage behavior have been presented in table 3. About half (46.6%) of the participants reported having taken antibiotics in the last six months. Although antibiotic use was less common in participants' with a greater level of knowledge, the association was not statistically significant ($p=0.081$). Moreover, 20.5% of the respondents took antibiotics without a prescription and a lack of knowledge of antibiotics was associated with more self-medication ($p=0.037$). Most participants (76.9%) said they had completed the course of their last antibiotic therapy. No significant association was found between the level of knowledge and nonadherence ($p= 0.113$).

Table 1. Demographic characteristics of the participants (N=429).

Demographic Characteristic	Number	Percentage (%)
Gender		
Male	237	55.20
Female	192	44.80
Age (years)		
18-35	244	56.90
36-50	140	32.60
>50	45	10.50
Education		
Secondary (Grade 9-10) or below	120	28.00
Higher Secondary (Grade 11-12)	91	21.20
University (Ongoing/ completed)	218	50.80

Table 2. Responses to questions/ statements assessing knowledge.

Questions/ Statements (N=10)	Correct Response	Participants' Response (%)		
		Yes/Agree	No/ Disagree	Not sure
<i>Antibiotic action and efficacy</i>				
1. Do you think antibiotics work on most coughs and colds?	No	69.9	16.8	13.3
2. Do you think antibiotics are effective against bacteria?	Yes	66.6	8.7	24.7
3. Do you think antibiotics are effective against viruses?	No	50.4	22.5	27.2
4. Do you think antibiotics work as painkillers?	No	47.9	41.7	10.4
5. Do you think antibiotics have any side effects?	Yes	81.1	11.4	7.5
<i>Antibiotic use and resistance</i>				
6. One should stop taking an antibiotic when symptoms are improving.	Disagree	29.6	65.5	4.9
7. It is okay to buy an antibiotic from pharmacies without a doctor's prescription.	Disagree	14.1	85.0	0.9
8. If taken too often, antibiotics are less likely to work in the future.	Agree	80.2	9.1	10.7
9. If the full course is not completed, antibiotics are less likely to work in the future.	Agree	76.9	10.0	13.1
10. Do you think pathogens can become resistant to antibiotics?	Yes	56.1	17.5	26.4

Table 3. Association between participants' knowledge of antibiotics and their antibiotic usage behavior.

Knowledge level	% of participants	Adjusted odds ratio (95% confidence interval)	p-value
Outcome= Participants took antibiotics in the last six months (46.6%)			
Good	34.1%	1	0.081
Average	49.0%	1.81 (1.06—3.07)	
Poor	51.6%	1.80 (0.95—3.43)	
Outcome= Participants self-medicated with antibiotics in the last six months (20.5%)			
Good	10.3%	1	0.037
Average	17.8%	2.26 (0.60—8.51)	
Poor	33.3%	5.42 (1.27—23.18)	
Outcome= Participants did not complete the full course of therapy (23.1%)			
Good	10.3%	1	0.113
Average	25.2%	3.90 (1.04—14.68)	
Poor	25.5%	4.47 (1.01—19.82)	

Poor, average, and good knowledge refer to 0-40%, 50-70%, and 80-100% correct responses respectively.

4. Discussion

The results suggest that people have a poor understanding of the action and efficacy of antibiotics. The fact that only 16.8% knew antibiotics cannot cure most common colds and coughs is alarming. This also explains the findings in a study conducted in Bangladesh where cold, cough, and fever were the second leading cause of self-medication with antibiotics (Biswas *et al.*, 2014). Again, although antibiotics only work against bacterial infections, the majority of the participants believed antibiotics are also effective against viruses or as painkillers. This indicates that many people consider antibiotics a “cure-all” and are likely to take antibiotics for unrelated symptoms. Compared to other countries like Britain, Kuwait, and South Korea, the prevalence of such misconceptions among the people of Bangladesh was higher (Awad and Aboud, 2015; Kim *et al.*, 2011; McNulty *et al.*, 2007). However, most participants were aware of the fact that antibiotics can have side effects. Since side effects are associated with all drugs, a high rate of correct response in this particular question may be more related to people's knowledge of and experience with all drugs in general than their specific knowledge of antibiotics.

Compared with developed countries such as Britain and Hong Kong, the rates of antibiotic use, self-medication, and non-adherence were higher in this study (McNulty *et al.*, 2007, You *et al.*, 2008). The fact that almost half of the participants took antibiotics in the last six months implies that many of these people took antibiotics unnecessarily. The prevalence of self-medication found in this study (20.5%) is very similar to that reported in another study conducted in Bangladesh (26.69%) (Biswas *et al.*, 2014). According to studies conducted in other Asian countries like Bhutan, India, and Indonesia, self-medication was practiced by 24- 54% of the general public (Ahmad *et al.*, 2012; Kurniawan *et al.*, 2017; Tshokey *et al.*, 2017). In this study, poor knowledge was associated with more self-medication. Results similar to ours were reported in studies performed in Lebanon and Indonesia (Jamhour *et al.*, 2017; Kurniawan *et al.*, 2017). However, in some other studies, self-medication was more prevalent among people with greater knowledge of antibiotics (Cheng *et al.*, 2018; McNulty *et al.*, 2007). Although the reasons behind this apparent discrepancy are unclear, the differences in health system and policy along with socioeconomic status of the people may be implicated.

4.1. Implications of this study

Given the high level of misconceptions and excessive use of antibiotics in Bangladesh, the first step should be the initiation of interventions to improve public knowledge of antibiotics and subsequently decrease overall antibiotic consumption. Now, whether better knowledge always translates into appropriate behavior is a matter of contention and knowledge was not significantly associated with two of the three parameters of antibiotic use tested in this study. There is, however, enough evidence that campaigns help to decrease antibiotic use in communities (Huttner *et al.*, 2010; Sabuncu *et al.*, 2009). Moreover, educating the public on the appropriate use of antibiotics has been mentioned as one of the primary intervention strategies by WHO for the containment of antibiotic resistance (WHO, 2001). If possible, social marketing strategies can be incorporated with antibiotic campaigns to elicit effective and sustainable change in antibiotic usage behavior (Edgar *et al.*, 2008). Nevertheless, it is important to understand that apart from inappropriate knowledge and attitude of the public, irrational antibiotic use in the developing countries is often driven by uninformed healthcare providers as well as factors associated with health systems and policies including the availability of over-the-counter antibiotics,

difficulty accessing health facilities and medical care, lack of trust in health professionals, untrained retail pharmacists, as well as inadequate regulatory policies (Servia-Dopazo and Figueiras, 2018; Torres *et al.*, 2019). Therefore, initiatives should not be restricted to disseminating information; simultaneous improvement of the health systems and implementation of proper antibiotic policies is also needed.

4.2. Limitations

The study has a couple of limitations. First, the survey was conducted in the capital district Dhaka (primarily in suburban and urban areas) and the participants may not represent the whole population of Bangladesh. There is a high possibility that the level of misconceptions about and misuse of antibiotics in rural areas will be even higher. Second, there is a possibility of recall bias since participants had to remember their past use of antibiotics.

5. Conclusions

In summary, our study has identified two problems- a high level of misconceptions about antibiotics and inappropriate antibiotic use among the people of Bangladesh. Also, knowledge of antibiotics had a significant impact on participants' self-medication behavior. These findings present a strong case for taking measures to educate the public about antibiotics. In addition to this, educating the healthcare providers along with improvements of the healthcare systems and implementation of regulatory measures will be very crucial to achieve long-lasting results.

Conflict of interest

None to declare.

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