



Prevalence of self-medication of antibiotics among people in Bangladesh

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Research Article

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Abstract

This study attempts to investigate the prevalence of self-medication of antibiotics among people in Bangladesh. This study was conducted in six districts of Bangladesh (Dhaka, Munshiganj, Kishoreganj, Chittagong, Chandpur, Kushtia) by collecting data on antimicrobial medication purchasing from retail drug stores established at the major streets. 750 customers were surveyed within the month of July 2009. The self-medication rates for ciprofloxacin, doxycycline, ampicillin, amoxicillin, azithromycin, cefradine and metronidazole were 3.6% (n=27), 5% (n=39), 1% (8), 2% (15), 1% (9), 1% (10) and 9% (68) respectively. The self medication rates for erythromycin, flucloxacillin, tetracycline, cefixime, cefpodoxime, cefuroxime and cotrimoxazole were less than one percent. The misuse incidences are self medicating with ciprofloxacin to treat menstrual irregularity and abdominal pain, metronidazole to treat fever and menstrual irregularity, amoxicillin to treat viral diseases, ampicillin to treat scabies, azithromycin to treat pain etc. We recommend immediate establishment of community pharmacies run by qualified Pharmacists who would spend more time for patients and prescription only status of antimicrobials in Bangladesh.

Keywords: Antimicrobials, Bangladesh, Self-medication, Resistance, Misuse.

Introduction

Widespread and inappropriate use of antibiotics increases health care costs (1) and contributes to antibiotic resistance (2). Antimicrobial medication management in Bangladesh has been highlighted by previous studies as an area for improvement (3). There is already enough evidence of growing resistance to antimicrobials in this country resulting from misuse (4-6). Previous study showed that antimicrobials are widely available (18% incidents) in the home medicine cabinets of the Dhaka City population (7). Since there is no prescription-only drug in Bangladesh, people can purchase drugs like sedatives, antimicrobials without prescription even in the remote parts of the country (8-9). The relative lack of data on the morbidity and mortality attributable to antibiotic resistance, including the economic impact on individuals as well as on health care and societies, may explain the weak reaction from politicians, public health workers, and consumers to this threat to public health (10). Therefore the present study attempts to investigate the prevalence of self-medication of antibiotics among people in Bangladesh.

Material and Method

The study was conducted in six districts of Bangladesh (Dhaka, Munshiganj, Kishoreganj, Chittagong, Chandpur, Kushtia) by collecting data on antimicrobial medication purchasing from retail drug stores established at the major streets. Seventh semester Pharmacy students interviewed the people who purchased any of the thirteen antimicrobials selected for study. The survey population signed the informed consent form of a structured questionnaire where the respective patient's age, gender, symptoms of diseases, history of physician visits were recorded. The retailers in the drug stores under our survey were C grade pharmacists, equivalent to pharmacy technicians. The retailers' consultation with patients was observed and from that the questionnaires were filled up by the surveyors. Simple random sampling technique was followed in the survey. Sample size of 965 customers was drawn using simple random sampling technique



with a design effect 2.5 assuming 50% prevalence rate. Finally the interviewers were able to conduct interviews with 750 people. 750 customers were surveyed within the month of July 2009. 95% confidence interval and 10% non-response were considered and sampling without replacement technique was used. Cases if not interested to participate in the interview and if not accompanied by patient while purchasing were excluded.

The questionnaire contained some basic variables: Age and sex of patients, education status, disease name, brand and generic name of the medicine used, prescription use, duration of use etc.

Data management

Supervisors in the field regularly reviewed questionnaires. Field researchers double-checked the responses at the field immediately after conducting interviews. Supervisors directly observed 5% cases during the interview conducted by field workers. Information from the written questionnaires was entered into electronic database of SPSS and Excel.

Data analysis

The data thus gathered was analyzed using SPSS (Statistical Package for the Social Sciences) version 13.0 software from IBM for windows (USA). The prevalence of self-medication, disease name were calculated. We assessed trends in the patients' characteristics across explanatory variables (disease name, prescription use etc.) using Pearson's chi square test for categorical variables and simple linear regression for continuous variables. The analysis was exploratory.

Transparency Declaration

The department of Pharmacy, State University of Bangladesh which has been granted the accreditation of the Pharmacy Council, Bangladesh and University Grants Commission, Bangladesh, reviewed the study and approved accordingly. No conflict of interests with any body. The study was self funded.

Results

The majority (82%) of respondents was in the age group 15-30 years and little proportions (2%) were 50 years above. Seventy one percent (71%) were male and majority of the respondents (71%) completed HSC (12th class standard). Few female patients came to visit the retailers; therefore the gender distribution is skewed (mostly male). (Table 1)

Metronidazole

Of all the antibiotics, Metronidazole was medicated most frequently. 30% people medicated with Metronidazole and 69% of them did so based on prescription from a qualified physician. The use of this antibiotic for more than one week duration was 3.7 times higher (OR 3.7, p<0.05) among people who had prescriptions than those did not have. (Table 2) Among non-prescription group, 80% medicated for diarrhea/dysentery and 20% medicated for amoebiasis or bacterial

infection or skin diseases or etc. Among the people in prescription group, highest proportions (47%) medicated for diarrhea/ dysentery. Another 37% people medicated for skin disease/Cellulites, amoebiasis and bacterial infections and 11% used for protozoal or G I infection or osteomyelitis or ulcer/ or brain abscess. Rest 8% for the prescription group used for giardiasis or dental infections. (Table 3)

Table 1: Descriptive Table on Demographic Characteristics

| Demographic characteristics | Proportion (%) | Mean |
|---------------------------------------|----------------|---------------------------------------|
| Age: | | |
| 15-30 | 82 | 26 (15-72), standard deviation=7.9 |
| 31-50 | 16 | |
| 50+ | 2 | |
| Sex: Male | 71 | - |
| Education: | | |
| SSC (passed secondary school) | 23 | - |
| HSC ((passed higher secondary school) | 71 | - |
| Graduation(passed college) | 6 | - |

Table 2: Prescription use and length of use of antibiotic (N=750)

| Antibiotic | % of people medicated (number, n) | Proportion (%) of people used prescription | Prescription group: Proportion of people medicated more than one week | Self medicated group: Proportion of people medicated more than one week | Odds ratio, p-value; (reference group self medication) |
|----------------|-----------------------------------|--|---|---|--|
| Metronidazole | 30 (222) | 69 | 29 | 10 | 3.7* (1.6, 8.7) |
| Amoxicillin | 25 (187) | 92 | 55 | 33 | 2.5 (0.8, 7.5) |
| Doxycycline | 24 (177) | 78 | 28 | 10 | 3.4* (1.1, 10.3) |
| Ciprofloxacin | 24 (177) | 85 | 44 | 15 | 4.4* (1.5, 13.7) |
| Cefradine | 13 (98) | 90 | 33 | 10 | 4.4 (0.5, 36.6) |
| Flucloxacillin | 13 (95) | 95 | 64 | 20 | 7.1 (0.8, 66.5) |
| Azithromycin | 13 (96) | 87 | 29 | 0 | - |
| Penicillin | 11 (80) | 90 | 56 | 25 | 3.7 (0.7, 19.8) |
| Cefixime | 7 (50) | 92 | 43 | 25 | 2.3 (0.2, 23.9) |
| Cefuroxim | 5 (35) | 100 | 57 | 0 | - |
| Erythromycin | 6 (45) | 93 | 48 | 0 | - |
| Cefpodoxime | 2 (18) | 94 | 82 | 0 | - |
| Tetracycline | 3 (19) | 79 | 13 | 0 | - |
| Cotrimoxazole | 3 (25) | 96 | 46 | 0 | - |

*: p<0.05



Table 3: Applications of medicine by disease categories

| Medicine | Diseases | Non-prescription | | Prescription | |
|---------------|--|------------------|----|--------------|----|
| | | % | N | % | n |
| Metronidazole | Amoebiasis | 8 | 5 | 10 | 16 |
| | Bacterial infection | 5 | 3 | 10 | 15 |
| | Dental infection | - | 0 | 3 | 4 |
| | Diarrhoea/ Dysentery | 80 | 52 | 47 | 71 |
| | Skin disease/Cellulites | 5 | 3 | 14 | 22 |
| | Giardiasis | 1 | 1 | 5 | 7 |
| | Protozoal/G I infection/ osteomyelitis/ Ulcer/ brain abscess/Giardiasis/Tonsillitis/Menstrual irregularity | 1 | 1 | 11 | 17 |
| Amoxicillin | Allergy, skin, wound, cellulites | 33 | 5 | 26 | 45 |
| | Respiratory tract infections | 27 | 4 | 9 | 16 |
| | Dental disease | 0 | 0 | 4 | 7 |
| | Ear infection | 20 | 3 | 23 | 40 |
| | Fever | 13 | 2 | 14 | 23 |
| | Nose infection | 7 | 1 | 14 | 24 |
| | Diarrhea, ulcer, endocarditic, gonorrhea, meningitis, pain, urinary infection | 0 | 0 | 10 | 17 |
| Doxycycline | Diarrhea | 15 | 6 | 19 | 26 |
| | Dysentery | 18 | 7 | 20 | 27 |
| | Fever | 51 | 20 | 31 | 43 |
| | Other diseases- Acne, Cholera, Rhinitis, Sinusitis, Tonsillitis | 16 | 6 | 30 | 42 |
| Ciprofloxacin | Bone/joint infection | - | 0 | 11 | 17 |
| | Skin, acne, cellulites. | 4 | 1 | 20 | 29 |
| | Allergy | 69 | 18 | 35 | 52 |
| | Fever | 4 | 1 | 6 | 9 |

| | | | | | |
|----------------|--|----|---|----|----|
| | sinusitis | | | | |
| | G. I infection | 12 | 3 | 19 | 28 |
| | Urinary/Surgery | - | 0 | 4 | 6 |
| | Diarrhea/dysentery | 11 | 3 | 3 | 5 |
| | Bronchitis/Respiratory tract infections | - | 0 | 2 | 3 |
| Cefradine | Bone infection | - | 0 | 6 | 5 |
| | Bronchitis/cough | 10 | 1 | 5 | 4 |
| | Cellulites, burn, fracture, impetigo, otitis | - | 0 | 31 | 26 |
| | Tonsillitis, throat, ear, sinusitis | 30 | 3 | 15 | 13 |
| | Dysentery | 40 | 4 | 25 | 21 |
| | Fever | 20 | 2 | 18 | 15 |
| Flucloxacillin | Wounds/burn /fracture/skin infection/Ekzema/Impetigo | 60 | 3 | 45 | 40 |
| | Throat and oral infection/Tonsillitis | 0 | 0 | 12 | 11 |
| | Cellulites | 0 | 0 | 18 | 16 |
| | Ulcer | 40 | 2 | 8 | 7 |
| | Others | 0 | 0 | 17 | 15 |
| Azithromycin | Bronchitis, cough, pneumonia | - | - | 10 | 9 |
| | Dysentery/diarrhea | - | - | 10 | 9 |
| | Fever | 11 | 1 | 10 | 9 |
| | Skin infection | - | - | 16 | 14 |
| | Tonsillitis, sinusitis, throat | 67 | 6 | 20 | 17 |
| | Typhoid | - | - | 20 | 17 |
| Penicillin | Urinary infection, otitis media, lyme | 22 | 2 | 14 | 12 |
| | Fever | 38 | 3 | 39 | 28 |
| | Rheumatic fever | 0 | 0 | 26 | 19 |
| | Tonsillitis | 38 | 3 | 22 | 16 |
| | Others | 24 | 2 | 13 | 9 |
| Cefixime | Fever/ enteric fever | 75 | 3 | 63 | 29 |
| | Urinary, Tonsillitis, infection, otitis, fracture, | 25 | 1 | 37 | 17 |



| | bronchitis | | | | |
|---------------|--|------------|---|----|----|
| Cefuroxim | Tonsillitis, ear/nose infection, Sinusitis | - | - | 48 | 17 |
| | Respiratory tract infections | - | - | 29 | 10 |
| | Fever | - | - | 9 | 3 |
| Erythromycin | Diarrhea/dysentery | - | - | 14 | 5 |
| | Cough | 67 | 2 | 0 | 0 |
| | Pimples/skin infection | 33 | 1 | 29 | 13 |
| | Acne | 0 | 0 | 41 | 17 |
| | Fever | 0 | 0 | 19 | 8 |
| Cefpodoxime | Other | 0 | 0 | 11 | 7 |
| | Pneumonia/R espiratory tract infections | - | - | 35 | 6 |
| | Skin infection | - | - | 24 | 4 |
| | Urinary, dysentery, otitis, typhoid | 100 | 1 | 41 | 7 |
| Tetracycline | Acne vulgaris | 25 | 1 | 13 | 2 |
| | Diarrhea/ Dysentery | 25 | 1 | 34 | 5 |
| | Fever | 25 | 1 | 33 | 5 |
| | Toothache, trachoma, bronchitis, anaerobic | 25 | 1 | 20 | 3 |
| | Cotrimoxazole | Bronchitis | - | 0 | 8 |
| Cotrimoxazole | Dysentery | - | 0 | 17 | 4 |
| | Fever | 100 | 1 | 21 | 5 |
| | Nocardiasis | - | 0 | 13 | 3 |
| | Osteomyelitis | - | 0 | 12 | 3 |
| | Septicemia/typhoid | - | 0 | 21 | 5 |
| | Urinary infection | - | 0 | 8 | 2 |

Amoxicillin

Of all the antibiotics Amoxicillin was medicated second most frequently. 25% medicated with Amoxicillin and 55% of them medicated based on prescription from a qualified physician. The use of this antibiotic for more than one week duration was 2.5 times higher (OR 2.5, p<0.05) among people those had prescriptions than those did not have. (Table 2) Among non-prescription group, 33% medicated for allergy, skin, wound, cellulitis (26% in prescription group). The other 27% self medicated for respiratory tract infections (9% in prescription group), 20% self medicated for ear infection (23% in prescription group), 13% for fever (14% in prescription group), 7% for nose infection (14% in prescription group). Among the people in prescription group; 10% also were prescribed for diarrhea, ulcer, endocarditic, gonorrhoea, meningitis, pain, urinary tract infection. (Table 3)

Doxycycline

Among the survey population third highest percentage of people 24% medicated with Doxycycline and 28% of them medicated based on prescription from a qualified physician. The use of this antibiotic for more than one week duration was 3.4 times higher (OR 3.4, p<0.05) among people those had prescriptions than those did not have. (Table 2) Among non-prescription group, 15% medicated for diarrhea (19% in prescription group). The other 18% self medicated for dysentery (20% in prescription group), 51% self medicated for fever (31% in prescription group), 16% for other diseases like acne, cholera, rhinitis, sinusitis, tonsillitis. Among the people in prescription group; 30% also were prescribed for acne, actinomycosis, appetite loss, bronchitis, brucellosis, cellulitis, cholera, cough, mumps, respiratory tract infection, dental disease, throat pain, tonsillitis, trachoma, tularemia. (Table 3)

Table 4: Self medication of antimicrobials

| Name of antimicrobial | Self medication rate (%) Total survey population n = 750 | Acquaintance with Medicine Rate (%) (Ref. 1) | Significance (Self medication Rate vs Acquaintance Rate) |
|-----------------------|--|--|--|
| Metronidazole | 9.07 (68) | 51.36 | 0.027 |
| Amoxicillin | 2.00 (15) | 50.84 | |
| Doxycycline | 5.20 (39) | 57.32 | |
| Ciprofloxacin | 3.60 (27) | 67.15 | |
| Cefradine | 1.33 (10) | 40.69 | |
| Flucloxacillin | 0.67 (5) | 18.41 | |
| Azithromycin | 1.2 (9) | 21.76 | |
| Penicillin | 1.1 (8) | 66.74 | |
| Cefixime | 0.53 (4) | 37.55 | |
| Cefuroxime | 0 (0) | 25.00 | |
| Erythromycin | 0.40 (3) | 17.47 | |
| Cefpodoxime | 0.13 (1) | 40.79 | |
| Tetracycline | 0.53 (4) | 23.64 | |
| Cotrimoxazole | 0.13 (1) | 18.31 | |

Ciprofloxacin

Among the survey population third highest percentage of people 24% medicated with Ciprofloxacin and 44% of them medicated based on prescription from a qualified physician. The use of this antibiotic for more than one week duration was 4.4 times higher (OR 4.4, p<0.05) among people those had prescriptions than those did not have. (Table 2) Among non-prescription group, 69% medicated for fever (35% in prescription group). The other 12% self medicated for gastrointestinal infection (19% in prescription group), 11% self medicated for diarrhea/dysentery (3% in



prescription group), 4% for skin, acne, cellulites, allergy (20% in prescription group), 4% for tonsillitis, ear infection, sinusitis (6% in prescription group). Among the people in prescription group; 11% also were prescribed for bone/joint infection, 4% for surgery and urinary tract infection, 2% for bronchitis and respiratory tract infections.

(Table 3)

Cefradine

Among the survey population fifth highest percentage of people 13% medicated with Cefradine and 33% of them medicated based on prescription from a qualified physician. The use of this antibiotic for more than one week duration was 4.4 times higher (OR 4.4, $p < 0.05$) among people those had prescriptions than those did not have. (Table 2) Among non-prescription group, 40% medicated for dysentery (25% in prescription group). The other 30% self medicated for tonsillitis, throat infection, ear infection, sinusitis (15% in prescription group), 20% self medicated for fever (18% in prescription group), 10% for bronchitis, cough (5% in prescription group). Among the people in prescription group; 6% also were prescribed for bone infection, 31% for cellulites, burn, fracture, impetigo, and otitis.

(Table 3)

Flucloxacillin

Among the survey population fifth highest percentage of people 13% medicated with Flucloxacillin and 64% of them medicated based on prescription from a qualified physician. The use of this antibiotic for more than one week duration was 7.1 times higher (OR 7.1, $p < 0.05$) among people those had prescriptions than those did not have. (Table 2) Among non-prescription group, 60% medicated for Wounds/burn/fracture/skin infection/Eczema/Impetigo (45% in prescription group). The other 40% self medicated for ulcer (8% in prescription group. Among the people in prescription group; 12% also were prescribed for Throat and oral infection/Tonsillitis, 18% for cellulites, 17% for Urinary tract infection, Throat infection, Sinusitis, Pneumonia, Otitis media, Mouth infection, Meningitis, Impetigo & wound, Fever, Endocarditis, Empyema, Eczema & acne infection, ear infection, Chicken pox, Abscesses. (Table 3)

Azithromycin

Among the survey population fifth highest percentage of people 13% medicated with Azithromycin and 87% of them medicated based on prescription from a qualified physician. None of the people who self medicated with this drug used it for more than one week duration was. (Table 2) Among non-prescription group, 11% self medicated it for fever, 67% for tonsillitis, sinusitis, throat infection and 22% for urinary tract infections (Table 3). Among prescription group, 10% took the drug for bronchitis, cough, pneumonia; 10% for dysentery and diarrhea, 10% for fever, 16% for skin infection, 20% for tonsillitis, sinusitis, throat infection; 20% for typhoid and 14% for urinary tract infection, otitis media and lyme.

Penicillin

Among the survey population eighth highest percentage of people 11% medicated with penicillin and 56% of them medicated based on prescription from a qualified physician. The use of this antibiotic for more than one week duration was 3.7 times higher (OR 3.7, $p < 0.05$) among people those had prescriptions than those did not have. (Table 2) Among non-prescription group, 38% medicated for fever (39% in prescription group). The other 38% self medicated for tonsillitis (22% in prescription group), 24% self medicated for other diseases like Endocarditis, Otitis media, Pneumonia, Scarlet fever, Typhoid fever, Viral fever (13% for prescription group). Among the people in prescription group; 26% also were prescribed for rheumatic fever. (Table 3)

Cefixime

Among the survey population ninth highest percentage of people 7% medicated with cefixime and 43% of them medicated based on prescription from a qualified physician. The use of this antibiotic for more than one week duration was 2.3 times higher (OR 2.3, $p < 0.05$) among people those had prescriptions than those did not have. (Table 2) Among non-prescription group, 75% medicated for fever and enteric fever (63% in prescription group). The other 25% self medicated for urinary tract infection, tonsillitis, otitis, fracture, bronchitis (37% in prescription group). (Table 3)

Cefuroxime

Five percent of the survey people medicated with this drug and all of them used based on prescriptions from a medically qualified physician. Fifty seven persons medicated with this medicine for more than a week. (Table 2) Almost half (48%) of the people those medicated with this medicine, they medicated for the diseases such as tonsillitis, ear/nose infection, sinusitis etc. One fifth (20%) proportions medicated for the diseases of skin infections. Rests were medicated for diarrhea, respiratory tract infections, fever related diseases. (Table 3)

Erythromycin

Among the survey population tenth highest percentage of people 6% medicated with erythromycin and 48% of them medicated based on prescription from a qualified physician. Among non-prescription group, 67% medicated for cough (0% in prescription group). The other 33% self medicated for pimples and other skin infections (70% in prescription group). 19% of the prescription group were also prescribed for fever, 11% for urinary tract infection, loose motion. (Table 3)



Cefpodoxime

Among the survey population eleventh highest percentage of people 2% medicated with erythromycin and 82% of them medicated based on prescription from a qualified physician. Among non-prescription group, 100% medicated for urinary tract infection, dysentery, otitis, typhoid (41% in prescription group). 35% of the prescription group was also prescribed for respiratory tract infections, 24% for skin infection. (Table 3)

Tetracycline

Among the survey population ninth highest percentage of people 3% medicated with tetracycline and 13% of them medicated based on prescription from a qualified physician. Among non-prescription group, 25% medicated for acne (13% in prescription group), 25% medicated for diarrhea/dysentery (34% in prescription group), 25% medicated for fever (33% in prescription group), 25% medicated for toothache, trachoma, bronchitis (20% in prescription group). (Table 3)

Cotrimoxazole

Among the survey population ninth highest percentage of people 3% medicated with cotrimoxazole and 46% of them medicated based on prescription from a qualified physician. Among non-prescription group, only 1 person was found who used this drug for fever. 8% of the prescription group were prescribed for bronchitis, 17% for dysentery, 21% for fever, 13% nocardiasis, 12% for osteomyelitis, 21% for septicemia, typhoid, 8% for urinary tract infection. (Table 3) 4% (n=27) of those people who purchased ciprofloxacin capsules did not have any prior consultation with a physician. Similarly, the self medication rates for doxycycline, ampicillin, amoxicillin, azithromycin, cefradine and metronidazole were 5% (n=39), 1% (8), 2% (15), 1% (9), 1% (10) and 9% (68) respectively. The retailers delivered the medicines readily to their customers without asking for prescriptions or reasons of purchasing. The self medication rates for erythromycin, flucloxacillin, tetracycline, cefixime, cefpodoxime and cotrimoxazole were less than one percent. Only cefuroxime showed self medication prevalence zero percent (Table 4).

Significant correlation between the self medication rate and their acquaintance rates found from a previous study (11).

Discussion and Conclusion

In 100% cases, proportion of people medicated more than 1 week is more in case of prescription group than self education group. In case of Metronidazole, Doxycycline and iprofloxacin, patients used medications for significantly more time duration than the people who self medicated with the same medicines. A clinical trial by Urien et al.(12) found improved adherence after telephone follow-up 78.3% versus 54.1% in the control group, $p = 0.005$) among adults with a prescription for antibiotics. Garnett et al. (13) observed an improvement in adherence among patients receiving telephone follow-up compared with a control group (87% versus 77%). A U.S.

survey found that 37% of patients prematurely discontinued antibiotic treatment (14) even with prescription. The result of this survey shows that the general public has a tendency to prematurely discontinue antibiotic regimen. Therefore when they self medicate antibiotics, they are discontinuing drug after feeling better.

Patients do not take the medicines that physicians prescribe, or take them for too short a time or in an inadequate manner, thus reducing the efficacy of the drugs (15). According to previous studies, patients stop taking antibiotic and other medications when they begin to feel better (7, 16).

Several people were coming to purchase the medicines without prior consultation with any qualified health personnel and in inappropriate indications or symptoms that need thorough Clinical and pathological examinations. The misuse incidences are self medicating with ciprofloxacin to treat menstrual irregularity and abdominal pain, metronidazole to treat fever and menstrual irregularity, amoxicillin to treat viral diseases, ampicillin to treat scabies, azithromycin to treat pain etc.

People self medicated those medicines more which they are more acquainted with. This indicates the public has and active contribution towards wrong use of widely available antibiotics. Predictors of self-medication of antibiotics can hence be the acquaintance with the drugs name by observing others using it, over the counter status of antibiotic etc.

As there is no community pharmacy run by registered pharmacists in Bangladesh, the absence of pharmacists is being filled by self medication and random misuse of medicines. There are 36,068 registered pharmacy technicians and 2,897 registered pharmacists in Bangladesh. 22 universities in Bangladesh offer 825 seats per semesters for course in Pharmacy. The registered pharmacists are mostly working in pharmaceutical industries. More pharmacists should be recruited for operation in clinical need.

We recommend immediate establishment of community pharmacies run by qualified pharmacists who would spend more time for patients and prescription only status of antimicrobials in Bangladesh. The purchasing of antimicrobials should be thoroughly monitored by a qualified pharmacist. Further studies on duration of therapies for antimicrobials and patient compliance behaviour need to be carried out.



Educational advertisements and campaigns are needed to make people aware of the danger of self medication with antimicrobials.

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AUTHORS' CONTRIBUTIONS

Authors contributed equally to all aspects of the study.

PEER REVIEW

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.