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DOCTOR'S PRESCRIBING TRENDS OF ANTIBIOTICS FOR OUT PATIENTS IN BANGLADESH: A CROSS-SECTIONAL HEALTH SURVEY CONDUCTED IN THREE DISTRICTS

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ABSTRACT: Objectives: The aim of this study was to analyze and evaluate the practitioners' prescribing habits of antibiotics in three cities of Bangladesh. **Methods:** A cross sectional health survey with manual data collection was carried out with a standardized questionnaire over three month period at the three cities Rajshahi, Jessore and Comilla in Bangladesh. The collected data was subjected to simple descriptive analyses including frequency distribution, mean and finally expressed in percentage. **Results:** A total of 900 prescriptions of outpatients were analyzed during the study period. It was found that the prescriber prescribed antibiotics to the patients who were suffering mainly from cold and fever, infections, diarrhea and gonorrhoea. The highest prescribed antibiotic groups were cephalosporins (25.55%, 95%CI: 24.98-26.12), quinolones (23.75 %, 95%CI: 23.31-24.25), penicillins (15.78%, 95%CI: 15.41-16.15), macrolides (13.55%, 95%CI: 12.98-14.12) and metronidazoles (8.33%, 95%CI: 7.82-8.84) respectively. Two or more antibiotics were prescribed in 24.78 % of prescriptions. A total of 85% prescriptions had complete information on dosage form, 71.4% had complete direction for antibiotics use, 64% prescriptions had no clinical test for prescribing antibiotics, and 69.4% patients completed full course of antibiotics and the patient's compliance was 81.6%. **Conclusion:** This health survey seeks patient's awareness towards antibiotics use extensively as well as suggests modifications in practitioners' prescribing habits so as to ensure rational use of antibiotics in Bangladesh.

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INTRODUCTION: One of the most prescribed, costly and frequently available medications are antibiotics. Antibiotics are widely used medicines to treat both life threatening and trivial infections. Their indiscriminate use increases the risk of bacterial drug resistance^{1, 2}. High incidences of infectious diseases, high usage of antibiotics^{3, 4, 5} and bacterial resistance⁶ are reported from low and middle income countries.

Resistant bacteria spread rapidly in these countries due to setting specific factors, such as overcrowding, poor sanitation, and a warm-humid climate.

Rising rates of bacterial resistance is increasingly seen as a global problem^{7, 8, 9, 10}. Inappropriate prescribing and use of antimicrobial agents continue to be global problems; reasons include the demand for antibiotic treatment even when not indicated. Lack of understanding about the ineffectiveness of antibiotics against viral illness and the worldwide uncontrolled availability of antibiotics are contributing factors. Moreover the clinician's desire to satisfy the patients and pressure to address the wants of the individual rather than to consider the overall population^{11, 12, 13}. Quality of life can be improved by enhancing

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standards of medical treatment at all levels of the health care delivery system. Setting standards and assessing the quality of care through performance review should become part of everyday clinical practice¹⁴. Information about antibiotic use patterns is necessary for a constructive approach to problems that arise from the multiple antibiotics available¹⁵. In developing countries the cost of health care is a matter of major concern¹⁶. This is especially true for Bangladesh, a developing country in South Asia.

Bangladesh has made substantial progress in drug manufacturing since the promulgation of 'Drug Control Ordinance-1982' but irrational use, inappropriate prescribing and unjustified self medication of antibiotics often increase the cost of therapy and the risk of emergence of resistant organisms. Many doctors in Bangladesh are prescribing antibiotics irrationally without taking consideration the clinical test in most cases. Subsequently, the patients are not completing the complete dosage regimen of antibiotics if it is given in cold and general fever or even in other complicated infectious diseases. So, it is very important to know the extent of antibiotic usages and thereafter their resistance patterns as well to develop adequate regulatory controls by the Drug regulatory authority of Bangladesh for the distribution and selling of most prescribed antibiotics.

Therefore, the aim of this study was to analyze and to indicate the most prescribed antibiotics in "three big cities" Rajshahi, Jessore and Comilla in Bangladesh.

METHODS:

Setting and design

Three big cities named Rajshahi, Jessore and Comilla were selected for collecting the data for over three month's period from July, 2013 to October, 2013. Rajshahi is located in the north-west of Bangladesh and the divisional headquarters of Rajshahi Division as well as the administrative district that bears its name and is one of the seven metropolitan cities of Bangladesh having an estimated population of 853,000. Its total area is 96.69 km² (37.33 sq mi) and is situated on the northern banks of the river Padma (or Ganges which is one of the major rivers of the Indian

subcontinent). Rajshahi consists of 4 Thanas, 35 Wards and 175 Mahallahs¹⁷. Jessore is located in the southwestern tip of Bangladesh. Jessore is the main city of Jessore district located at 23.1681°N 89.2042°E and has a total area of 435.22 km². It has a population of 742,898 where males constitute 52.85% of the population, and females 47.15%. This city's eighteen-up population is 281,108 and has an average literacy rate of 44.2% (7+ years)¹⁸.

On the other hand, Comilla is situated in south-eastern of Bangladesh. It covers a total area of 153 square kilometers. It is bounded by Burchiganj and Tripura on the north, Laksham and Chaudagram on the south, and Barura on the west. Total population of this city is 346,238¹⁹. In this health survey, any patient that was prescribed one or more antibiotics at any stage during this study is defined as an 'antibiotic patient'. The term 'antibiotic' is used for 'anti-infectives for systemic use' (antibacterials-J01 and anti-mycobacterials-J04), as classified by World Health Organization Collaborating Center (WHOCC) for Drug Statistics Methodology²⁰. WHO Anatomical Therapeutic Chemical (ATC) classifications for antibiotics^{21, 22} was used in this study.

Data Collection

This cross-sectional health survey was carried out with a self designed standard questionnaire by directly interviewing the 900 outpatients, 300 from each city respectively. Four students of the Department of Pharmacy of Rajshahi University and three students from the Department of Pharmacy of Jessore University of Science and Technology were assigned and given instruction by the principle investigator, Mohitosh Biswas, Lecturer of Pharmacy Department of Rajshahi University for conducting this health survey. Written consent was taken from each patient during this study. Data were collected from the patients by random selecting the patients maximum of which came to purchase the drugs from the pharmacies.

The follow-up patients, patients already recovered from diseases but having prescriptions with antibiotics for the study period were also included in this study. The data collectors were waiting in front of the pharmacy shop and convince them to produce their prescription data to the interviewers as well as participated in the interview session. The

language of the questionnaire was English which is translated to Bengali language by the data collectors to the participants whom mother tongue is Bengali language. The Bengali answers given by the respondents translated to the English languages in the same way by the data collectors. Maximum interview was taken in front of the Rajshahi Medical College Hospital, Jessore Sadar Hospital and Comilla Medical College Hospital respectively where the patients came to take medical service. The data was collected from the patients where at least one antibiotic was prescribed during the study period.

The patients who were unconscious/mentally retarded, who were suffering with psychiatric diseases and who were admitted into hospitals were excluded from the study. Few questionnaires were excluded during the data analysis because of inadequate information.

Ethical considerations

The study was conducted following the general principles (section 12) of WMA declaration of Helsinki. This survey based research is also logistically supported by the Department of Pharmacy, University of Rajshahi. The human subjects involved in this study did not use any hazardous agents and samples were not collected from them. As the human subjects only participated in the interview, this survey based research didn't take any further approval from institutional ethics committee.

Statistical analysis

Descriptive statistics were applied to the collected data using Microsoft Excel software. Results are expressed graphically in percentages, mean, standard deviation (SD) and 95% CI. Modified Wald method was applied to calculate 95% CI.

RESULTS:

This is the first comparative survey in the Jessore, Rajshahi and Comilla city of Bangladesh indicating the prescription antibiotics for outpatients. From this health survey study it was found that antibiotics were prescribed averagely in 54% males and 46% females in these three cities, **Figure 1**. Among 900 patients, averagely 74 % patients visited Bachelor of Medicine, Bachelor of Surgery (MBBS) doctors whereas 18% Quack doctors and

8% patients visited Bachelor of Dental service (BDS) doctors, **Figure 2**. Children aged from "0" to 15 years old took the highest percentage of prescription (34.33%) followed by older peoples aged over 60 years (26.16%) whereas young people aged between 16-30 years took the least percentage (8.01%) of prescriptions. Middle aged patients whom aged ranges between 31-45 years prescribed 15.05% antibiotics and patients aged between 46-60 years prescribed 16.45% antibiotics, **Figure 3**.

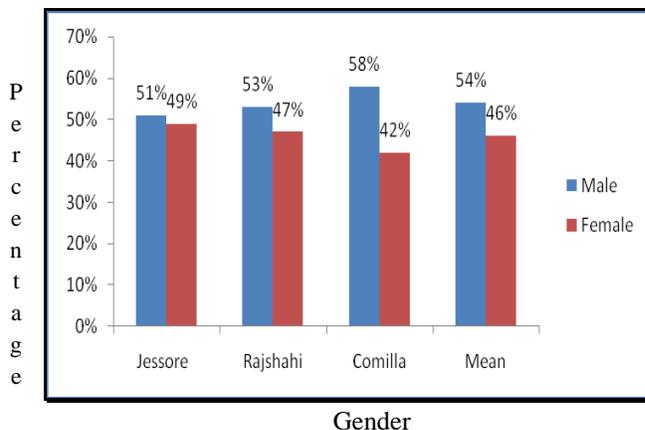


FIGURE 1: GENDER VARIABILITY OF COLLECTED PRESCRIPTIONS

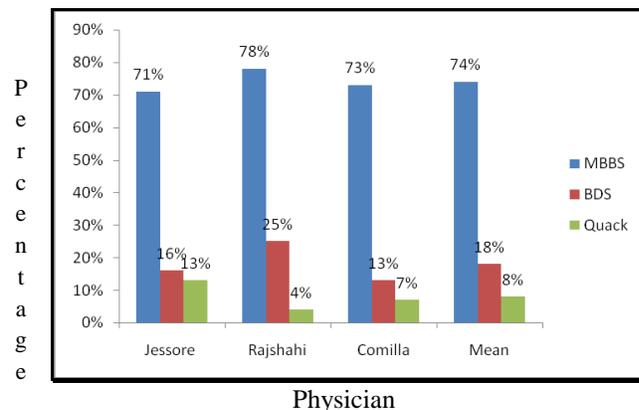


FIGURE 2: PRESCRIPTIONS OBTAINED FROM DIFFERENT HEALTH CARE PROFESSIONALS

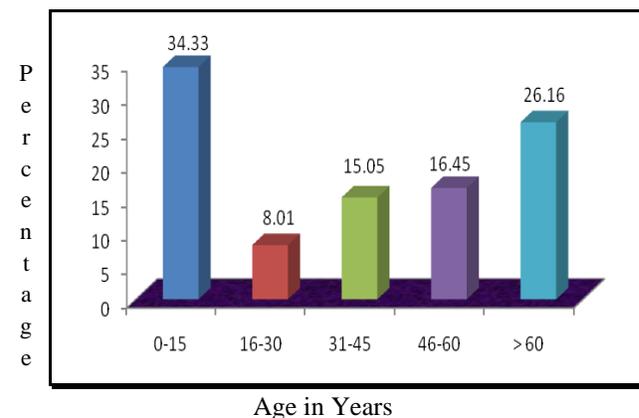


FIGURE 3: AGE DISTRIBUTION OF COLLECTED PRESCRIPTIONS

The reasons for taking the prescriptions from doctors were due to suffering from infections (43%), cold and fever (31%), diarrhea and

dysentery (22%), gonorrhoea (3%) and others diseases (2%), **Figure 4**. Other diseases include inflammations, pains, gout and accidental injury.

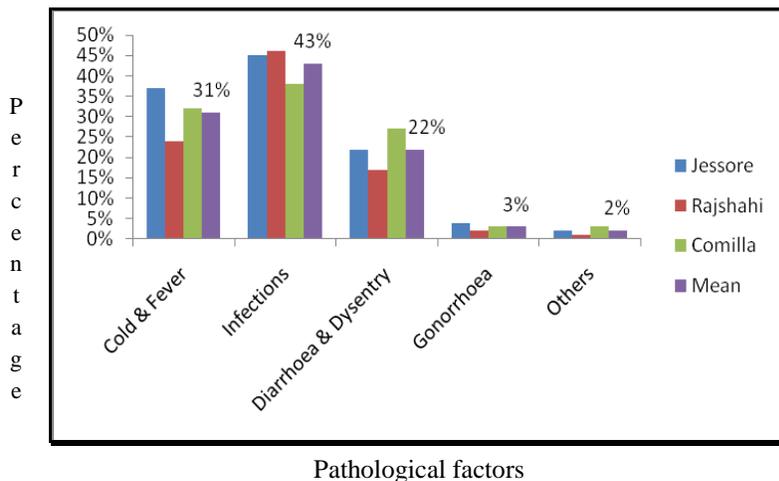


FIGURE 4: REASONS FOR VISITING DOCTORS

The average highest prescribed antibiotic groups in these three cities were cephalosporins (25.55%, 95% CI: 24.98-26.12), quinolones (23.75%, 95% CI: 23.31-24.25), penicillins (15.78%, 95% CI: 15.41-

16.15), macrolides (13.55%, 95% CI: 12.98-14.12) and metronidazoles (8.33%, 95% CI: 7.82-8.84) respectively, **Table 1**.

TABLE 1: FREQUENCY OF PRESCRIBED ANTIBIOTICS IN THREE CITIES OF BANGLADESH

Group of antibiotics with ATC Code	TNP (N=900)			IP (%)			AVP (%)	SD	95% CI
	Jessore (n=300)	Rajshahi (n=300)	Comilla (n=300)	Jessore	Rajshahi	Comilla			
Cephalosporins (J01D)	94	57	79	31.33	19	26.33	25.55	5.06	24.98 to 26.12
Quinolones (J01M)	85	74	55	28.33	24.67	18.33	23.78	4.13	23.31 to 24.25
Macrolides (J01F)	25	61	36	8.33	20.33	12	13.55	5.02	12.98 to 14.12
Aminoglycosides (J01G)	5	4	0	1.67	1.33	0	1	0.72	0.92 to 1.08
Penicillins (J01C)	36	60	46	12	20	15.33	15.78	3.28	15.41 to 16.15
Antituberculars (J04A)	20	0	6	6.67	0	2	2.89	2.79	2.57 to 3.21
Tetracyclins (J01A)	6	18	11	2	6	3.67	3.89	1.64	3.7 to 4.08
Metronidazoles(J01XD01)	13	19	43	4.33	6.33	14.33	8.33	4.32	7.84 to 8.82
Antifungals	6	5	16	2	1.67	5.33	3	1.65	2.81 to 3.19
Other antibiotics (J01X)	10	2	8	3.33	0.67	2.67	2.22	1.13	2.09 to 2.35

Cephalosporins were prescribed highest in Jessore city (31.33%) whereas lowest in Rajshahi city (19%). After cephalosporins, the highest antibiotic usage was quinolones probably due to quick recovery from diseases. Quinolones were prescribed highest in Jessore city (28.33%) whereas lowest in Comilla city (18.33%). The highest prescribed quinolones were ciprofloxacin, levofloxacin and sparfloxacin. Penicillins were prescribed highest in Comilla city (15.333%) but lowest at Jessore city (12%).

On the other hand, macrolides were prescribed highest in Rajshahi city (20.33%) followed by lowest in Comilla city (12%). The antibiotics which were prescribed in least percentages were aminoglycosides (1%, 95% CI: 0.92-1.08),

antituberculars (2.89%, 95% CI: 2.57-3.21) followed by tetracyclines (3.89%, 95% CI: 3.7-4.08). From this study it was found that single antibiotic was prescribed in 75.22% of total prescriptions whereas two or more antibiotics were prescribed in 24.78 % of total prescriptions. A total of 85% prescriptions had complete information on dosage form whereas 7.89% prescriptions had no complete information on dosage forms and 7.11% prescriptions had not mentioned the dosage forms.

Complete direction for antibiotics usages were found in 71.44% of total prescriptions but 28.56% prescriptions had no complete directions for antibiotics usages. It was found that after clinical test, antibiotics were prescribed in 36% prescriptions whereas 64% prescriptions had no

clinical test for prescribing antibiotics. After prescription, 30.33% patients didn't complete the full antibiotic courses but 69.4% patients completed full course of antibiotics. The patients compliance were found in 81.6% of total

prescriptions where patients recovered from suffered diseases. Still 18.33% percentage of total patients complaint about side effects by taking the prescribed antibiotics, **Table 2**.

TABLE 2: PRESCRIPTION PATTERN OF ANTIBIOTICS IN THREE CITIES OF BANGLADESH

Question Pattern	Response Pattern	Frequency n=900	Percentage (%)
Pattern of antibiotics	Single antibiotic	677	75.22
Prescription	Multiple antibiotics	223	24.78
Information on dosage form	Complete	765	85
	Incomplete	71	7.89
	Not mentioned	64	7.11
Information about the direction for antibiotic use	Complete direction	643	71.44
	Incomplete direction	257	28.56
Clinical test for prescribing antibiotics	With test	324	36
	Without test	576	64
Completion of full antibiotic course	Yes	627	69.67
	No	273	30.33
Patient's compliance	Disease recovery	735	81.67
	Side effects	165	18.33

DISCUSSIONS: This is the first report to indicate the prescription antibiotics for outpatients in the Jessore, Rajshahi and Comilla city. In this study males were prescribed more antibiotics than females. Higher prevalence of antibiotics in males also had been observed in previous studies conducted in Bangladesh, India, Nepal, Italy and Denmark^{23, 24, 25, 26}. These findings can't be fully explained although we think medical decisions are being biased by the male because of their dominance character in the Bangladesh.

Antibiotics prescription rates in this study was found to be particularly high in the pediatric and geriatric populations perhaps because these populations are more prone to infections²⁷. But antibiotic usage is also particularly high (34.34%) among the age group of "0"-15 years of age possibly because care givers of the children are more likely to insist upon an antibiotic prescription as they perceive it to be a panacea for their children's ailments. On the other hand, least percentages of antibiotics (8.01%) were prescribed for young people's aged between 16-30 years because immunity is very strong of this category of patients therefore, less affected by diseases.

Averagely highest percentage of patients (74%) visited MBBS doctors in these three cities because of the presence of Jessore Sadar Hospital, Rajshahi Medical College Hospital and Comilla Medical College Hospital where found MBBS easily and

being the main cities of these districts, a lot of MBBS doctors practice here. Being metropolitan city and divisional head quarters, highest percentage of patients (78%) visited MBBS doctors in the Rajshahi city. This is because high facilities and standard life status, large number of MBBS doctors are found here that was reflected in the survey results. The results obtained were correlated with the recent study conducted in the three cities of Jessore district only²⁸.

Guidelines suggest receiving antibiotic use only if positive infection was observed²⁹ but 64% prescriptions in this survey has no clinical test for positive infection although the prescribers are prescribing antibiotics irrationally. Furthermore, established guidelines suggest that antibiotics should not be the choice of treatment in most diarrhea cases³⁰ but this study revealed that 22% patients were prescribed antibiotics due to suffering from diarrhea and dysentery.

In our research it was found that cephalosporins accounted 25.55% of total antibiotic prescriptions where the highest uses were by ceftriaxone, cefixime, and cefuroxime. The results are similar but the prevalence rate of this group of antibiotic in these three cities is low as compared to the recent study conducted in Bangladesh²⁸. Another recent study conducted in Bangladesh found ceftazidime, ceftriaxone and cefixime as abnormally high resistants^{31, 32, 33} which confirmed the high usages

of this antibiotics in Bangladesh. This is probably a result of aggressive marketing policies of Bangladeshi Pharmaceutical Company on the physicians combined with inadequate knowledge of current treatment guidelines. In Bangladesh many doctors are not prescribing antibiotics by following the prescription guidelines of antibiotics. As a result, sometimes antibiotics are prescribed irrationally here to give quick relief of the patients without taking consideration of the patient's disease condition²⁸. Hospitals also account for antibiotic misuse worldwide due to non evidence based practice. Our survey based research also revealed that patients receiving antibiotics in Bangladesh is correlated to the reports on antibiotic usages in other parts of Asia, Europe or America^{26, 27, 34}.

This study has some limitations. First, the survey was only targeted the prescriptions having antibiotics therefore actual prevalence rate of antibiotics in the outpatient's prescriptions was not possible to calculate. Second, the findings obtained from this small sample size (900 only) cannot be generalized to the whole population of Bangladesh. Third, seasonal variations in illnesses should also be taken into consideration which is difficult to interpret by this short period of survey (only three months). Despite these limitations, our findings could play pivotal role in the control of antibiotics distribution, prescription and selling by indicating current prescription antibiotics and their usage patterns in Bangladesh.

CONCLUSIONS: Antibiotic usage is not closely monitored in Bangladesh. The results in this survey showed extensive antibiotic prescribing trends in Bangladesh without clinical test and a large number of patients did not complete the full course of antibiotics which would aggravate to develop quick antibiotic resistance in Bangladesh. This health survey therefore seeks patient's awareness towards antibiotics use extensively as well as suggests modifications in practitioners' prescribing habits so as to ensure rational use of antibiotics in Bangladesh.

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