Original Article

Pattern of Antibiotic Use among Hospitalized Patients according to World Health Organization Access, Watch, Reserve (AWaRe) Classification and Bangladesh Medical University Guideline: Findings from a Selected Medical College Hospital in Bangladesh

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Abstract:

Background: Antibiotic therapy is considered a principal component of infectious disease management in healthcare settings. Continuous, indiscriminate, and excessive use of antimicrobial agents promotes the emergence of resistant organisms, which is a global threat today, and also increases healthcare costs. **Objective:** To assess the pattern of antibiotic use among hospitalized patients according to Bangladesh Medical University (BMU) guideline and World Health Organization (WHO) Access, Watch, Reserve (AWaRe) classification. **Methods:** An observational descriptive cross-sectional study was carried out in the department of Surgery and department of Gynaecology & Obstetrics of Dhaka Medical College Hospital from January 2022 to December 2022. A total of 300 prescriptions containing antibiotics was consecutively selected. The BMU guideline and WHO AWaRe categorization of antibiotics were used to assess the prescribing practices of physicians. **Results:** In this study, the majority of prescriptions (68.7%) in the Gynaecology & Obstetrics department involved a combination of two antibiotics. In the Surgery department, most antibiotics (76%) were prescribed using their generic names, and the majority (83.3%) were administered via the parenteral route. Empirical therapy was predominant in the Surgery department, accounting for 78.7% of prescriptions. Cephalosporins were the most frequently prescribed antibiotic group (82%) in the Gynaecology & Obstetrics department. Overall, 57.3% of prescriptions adhered to the BMU antibiotic guidelines, with the highest adherence observed in the Surgery department. Additionally, 61.3% of antibiotics prescribed in the Surgery department belonged to the "Watch" group, according to the WHO AWaRe classification. **Conclusion:** Most prescriptions adhered to the BMU antibiotic guideline, and a large proportion of antibiotics prescribed belonged to the Watch group of the WHO AWaRe classification.

Key words: Antibiotic, BMU antibiotic guideline, WHO AWaRe classification.

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Introduction:
Antibiotics are currently the most commonly prescribed drugs in hospitals worldwide and are effectively prolonged the life expectancy. Almost half of all medicines globally are used irrationally. WHO states that irrationality can have severe consequences:

adverse drug reactions, drug resistance, protracted illness and even death[1]. Antibiotic resistance threats world widely which is the greatest challenge to the effective treatment of infections.To control this condition awareness of use should be increased and encourage immediate action to address the threat. A study conducted in Tehran, Iran showed that antibiotic prescribing was unjustified in 42.7% of the cases[2]. A study conducted in Bangladesh showed that 33% of physicians who were aware of the antibiotic stewardship programme were less likely to wait for laboratory results before prescribing antibiotics[3]. Pattern of antibiotic use in different departments of Dhaka Medical College Hospital showed: ceftriaxone 49.75%, metronidazole 17.5% and ciprofloxacin 12.75%[4].

Method:
Study Design and Study Population: An observational, descriptive, cross-sectional study was conducted in the Department of Surgery and the Department of Gynaecology & Obstetrics at Dhaka Medical College Hospital. Duration of the Study: The study was conducted over a one-year period, from January 2022 to December 2022. Inclusion Criteria: Patients above 18 years of age, of both genders, who were admitted to the Department of Surgery and the Department of Gynaecology & Obstetrics at Dhaka Medical College Hospital and were prescribed with antibiotics were included. Exclusion Criteria: Admitted patients who were unwilling to participate in the study and those who were not prescribed with antibiotics were excluded. The protocol of the study was approved by Ethical Review Committee of Dhaka Medical College. Study subjects were selected by consecutive sampling technique. Before recruitment, aim, benefit and procedure of the study was explained and informed written consent was taken from each study subject. Patient confidentiality was strictly maintained throughout the study by anonymizing all personal identifiers. Data were used solely for research purposes, and no individual information was disclosed in any publication. The picture of those prescriptions were captured by a photo capturing device. Later on, the photo of antibiotic containing prescription was screened and reviewed to record in the data collection form.For evaluating the adherence with Antimicrobial Guideline of BMU, 2015, at first compared the prescribed condition with the mentioned diseases of Antimicrobial Guideline of BMU, 2015. When the condition was matched then the selection of antibiotic and dose mentioned in guideline for that condition were compared. The decision was taken as adhered

when above conditions were matched together. Statistical method: Data was analyzed using descriptive statistics. Continuous data was expressed as mean ± SD (standard deviation) and the nominal data was expressed as percentages. Analysis of data was carried out by using Statistical Package for Social Sciences (SPSS) 26 version.

Results:
Table-I: Distribution of the study patients according to age (n=300)

Age group (years)	Obs & Gynae No . (%) (n=150)	Surgery No . (%) (n=150)	Total (n=150)
<20	24(16.0%)	10(6.7%)	34(11.3%)
21-40	107(71.3%)	56(37.3%)	163(54.3%)
41-60	15(10.0%)	66(44.0%)	81(27.0%)
61-80	4(2.7%)	17(11.3%)	21(7.0%)
>80	0(0.0%)	1(0.7%)	1(0.3%)
Total	150(100.0%)	150(100.0%)	300(100.0%)

Table I presents the distribution of study patients according to age. The majority of patients from the Obstetrics & Gynaecology department 107 (71.3%) cases, were between 21 and 40 years of age.

Table-II: Proportion of number of antibiotic per prescription

Number of antibiotics	Obs & Gynae No. (%) (n=150)	Surgery No. (%)(n=150)	Total
One	35(23.3)	72(48.0)	107×1=107
Two	103(68.7)	76(50.7)	179×2=358
Three	12(8.0)	2(1.3)	14×3=42
Total	150(100.0)	150(100.0)	507

Mean 1.69
Table II presents the proportion of antibiotics prescribed per prescription. The most common pattern was the use of two antibiotics, predominantly from the Obstetrics & Gynaecology department, accounting for 103 prescriptions (68.7%). Although the sample size was 300, multiple antibiotics per prescription resulted in a total of 507 antibiotics.

Table-III: Distribution of antibiotic prescriptions by nomenclature (n=300)

Nomenclature	Obs & Gynae No. (%) (n=150)	Surgery No. (%) (n=150)
Generic	96(64.0)	114(76.0)
Trade	13(8.7)	16(10.7)
Both(Generic+ Trade)	41(27.3)	20(13.3)
Total	150(100.0)	150(100.0)

Table-III presents the distribution of antibiotic prescriptions by nomenclature. The majority were prescribed using generic names, with 114 cases (76%) originating from the Surgery department.

Table-IV: Proportion of route of antibiotic administration (N=300)

Route	Obs & Gynae No.(%) (n=150)	Surgery No.(%) (n=150)
Parenteral	116(77.3)	125(83.3)
Oral	31(20.7)	23(15.3)
Both (Parenteral +oral)	3(2.0)	2(1.3)
Total	150(100.0)	150(100.0)

Table IV presents the distribution of study patients by route of antibiotic administration. The majority of antibiotics were administered via the parenteral route, with 125 prescriptions (83.33%) originating from the Surgery department.
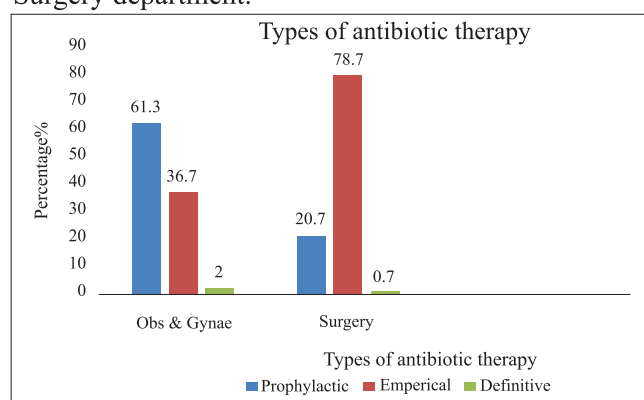

Figure1: Distribution of study patients by types of antibiotic therapy

Figure 1 illustrates the distribution of study patients by type of antibiotic therapy. The majority of treatments were empirical, with 118 cases (78.7%) originating from the Surgery department.

Table-V: Distribution of study patients according to group of antibiotic

Antibiotic	Obs & Gynae No.(%)(n=150)	Surgery No.(%) (n=150)
Cephalosporin	123(82.0)	108(72.0)
Penicillin	13(8.67)	10(6.67)
Fluroquinolone	16(10.67)	13(8.67)
Aminoglycosides	8(5.33)	3(2.0)
Macrolides	1(0.67)	0(0.0)
Carbepenem	6(4.0)	26(17.33)
Nitroimidazole	109(72)	68(45.33)
Sulfonamide	0(0.0)	1(0.67)
Clindamycin	-	1(0.67)
Tetracycline	1(0.67)	-

Table V indicates that cephalosporins were the most frequently prescribed group of antibiotics.

Table-VI: Distribution of study patients by name of antibiotic

Name of antibiotic	Obs &Gynae No.(%) (n=150)	Surgery No.(%) (n=150)
Cefixime	11(7.33)	6(4.0)
Cefoperazone	-	1(0.67)
Ceftazidime	-	7(4.67)
Ceftriaxone	93(62.0)	50(33.33)
Cefuroxime	16(10.67)	44(29.33)
Cephradin	3(2.0)	-
Ciprofloxacin	16(10.67)	9(6.0)
Co-amoxiclav	2(1.33)	3(2.0)
Co-trimoxazol	-	1(0.67)
Erythomycin	1(0.67)	-
Flucloxacillin	11(7.33)	7(4.67)
Gentamycin	7(4.67)	-
Meropenem	6(4.0)	26(17.33)
Metronidazole	109(72.0)	68(45.33)
Moxifloxacin	0(0.0)	1(0.67)
Amikacin	1(0.67)	3(2.0)
Clindamycin	-	1(0.67)
Doxycycline	1(0.67)	-
Levofloxacin	-	3(2.0)

Table-VII: Distribution of antibiotics on the basis of Adherence to BMU guideline (N=300)

Adherent type	Obs & Gynae No.(%) (n=150)	Surgery No.(%)(n=150)
Adherence	69(46.0)	86(57.3)
Non-adherence	81(54.0)	64(42.7)
Total	150(100.0)	150(100.0)

Table VII shows that the majority of prescriptions adhered to the BMU antibiotic guideline, with 86 cases (57.3%) from the Surgery department.
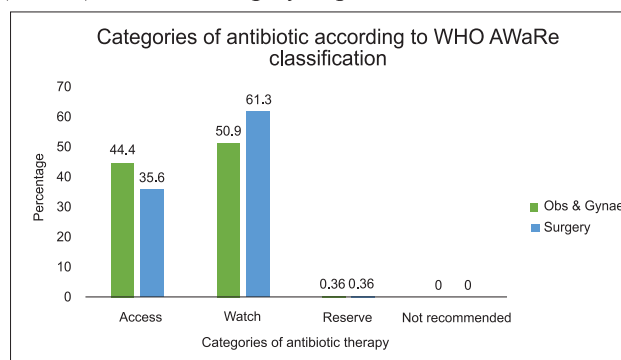

Figure 2: Distribution of antibiotics according to WHO AWaRe classification

Figure 2 shows that the majority of antibiotics (61.3%) belonged to the Watch group and were prescribed by the Surgery department.

Discussion:
Irrational use of antibiotics contributes to a series of consequences like drug interaction, increased hospital stay, increased cost and bacterial resistance[5]. In this study the demographic profile showed the predominant age group was 21-40 years (71.3%), which was similar to the study, conducted in Assam, India where 21-40 years age group was predominant (53%)[6]. The average number of drugs per prescription is an important parameter of a prescription audit. In our study we concentrated only on antibiotics. To minimize the risk of drug interactions, development of bacterial resistance and hospital costs, it is preferable to keep the number of drugs per prescription as low as possible. Here, the average number of antibiotics per prescription was 1.69 which was similar to the study in western Nepal (1.7)[7] and northern India (1.61)[8]. In this study, two antibiotics were most commonly prescribed in the Gynaecology & Obstetrics Department (68.7%), similar to findings from India (41.6%)[9], Yemen (55.73%)[10], and Uttarakhand (39%)[11].

Prescribing drugs by generic name promotes rational use in terms of safety, efficacy, and cost[12]. In this study, 114(76%) of antibiotics in the Surgery department were prescribed generically, likely due to government hospitals supplying medications in generic name. An Indian study reported 55.44% generic prescriptions in the Surgery ward and 69.01% in the Medicine ward[13]. Another study showed 81.47% of antibiotics were prescribed by generic name[12].In this study, most of the antibiotics were prescribed via the parenteral route, with 83.3% from the Surgery department. This may be due to the inpatient setting, where many patients were severely ill and required emergency interventions. Similar findings were reported inYemen (99.7%), Eastern India (82.91%), Kerala (60%), and Mongolia (81.9%)[10, 13, 14,15]. In this study, empirical antibiotic therapy was common in both departments, especially in Surgery (118 cases, 78.7%). This may be due to severely ill inpatients, high patient load, limited access to round-the-clock culture and sensitivity testing, and financial constraints. In such settings, empirical therapy may offer more benefit than risk. Similar findings were reported in Bangladesh (93.6%)[16] and India (61.6%)[9].

In this study, cephalosporins were the most commonly prescribed antibiotics (82%) in Gynaecology & Obstetrics and 72% in Surgery, often co-prescribed with metronidazole (72% and 45.33%, respectively). Cephalosporins were mainly used for intra-abdominal infections and surgical prophylaxis, while metronidazole provided anaerobic coverage after surgery. A similar study in India reported cephalosporin use for intra-abdominal infections (34.4%) and surgical prophylaxis (24%), with 66.4% of inpatients co-prescribed other antibiotics, most commonly metronidazole (69.9%)[9].

In this study, most prescriptions adhered to BMU antibiotic guideline, with 57.3% compliance in the Surgery department and 46.0% in Gynaecology & Obstetricsdepartment. A study conducted in Bangladesh reported the highest adherence in Obstetrics & Gynecology at 91.3%[17].In this study, 61.3% of antibiotics prescribed in the Surgery department belonged to the WHO AWaRe Watch group, likely due to their broad-spectrum activity and frequent empirical use in severe cases. A 2022 study in Bangladesh reported similar patterns: in the Surgery ward, 62.9% of patients received Watch group antibiotics, 36.4% Access, and 0.2% Reserve; in Gynaecology & Obstetrics, the figures were 55.4%, 44.4%, and 0.2%, respectively[18].

Conclusion: The study indicates that antibiotic therapy was largely empirical, with prescriptions commonly written in generic names and administered via the parenteral route. Cephalosporins were the most frequently used antibiotic group. Most prescriptions adhered to the BMU antibiotic guideline, and the majority of antibiotics belonged to the Watch group under the WHO AWaRe classification.

Limitations of the study: This cross-sectional study employed consecutive sampling, which may introduce selection bias.This study was conducted in two departments of a tertiary care hospital with a relatively small sample size; therefore, the findings may not be generalizable to antibiotic prescribing practices in remote regions of Bangladesh or across the country as a whole.

Recommendations: Antibiotic use should be evidence-based. Although developing national or hospital level guidelines may be time consuming,

adopting BMU guideline and the WHO AWaRe classification can streamline the process.

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