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ANTIBIOTIC PRESCRIBING PATTERN IN THE IN-PATIENT DEPARTMENTS OF A TERTIARY CARE HOSPITAL IN GMC ANANTNAG: A CROSS SECTIONAL PROSPECTIVE STUDY.

Pharmacology

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ABSTRACT

Objective: Antibiotics are currently the most commonly prescribed drugs in hospitals worldwide. However, excessive and inappropriate use of antibiotics can lead to increased drug resistance. Rational use of antibiotics should be a priority of policy makers. **Aim:** To assess and evaluate the prescribing pattern and the current practice of antibiotics in hospitalized patients and to evaluate the safe usage of antibiotics.**Materials and Methods:** This study was an institutional-based cross-sectional prospective observational study carried out in four in-patient departments (Surgery, Medicine, Ent &Orthopedic) in a tertiary care hospital between July 2023 and December 2023. Data was collected using a data abstraction format generated by World Health Organization (WHO) prescribing indicators.The enrolled patients were observed from admission till discharge. Data analysis was carried out using SPSS version 25.0 of Statistical Software. **Results:** Out of 1600 patients admitted in the hospital, a total of 1300 antibiotics were prescribed for 815 (50.93, 95% CI 48.4-53.3) patients. The average (mean±SD) number of prescribed antibiotics per patient was found to be 2.53±1.47, with the highest value (four antibiotics) being observed in surgical ward for a mean±SD duration of 4.2±2.3 days, and the longest duration (7days) being observed in the medical ward. Ceftriaxone was the most commonly prescribed antibiotic in most wards, accounting for 12.80%. Ciprofloxcin(13.80%) was the most frequently prescribed antibiotic in surgery ward as prophylaxis, whereas Moxifloxcin (10.94%) was the commonest antibiotic prescribed on the medical ward, as community- acquired pneumonia (CAP) was a common reason for admission in the ward. **Conclusion:** This study shows that the prescribing pattern of antibiotics in the hospital deviates from and is non-compliant with the standard endorsed by WHO Prescribing Pattern . Establishing an antibiotic stewardship program, introducing antibiotic use based on culture and sensitivity tests, and developing institutional guidelines could all help to alleviate this problem. It was observed that the hospital physicians prescribed antibiotics more rationally with no banned drugs and less newer drugs. Rational prescribing of antibiotics would help avoid polypharmacy and prevent drug resistance.

KEYWORDS

WHO prescribing indicators, antibiotic, Prescribing pattern, Essential Medicine List, Antibiotic Stewardship Program(ASP)

INTRODUCTION

The analysis of prescription pattern is a prudent tool to define rational drug therapy, maximize utilization of resources and to reduce prescription errors. Prescription pattern monitoring studies (PPMS) are drug utilization studies with the main focus on prescribing, dispensing and administering of drugs[1].

Antibiotics form a major chunk of drugs prescribed worldwide. Development of antimicrobial agents (AMAs) has been an important milestone in the evolution of modern medicine, enabling elimination of infectious diseases and epidemics and effectively reducing mortality[2]. Unfortunately erroneous use of antibiotics has lead to serious ramifications like antibiotic resistance and emergence of multi drug resistant strains.

Antimicrobial Stewardship Program (ASP) is one of the important strategies for ensuring appropriate use of AMAs and for controlling the emergence of antimicrobial resistance[4]. Awareness of the need for such a strategy, particularly in the Tertiary Care hospitals, is fortunately increasing, with actual implementation in many such set ups[5].

The Problem of overuse of antibiotic is a global phenomenon. In India, the prevalence of use of antibiotics varies from 24% to 67%.The International Network for the Rational Use of Drugs (INRUD) was established in 1989 to promote the rational use of drugs in developing countries. Various indicators were developed by INRUD in collaboration with WHO that provided objective indices to allow for assessment of drug use practices[6]. Unnecessary poly-pharmacy, high use of drugs with unproven efficacy, and irrational antibiotic usage are some of the recognized drug prescription issues in developing countries. These problems lead to increased health-care utilization, morbidity, mortality, adverse drug events, and drug resistance[7].

Antibiotic resistance (ABR) develops when potentially harmful bacteria change in a way that reduces or eliminates the effectiveness of the antibiotic. Although ABR is a common issue, the inappropriate use and malprescribing of antibiotics is increasing the incidence of ABR[8].

Currently, the Center for Disease Control and Prevention (CDC) warns health professionals to work in improving antibiotic prescribing practice and use in human health care, and recommends the establishment of an Antibiotic Stewardship Program (ASP)[9].

Although antibiotics are a cornerstone tool in health-care delivery in hospitals and save countless lives, up to half (20–50%) of prescribed antibiotics are inappropriately consumed worldwide[10]. Still, there is a need for data on both antibiotic use and determinants of its use from all the regions of the world . It is very essential to analyze and monitor the prescribing patterns of drugs from time to time. This would enable the basic modification in prescribing practices to enhance the therapeutic benefit and decrease the side effects of drugs. So our study aims to assess and evaluate the prescribing pattern and the current practice of antibiotics in hospitalized patients.and to assess the safety usage of antibiotics.

MATERIALS AND METHODS

Study design and setting

The study was a cross-sectional prospective & observatoinal study carried out in four in-patient departments (Surgery, Medicine, Orthopedics & Ent) in a tertiary care hospital between July 2023 and December 2023.

Source and study population

Patients(n=815) who were hospitalized in the selected wards(surgery,medicine,Ent & Ortho) of the hospital were the source of the population, and all patients admitted during the study period to the selected wards of the hospital who met the inclusion criteria were

our study population.

Eligibility Criteria

All patients admitted to the study wards of the hospital during the study Period were included. The patients who visited the out-patient departments, who were unconscious/mentally retarded, who were suffering with psychiatric diseases, and who were admitted into intensive care unit, were excluded from the study. Patients on programmed antibiotics for long-term therapy (patients on anti-tuberculosis drugs) were excluded.

Study variables

The dependent variable of this study is the antibiotic prescribing pattern (WHO indicators). The independent variables are socio-demographics (age, gender, and residence), reason for admission and co-morbid conditions, antibiotic information (frequency, indication, and regimen/combination), and pattern of culture and sensitivity testing.

Data Collection

The data was abstracted from patient's medical charts ,it included, patient's socio-demographic characteristics, diagnosis/reason for admission, dosage form and route of administration, frequency, indication, and duration of prescribed antibiotic type and number of prescribed antibiotics and provision of routine laboratory results for monitoring, such as antibiotic sensitivity tests. During the study period, patient's medical charts were reviewed on a daily basis and any change either in the drug chart or in the laboratory details was collected. Data was collected following the pre-tested structured questionnaire and standard antibiotic prescribing indicators generated by the WHO, and also questionnaire from similar studies was used[1].

Statistical analysis

Using Epi Data Manager and Epi Data Entry Client Version 4.0.2.00, variables was coded, the database was set, and data was entered. For analysis, the data were exported to SPSS version 25.0. To describe socio- demographic and antibiotic prescribing patterns, descriptive statistics such as mean and standard deviation for continuous variables and frequency and percentage for categorical variables were used. Antibiotic prescribing trends were calculated, assessed, and compared with WHO prescribing indicator standard values[2]. **Data quality control** A week before the actual data collection began, 5% of the sample was pretested, and changes were made as a result. The data collectors had been trained, and they were closely supervised.. The completeness of the filled information was checked at the end of each data collection day to ensure the quality of the recorded data. If any mistake was found, it was be corrected right away.

RESULTS

Socio-Demographic Characteristics

Out of 1600 patients approached, 815 were found to be on at least one antibiotic and were included in the study. The mean ±SD age of patients was 40.25±9.97 years. The majority of patients were female(54.11%), lived in rural area(62.94%). The socio-demographic characteristics of participants are described in Table 1(fig 1).

WHO Indicators (Prescribing Indicators)

Out of 1600 inpatients in the hospital, a total of 1300 antibiotics were prescribed for 815 (50.93, 95% CI 48.4-53.3) patients. The average (mean±SD) number of prescribed antibiotics per patient was found to be 2.53±1.47, with the highest value (four antibiotics) being observed in the surgical ward for a mean±SD duration of 4.2±2.3 days, and the longest duration (7days) being observed in the medical ward. Furthermore, the percentages of antibiotics prescribed from the EML list and using their generic name were 100% and 48.38%, respectively. Details regarding prescribing indicators are summarized in Table 2. Some antibiotics were prescribed empirically in some cases, as culture and sensitivity testing of antibiotics was carried out for some of the antibiotics in the hospital. Half (50.1%) of the antibiotics were prescribed for therapeutic indications 43.92%and26.62 % for prophylactic purposes. The majority (36.02) of in patients on the surgical ward received antibiotics for prophylaxis. Almost all (39.92%) of the patients on the medical ward received antibiotics for therapeutic purposes. Injection was the most common route of antibiotic administration, used in (48.46%) of adult patients.

Table: 1Demographic profile of Patients Admitted to GMC Anantnag and Associate hospitals

	Category	Included wards(n=815)				Total frequency (%)
		Surgical (n=305)	Medical (n=258)	ENT (n=142)	Ortho (n=110)	
Age (years)	Mean ±SD	34.52± 11.25	44.31± 9.87	44.57± 10.45	46.30 ±9.87	40.25±9.97
Sex	Male	110(36.06)	63 (24.4)	45 (31.69)	47 (42.72)	265 (32.51)
	Female	195(63.93)	85 (32.94)	97 (68.30)	64 (58.18)	441 (54.11)
Residence	Rural	195(63.9)	157 (60.85)	96 (67.60)	65 (59.09)	513 (62.94)
	Urban	110(33.11)	101 (39.14)	46 (32.39)	45 (40.90)	302 (37.05)

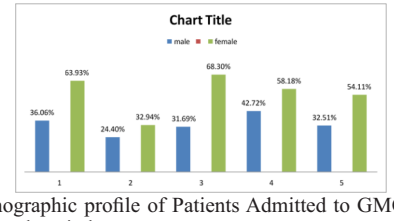

Fig1: Demographic profile of Patients Admitted to GMC Anantnag and Associate hospitals

Table 2 :WHO Prescribing indicators of antibiotics among in-patients admitted to GMC Anantnag & Associated

Prescribing Indicator	Selected Wards n (%) [N=1600],n (%)				Total, n=822 n (%), mean ±SD	Proportion(95 % CI)
	Surgical	Medical	Ent	Ortho		
Percentage of patients admitted with at least one antibiotic	305(37.42)	258(31.65)	142(17.42)	110(13.49)	815(50.93)	48.4-53.3
Average number of antibiotics prescribed per patient	634 (2.36± 1.46)	399 (2.49± 1.46)	166 (2.81± 1.38)	101 (2.65± 1.32)	8I5(2.53±1.47)	-----
Percentage of antibiotics prescribed from national FL/EML	634(100)	399(100)	166(100)	101(100)	1300(100)	-------
Percentage of antibiotics prescribed by generic name	255(40.22)	199(49.87)	110(66.26)	65(64.35)	629(48.38)	45.6-51.0
Percentage of antibiotics prescribed in oral form	153(24.13)	120(30.03)	95(57.22)	55(54.45)	423(32.53)	29.9-35.0
Percentage of antibiotics prescribed in injection form	230(36.27)	160(40.10)	142(85.54)	98(97.02)	630(48.46)	45.7-51.1
Average duration of days antibiotic prescribed in the hospital stay	4.2	6.8	1.2	0.3	4.2±2.3	--
Percentage of patients who received antibiotics for therapeutic purpose	76(24.91)	103(39.92)	99(69.97)	80(72.72)	358(43.92)	40.4-47.2
Percentage of patients who received antibiotics for prophylactic purpose	110(36.02)	12(4.65)	75(52.81)	20(18.18)	217(26.62)	23.5-29.6
Percentage of patients who received fixed dose combinations	175(57.37)	105(40.69)	95(66.90)	75(68.18)	450(55.21)	51.8-58.6

Abbrevations: FL/EML, formulary LIST/ESSENTIAL MEDICINNE LIST

Distribution of Prescribed Antibiotics

As shown in Table 3, more than half (62.46 %) of antibiotics were prescribed for patients admitted to the surgical ward. Ceftriaxone was the most commonly prescribed antibiotic in most wards, accounting for 12.46%. Ciprofloxcin(13.80%) was the most frequently prescribed

antibiotic on surgery ward prophylaxis, whereas Moxifloxcin (10.94%) was the commonest antibiotic prescribed on the medical ward, as community-acquired pneumonia (CAP) was a common reason for admission. The most frequently prescribed combination was azithromycin with ceftriaxone (18.46%) followed by ceftriaxone with Sulbectum (16.66%). More than half (55.21%) of patients were treated with combination antibiotics.

The culture and sensitivity testing were performed, and the resistant strains of Escherichia coli Pseudomonas aeroginosa, Klebsiella Pneumonia, were isolated. Results showed that E. coli was sensitive to piperacillin, tazobactam, amikacin and it was resistant to ampicillin. Ceftriaxone & ceftazidine. P. aeroginosa was sensitive to piperacillin, tazobactam, ceftazidine, and cefoperazone. K. pneumonia was sensitive to piperacillin, tazobactam, and imipenam.Resistence was found to be more for ampicillin, cefazolin, and cefuroxime, whereas sensitivity was more for gentamicin, piperacillin, tazobactam, and amikacin.

Table 3: WHO prescribing indicators of antibiotics among in-patients admitted to GMC Anantnag & Associated hospitals

	Selected Wards, n (%) [N=1600]				Total=815 mean± SD	Proportion(95 % CI)
	Surgical	Medical	Ent	Ortho		
Amoxicillin–clavulanic acid	110(13.54)	70(11.78)	35(13.61)	15 (9.61)	230 (12.13)	11.10-14.16
Amoxicillin capsule	115(14.16)	52 (8.75)	24 (9.33)	18(11.53)	209 (11.47)	10.01-12.94
Ceftriaxone injection	104(12.80)	75(12.62)	32 (12.45)	16(10.25)	227 (12.46)	10.95-13.98
Ciprofloxacin	97(11.94)	82 (13.80)	42 (16.34)	35(22.43)	256(14.05)	12.46-15.65
Vancomycin	60 (7.3)	52 (8.75)	2 (0.77)	20 (12.82)	134 (7.35)	6.16-8.56
Metronidazole injection	76 (9.3)	32 (5.38)	3(1.16)	5(3.20)	116(6.37)	5.29-7.59
Levofloxacin	88 (10.83)	42 (7.07)	34(13.22)	21(13.46)	187 (10.26)	8.87-11.66
Azithromycin capsule–	66(8.12)	48(8.08)	32 (12.45)	16 (10.25)	162(8.89)	7.59-10.20
Moxifloxacin	42(5.17)	65(10.94)	43(16.73)	8(5.12)	158 (8.67)	7.38-9.97
Cefepime injection	54(6.65)	76 (12.79)	10 (3.89)	2(1.28)	142 (7.79)	6.57-9.03
Total	812(62.46)	594(45.69)	257(21.15)	156(12)	1821(100)	

Table:4 Antibiotics combinations used in GMC Anantnag

Combinations	Selected Wards, n (%) [N=1600]				Total Percentage%
	Surgical	Medicine	Ent	Ortho	
Piperacillin +tazobactam	72(18.46)	96 (19.71)	32(17.48)	12(15.58)	210(17.42)
Azithromycin +ceftriaxone	46(11.79)	54(11.08)	35(19.12)	24(31.16)	159(13.19)
Metronidazole +ciprofloxacin	14(3.58)	44(9.03)	4(2.18)	3(1.60)	65(5.39)
Ciprofloxacin +vancomycin	26(6.66)	35(7.18)	2(1.09)	0(0)	63(5.22)
Ceftriaxone+ sulbactam	65(16.66)	88(18.06)	24(13.11)	6(7.79)	183(15.1)
Ceftazidime + vancomycin	16(4.10)	54(11.08)	10(3.46)	7(9.09)	87(7.21)
Ampicillin + gentamicin	73(18.71)	68(13.96)	6(3.29)	3(3.89)	150(12.44)
Levofloxacin + ornidazole	63(16.15)	54(11.08)	32(17.48)	12(15.58)	163(13.52)
Azithromycin + amoxicillin–clavulanic acid	15(3.84)	62(12.73)	38(20.76)	10(12.98)	125(10.37)

Table 5: Systemic infections and percentage of patients on antibiotics

Indication	Patients
Urinary tract infection	12(1.47)
Respiratory infection	45(5.52)
GIT	20(2.45)
Fever	15(1.8)
Surgery Related Infections	32(3.92)
Bone Related Infection	16(1.96)

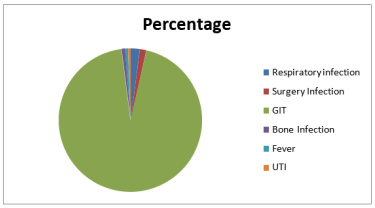

Fig 2: Systemic infections and percentage of patients on antibiotics

DISCUSSION

In the present study, the prescribing pattern of antibiotics in four different wards were analyzed using WHO prescribing indicators. During the study period, 50.93% (95% CI48.4-53.3) of patients were prescribed antibiotics. This finding was higher than the WHO's recommended range of 20–25.4%[12]. This indicates that our institute has a high rate of antibiotic prescriptions. This percentage matched that of prior research, which found 58.1% in southern Ethiopia [13], 58.5% in Gondar[14], and 64.7% in southwest Ethiopia[15]. On the other hand, our antibiotic prescribing rate was low when compared with the findings of Harar (66.9%)[16], Congo (68%)[17], Eritrea (79.05%)[18], and Pakistan (82.3%)[19].

The percentage of patients using at least one antibiotic in this study was greater than the figures of 24.37% reported in Wello town, Ethiopia[20], 29.4% in Gondar hospital, Ethiopia,48.5% in Gondar town[21] and 32.0% in Ayder hospital, Northern Ethiopia[22]. Similarly, it was also higher than in studies reported from Cameroon (36.71%)[23], Pakistan (51.5%)[24] , China (54.6%)[25].

This disparity could be explained by the fact that these studies were conducted on outpatients who only received oral antibiotics in the community, whereas our study was conducted on hospitalized patients who received both oral and parenteral antibiotics. Furthermore, compared with other studies, Our studies looked at antibiotic prescribing patterns for a shorter period of time (no more than 6 months.

Moreover, the average number ((2.5) of antibiotics per patient in our study exceeded the standard recommended by the WHO, with a limit of 1.6–1.8,1 showing that prescription pattern of antibiotics in the study area was similar to the 2.1–2.2 antibiotics per patient reported in other studies conducted in eastern Ethiopia and Addis Ababa [26].On the other hand, our finding was higher than the optimal values and lower than findings reported from Eritrea and Congo, in which 1.29 and 1.4 antibiotics per patient were prescribed, respectively[27].

All of the antibiotics prescribed in this current study (100%) were from The NEML of India an Jammd. This is in line with a study undertaken in Aksum[29] in which 100% of antibiotics were prescribed from the national EML. This could be explained by the fact that J&k public hospitals procure the majority of their drugs from a government supplier, which mostly distributes pharmaceuticals based on the national EML. As a result, prescribers in GMC ANANTNAG are encouraged to follow the EML, resulting in 100% compliance.

Despite the goal of prescribing antibiotics by their generic names 100% of the time, In present study we found that only 48.38% of medicines were prescribed by their generic names. According to the WHO[12] indicators, prescribing antibiotics by their generic names are one of the clearest markers of the adoption of low-cost antibiotics. In this study, antibiotics were prescribed by their generic names 48.38% of the time. This was less than the WHO-recommended criterion of prescribing medications by their generic names (100%)[29]. This result, however, was similar with rates of 49.3% and 56.1% found in Sudan[31] and Zambia[32] studies, respectively. Furthermore, our findings are lesser to those of Gondar, Ethiopia (96%),3 Aksum, Ethiopia (97.6%), Sidama, Ethiopia[29]. In truth, there is no difference in pharmacological efficacy between prescribing antibiotics by their brand and generic names[30]. This may be justified because prescribing pharmaceuticals by their generic names minimizes the danger of drug replication, as patients may be unaware that the same drug is being used by two

doctors if one prescribes a brand name and the other a generic name, or if both prescribe different brands. However, there may be discrepancies in perceptions and understandings of the differences between generic and brand names. As a result, in our setting, prescribing antibiotics by generic names is a beneficial practice that should be encouraged.

Another significant finding from our study was that injectable antibiotics were frequently prescribed ((48.46%). The Studies in Ethiopia found lower rates of injection prescribing at 4%,3 11.2%,25 26.5%, and 38%[13]. .Injectable antibiotics were most likely readily available in our study because they are often reserved for hospitalized patients, who would be managed onward in the setting of this investigation, whereas outpatients would not. Injectable antibiotics are overprescribed, which is considered inappropriate antibiotic use. As a result, GMC ANANTNAG prescribers should emphasize the use of oral antibiotics over injectable antibiotics to prevent injection related infections, shorten hospital stays and lower healthcare costs.

Since GMC ANANTNAG does culture and local sensitivity testing of microorganisms, and most antibiotics were prescribed empirically. As evidenced by similar studies, prescribing broad-spectrum antibiotics is common practice. Ciprofloxacin was the most commonly prescribed antibiotic(14.05%), followed by Ceftriaxone (12.46%) and Amoxicillin–clavulanic acid (12.13%). This finding was consistent with a similar study conducted in Aksum and Saudi Arabia[32] in which ceftriaxone was the most commonly prescribed antibiotic. Among hospitalized patients, surgical site infection (ceftriaxone) and respiratory tract infection were suggested as conceivable explanations for antibiotic utilization. This disparity may be explained by the fact that our study was conducted in a tertiary hospital where all prescribers are at least general practitioners and are capable of prescribing antibiotics with lower resistance to treat complicated medical problems in patients referred from various primary healthcare settings.

CONCLUSION

In this study, the antibiotic prescribing pattern deviated from the WHO-recommended standard. This necessitates the implementation of ongoing interventional techniques as well as periodic audits at all levels of healthcare to avoid the harmful repercussions of incorrect antibiotic prescribing. More than half of the patients in this study were taking at least one antibiotic, and all antibiotics were obtained from the NEML of India and EML of JK. However, in all cases, antibiotics were usually given without a culture or sensitivity test. This finding indicates that the hospital's antibiotic prescribing practice deviates from and is in violation of the WHO-endorsed standard. Establishing an antibiotic stewardship program, introducing antibiotic use based on culture and sensitivity tests, and developing institutional guidelines could all help to alleviate this problem. As a result, this study provides valuable insights into the antibiotics Prescribing Pattern in the Inpatient Departments of a Tertiary Care Hospital in GMC Anantnag.

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Author contributions

All authors made a significant contribution to the work reported in the conception, study design, execution, acquisition of data, analysis, and interpretation; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted, and agree to be accountable for all aspects of the work.

Ethical approval

The study was approved by the Ethical committee of GMC ANANTNAG (Approval Number:IEC/GMCA/23/071), and subsequent permission was obtained from related Departments.

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