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Evaluation of Prescribing Patterns of Antibiotics in General Medicine Ward in a Tertiary Care Hospital

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ABSTRACT

Knowledge about antibiotic utilization and resistance patterns of most common microorganisms are unavailable in tertiary care hospitals.

To assess the pattern of antibiotic utilization and outcome of patients in a General Medical Ward, all positive blood cultures (BC) over a 4 month period from July 2019 to October 2019 were retrospectively reviewed. Sixty-five positive BC were recorded in which patients (43% males & 22% females). 72% of the patients received antibiotics before or soon after obtaining the BC, and ceftriaxone was the most frequently-prescribed antibiotic (41.93%), either alone or in combination with other antibiotics. The bacteraemia was due to gram-positive cocci in 60.46% of cases, gram-negative rods in 30.23%, and gram-positive rods in 9.30%. Positive BC due to contamination was not included. The most common gram-positive cocci were Staphylococcus epidermidis, followed by S. aureus, while the most common gram-negative bacilli were Brucella species, Proteus mirabilis, and Klebsiella sp. The suspected sources of the bacteraemia were respiratory (21.2%), urinary (19.2%), or skin (19.2%). A subsequent change in the antibiotics regimen was done in 69.76% cases after BC results became available with no apparent effect on the outcome. Adding Cefotaxime, Amoxicillin clavulonic acid, piperacillintazobactum, vancomycin and clindamycin was the most frequent change done (19.4% for each equally). Complications developed in 69.76% of patients, with 88.66% of them suffering from sepsis/shock. 69.23% of the patients improved and 30.77% expired; death was related to infection in 87.5% of cases. In conclusion, most bacteremia in the medical ward of the hospital were due to gram-positive cocci, which should be considered in antibiotic selection prior to BC.

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KEYWORDS: *Antibiotic, resistance, sensitivity, blood culture, medical, utilization*

INRODUCTION

In the developing nations, the expenses of drugs is a most important alarm to medical health care professionals and patients because the management and utilization of antimicrobials has clinical, cost-effective, and ecological implications and they are the most frequently prescribed therapeutic products accounting for 30–50% of prescriptions for drugs. It has been found that antibiotic expenditures account for nearly 50% of a hospital's total drug resources.(1)

Substantial overuse of antimicrobial drugs predominantly broad-spectrum antibiotics has been disclosed in the past few years, and virtually half of all the antibiotic drug prescriptions have been found to be inexpertly selected. This is the fact of the general medicine wards in tertiary medical centres where inaccuracy in prescription, administration, and dispensing are frequent. In such scenarios, the possibility of drug interactions and adverse drug reactions are high, as large numbers of medications are prescribed. Additionally, inappropriate and unreasonable utilization of antimicrobials contributes to reduced drug efficacy, appearance of new co-infections and microbial resistance to the commonly-prescribed antimicrobials. (2)

The study of prescription pattern is generally a part of a medical audit that looks for assessment and if required, modification in prescription pattern to obtain rational and cost-effective medical care.(3)Growth of resistant microorganisms due to improper use of antibiotics can effect in the stretch of these microorganisms to other patients admitted in the same ward. (4)

Review of the antimicrobial agent utilization in the TMC and information about the various strains of microorganisms and their sensitivity patterns are helpful in developing infection control plans in the TMC. (5)

Hence, prevention of inappropriate antibiotics use is vital for infection control plans in the TMC.

With the purpose of assessing the pattern of antibiotic utilization and outcome of patients, this report shows the results of a retrospective analysis of the pattern of antibiotics use over a 4 month period of time (July-October 2019) in the general medical ward of tertiary care hospital.

MATERIALS AND METHODS

Study design

We retrospectively monitored all patients admitted in a general medical ward of a tertiary care hospital over a period of 4 months between July and October 2019

Setting

A general medical ward of a Tertiary Care Hospital

Patient data

For all patients, clinical and laboratory data which were recorded by trained physicians and nurses during the period of hospitalization were utilized. The patients were considered to have infection if they had at least one positive blood culture (BC).

Blood culture

10 ml of venous blood from the patients was obtained aseptically. The collected blood was sent to laboratory for identifying the organism. Enriched and selective media including blood, examined for growth at 24–48 h. Isolates, if any, were identified by standard microbiologic procedures, including Gram staining, colony characteristics, and biochemical properties such as catalase, mannitol salt agar, DNAse agar, and hemolysis on blood agar plates, for Gram-positive isolates; and triple sugar iron (TSI), Antibiotic susceptibility was performed by the Kerby-Bauer disc diffusion method including standard oxacillin disc susceptibility as well as optochin and bacitracin.

RESULTS:

Fig1:

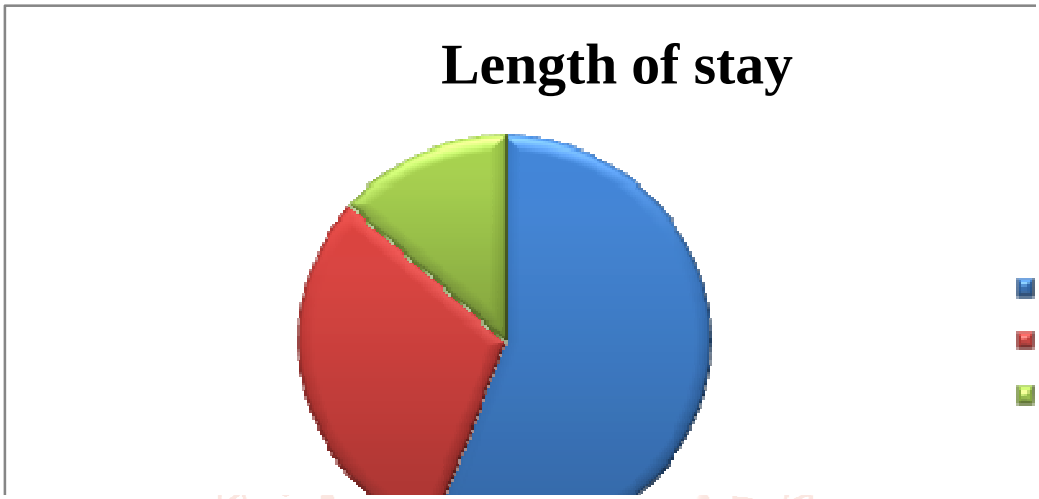

Table1: Length of stay

S. No.	No. of days	No. of patients	Percentage %
1.	5 -7 days	91	55.83
2.	7 - 15 days	50	30.67
3.	15 - 30 days	22	13.5

Fig2:

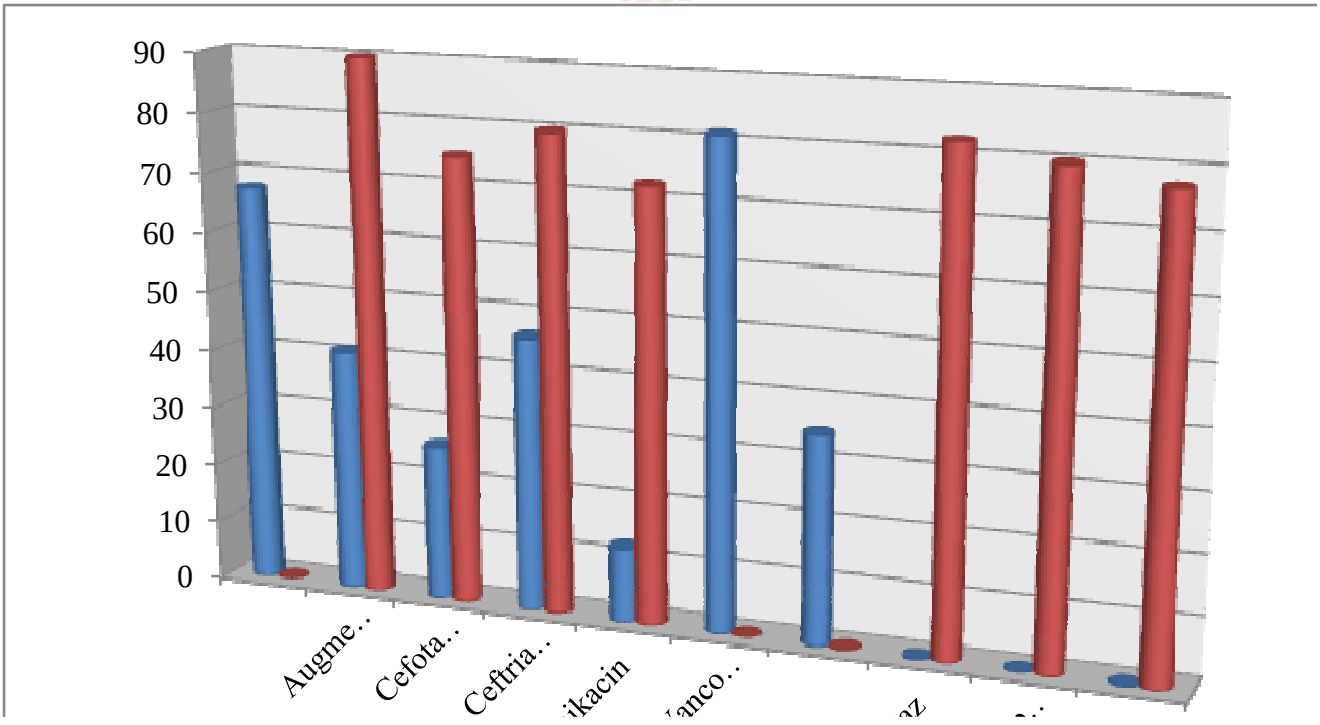

Table2: Sensitivity tests on organisms

S. No.	Antimicrobials	Organisms	
		Gram positive	Gram negative
1.	Tetracycline	67.5	-
2.	Augmentin	41	90
3.	Cefotaxim	26.25	75
4.	Ceftriaxone	46.25	80
5.	Amikacin	12.5	72.5
6.	Vancomycin	81.25	-
7.	Azithromycin	35	-
8.	Piptaz	-	82.5
9.	Meropenem	-	80
10.	Ciprofloxacin	-	77.5

Fig3:

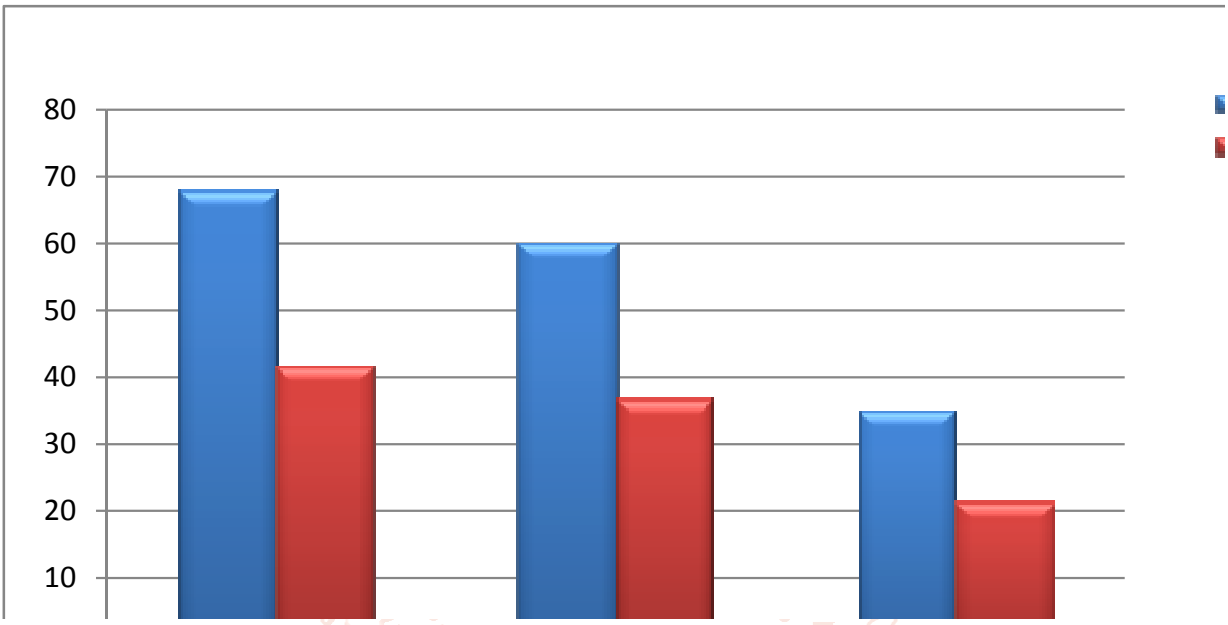

Table3: Change of antimicrobials

S. No.	Antimicrobials	No. of cases	Percentage %
1.	No change	68	41.72
2.	Single change	60	36.80
3.	Repeated changes	35	21.47

Fig4:

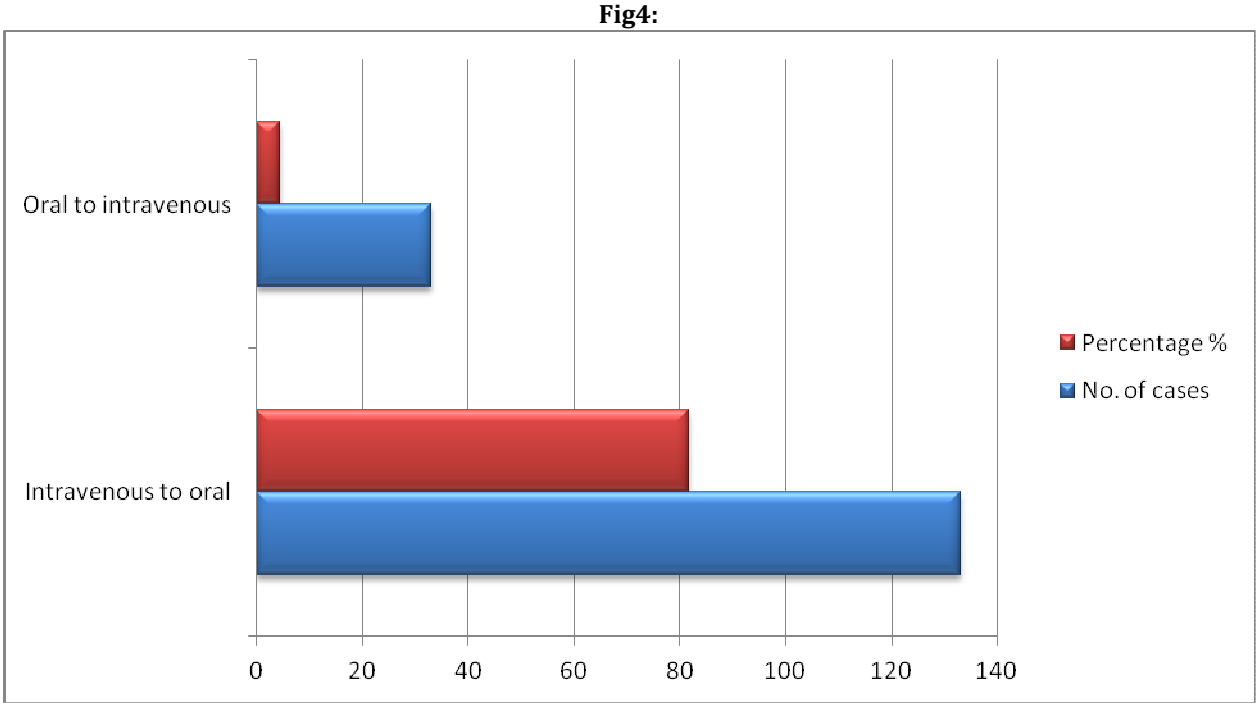

Table4: Change in route of administration

S. No.	Antimicrobials	No. of cases	Percentage %
1.	Intravenous to oral	133	81.6
2.	Oral to intravenous	30	18.4

DISCUSSION:

Antibiotic resistance among pathogenic microorganisms is a matter of worldwide concern. Selective pressure by antimicrobial drugs is by far the most important driving force for the development of such resistance. Antibiotics are among the most commonly prescribed drugs in hospitals and in developed countries around 30% of the hospitalized patients are treated with these drugs. (6)

Antibiotic prescription was studied over 3 months, the major disadvantage being that seasonal variations in antibiotic prescribing could not be taken into consideration over this short period. The number of samples which were sent for culture and sensitivity testing were small which may also affect the validity of the conclusions drawn about antibiotic resistance.(7)

The average number of drugs per prescription is an important index of a prescription audit. It is preferable to keep the number of drugs per prescription as low as possible to minimize the risk of drug interactions, development of bacterial resistance and hospital costs. (8)

Ampicillin, amoxicillin, metronidazole, ciprofloxacin and crystalline penicillin were the 5 most commonly prescribed antibiotics. In many patients treatment was started with parenteral ampicillin which later changed to oral amoxicillin once the condition of the patient improved. (9)

We did not look at the co-prescribed drugs here, but concentrated only on antibiotics. The average number of antibiotics prescribed during the hospital stay was 1.7, which is similar to the observation in an Indian study. The antibiotics most frequently prescribed together were ampicillin and gentamicin. Three or more antibiotics were prescribed to patients in whom the antibiotics were changed either after evaluating the culture and sensitivity reports or due to lack of progress in the clinical condition. Multiple antibiotics were prescribed together in critically ill patients.(10)

Several physicians mentioned that, though they were confident that the condition does not require any antibiotic therapy, they did not want to take a risk on patient's health condition. Clinicians in private sector expressed: "Most of us are giving it (antibiotics)in case fever occurs, then they (patient/patient care takers) may blame us if there is an infection. So that we are prescribing everybody four days antibiotic course". Doctors felt that beneath unhygienic circumstances, patients are predisposed to infection, so antibiotics are prescribed as a preventive measure.(11) a lot of doctors from private division said that professionals from other medical professions like homeopathy, ayurveda, unani and so on prescribed medicines that are mostly seems to be antibiotics.

This leads to inappropriate exercise of antibiotics by the professionals who are not legally entitled to prescribe allopathic drugs.

Information about antibiotic use patterns is essential for a beneficial approach to problems that occur from the multiple antibiotics available.(12)

The minimum length of hospitalization was 5 days. The widely held of patients were hospitalized for a time period of 5 to 7 days.

Steps have to be followed to advance reporting of culture sensitivity tests:-

A. Instant transport and processing of the sample after collection
B. Invariable monitoring of the culture systems to observe the growth
C. Recognition of the organism and antibiotic sensitivity testing to be done at 16 h
D. Reading of the AST to be taken 16 hrs after putting the antibiotic disc
E. Immediate dispatch, collection and interpretation of the results.

Due to several problems these steps cannot be followed strictly within the specified time period, hence the results are delayed by about 24 hrs or more.

In this study median duration of hospitalization for patients receiving systemic antibiotics was significantly higher compared to patients not receiving antibiotics.

Antibiotics were most commonly used in respiratory tract infection, Pancreatitis, Stroke cases tuberculosis and UTI followed by sepsis and intra-abdominal infections. (13)

We did not look at the co-prescribed drugs here, but concentrated only on antibiotics. The average number of antibiotics

Antibiotic utilization in different specialties may have been considered in the above studies. (14)

Antibiotic resistance is an increasingly encountered problem in the Internal Medicine ward of our hospital. We are in the process of formulating an antibiotic use policy and at present, only have antibiotic use guidelines for the department of Internal Medicine. However, a system to rapidly detect and report resistant organisms in individual patients should be in place to ensure a rapid response by caregivers. Prevention and control of the spread of antibiotic-resistant organisms will require increased adherence to basic infection control policies and procedures, combination of antimicrobial resistance policies into institutional goals and development of a plan to deal with patients colonized with resistant organisms.(15)

A total of 163 organisms were isolated from the specimens sent for culture and sensitivity testing. The small number of specimens may, however, limit conclusions about antibiotic resistance. Carrying out the study for a longer period of time could partly overcome this gap. E. coli, H. influenzae, K. pneumoniae, S. pneumonia and S. aureuswere the

commonest organisms isolated and were resistant to cotrimoxazole, chloramphenicol and amoxiclav in a significant number of cases. This maybe, is one of the reasons for the decreased use of sulfonamides in the Internal Medicine ward. Urine was the second most common specimen sent for culture and sensitivity testing. E. coli was the most frequent isolate from urine samples and was mostly resistant to tetracycline, trimethoprim and cotrimoxazole. The low number of samples in our study makes it difficult to draw strong conclusions but an increasing resistance of E. coli and S. aureus to commonly used antibiotics is observed.(16)

In a recent study a vast majority of physicians (97%) believed that widespread and inappropriate use of antimicrobials was an important cause of resistance. (17) However, only 60% favoured restricting the use of broad-spectrum antibiotics. (18)Though maximum drugs were prescribed from essential drug list, the results indicate that there is a considerable scope for improving prescribing habits according to rational drug use and to provide a feed back to hospital authority for making maximum number of drugs available to the patients. (19)The common irrational prescribing patterns includepolypharmacy, the use of drugs of poor therapeutic value, theuse of drugs that are not related to the diagnosis, the unnecessary use of potent drugs, the inappropriate use of antimicrobials and use of unnecessary expensive drugs. Prescriptions and drug utilization patterns need to be evaluated from time to time so as to increase the therapeutic efficacy, decrease the adverse effects and to provide feedback to the prescribers to create awareness towards rational use of drugs. (20),(21), (22)Use of generic names in prescription eliminate the chance of duplication of drug products and also reduce the cost of the patient. (23) Irrational use of drugs is a common occurrence throughout the world.(24) There were fewer number of drugs per prescription, fewer fixed drug combinations, more drugs from essential drug list and frequent generic prescriptions in our study as compared to other studies. (25)(26)(27) Still, it is preferable to keep the mean number of drugs per prescription as low as possible, since higher figures always lead to an increased risk of drug interactions, affect patients' compliance, and increase hospital patient costs. Further, prescribing drugs more in generic names may help in cheaper treatment. Irrational prescribing can beavoided by sticking to the ideal prescription writing. (28)(29) To record the required information of the prescriptions. Each prescription was subjected to critical evaluation using WHO guidelines as described in accordance with "how to investigate drug use in health facilities?". (30)Also it has been found that the public health concern of contributing to the problem of antibiotic resistance does not exert a strong impact on physician prescribing decisions. All these factors may have to be taken into consideration while developing a programme to reduce the use of irrational prescription of antibiotics.

CONCLUSION:

The study of prescribing patterns pursues to monitor, evaluate and suggest modifications in practitioners prescribing practices so as to make medical care rational and cost effective.

Quality of life can be improved by enhancing 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 practice.

The high rate of prescription of parenteral antibiotics is a matter of concern. Decreasing the prescribing of parenteral antibiotics and an early switch to oral antibiotics will significantly reduce the expenditure acquired. An intravenous to oral antibiotic conversion program can be instituted. Quickening the availability of culture and sensitivity reports will enable the treatment to have a sound bacteriological basis. Antibiotic resistance is becoming a problem and formulation of a hospital antibiotic use policy is a matter of urgent concern. An educational programme and an antibiotic order form may be useful initiatives to reduce antibiotic use. Guidelines for antibiotic use in the community and restricting the level of health care practitioners who can prescribe antibiotics are required.

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