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Study on Prescribing Pattern of Antibiotic used for Urinary Tract Infection in Tertiary Care Teaching Hospital: A Preliminary Antibiotic Stewardship Programme

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Abstract

Urinary tract infection is defined as the presence of microorganism in the urine that cannot beaccounted by contamination. First line treatments for UTI are antibiotics. Antibiotic stewardship is the coordinated intervention designed to improve and measure the appropriate use of antibiotic agents, by promoting the selection of optimal antibiotic drug regimen including dosing, duration of therapy and route of administration. The objective of the studywas to analyze the prescribing pattern of antibiotic use in adult patients diagnosed with UTI and to assess the antibiotic resistance pattern in a tertiary care teaching hospital within a timeperiod of six months.

Females are much prone to urinary tract infections and more observed in the age group56-65 years. The third generation cephalosporin's (53.8%) were the most widely prescribed and Ceftriaxone (30.5%) was the mostly preferred antibiotic for UTI. Most ofthe antibiotics were prescribed without culture and sensitivity reports. 17.14% initial antibiotic therapy became ineffective due to the lack of culture and antibiotic sensitivitytest. This may lead to antibiotic resistance and therefore the patients were switched on to more effective antibiotics (dual therapy). These shows the need for antibiotic stewardship program in the hospital for the rationale use of antibiotics thereby decreasing theresistance and promoting cost effective therapy and measures to prevent ADR associatedin UTI.

Keywords: Urinary Tract Infection; Antibiotic Stewardship Programme; Antibioticresistance

Introduction

Urinary tract infections are the common bacterial infection requiring medical care. In thiscondition one or more parts of the urinary system are affected. Depending on the type ofUTI and on which part of Urinary tract is infected, may result in more specific signs and symptoms [1]. Etiological agents of UTI (*E.coli, Klebsiella pneumonia, Proteus mirabilis, Enterobacter agglomerans*) are variable and usually depend on age, time, geographical location and sex of patients [2]. UTI is diagnosed primarily based on signs and symptoms rather than isolated laboratory findings. Thus, the collection and interpretation of urine cultures should be based on the clinical scenario. Antibiotic resistance and hospital infections have increased alarmingly in India. More the bacteria are exposed to antibiotics, the more resistance. So it is necessary for rational use of the antibiotics [3].

Unregulated access to microbials can contribute to the rise in resistance [4]. Recommended treatment options include trimethoprim alone or in combination with sulfamethoxazole, fluoroquinolones, β-lactams, norfloxacin,ciprofloxacin and nitrofurantoin. Three basic mechanisms of resistance to all antibioticsare known, i.e., target alteration, reduced drug concentration and inactivation of the drug [5]. To contain the problems of resistance and infections antibiotic stewardship and hospital infection control are two remedies which have been employed worldwide [6].

Antibiotic stewardship is the coordinated intervention designed to improve and measure the appropriate use of antibiotic agents, by promoting the selection of optimal antibiotic drug regimen including dosing, duration of therapy and route of administration. The purpose of antibiotic stewardship programme is to optimize safe and appropriate use of antibiotics to improve clinical outcomes and minimize adverse effects of antibiotics. It also helps to reduce health care costs without adversely impactingquality of patient care and also it reduce the incidence of antibiotic induced collateral damage. To determine the quality of antibiotic use periodic assessment of antibiotic use [7] should be performed. This antibiotic usage study in UTI, will help in establishing a proper antibiotic utilization guideline and promotes the rational prescribing of medicines.Hence, this work was taken up to study the prescription pattern of antibiotics usage for urinary tract infection patients at a tertiary care teaching hospital.

Aim and Objectives

- To analyze the prescribing pattern of antibiotic use in adult patients diagnosedwith UTI in tertiary care teaching hospital as a part of preliminary antibiotic stewardship program.
- To assess the antibiotic resistance pattern in a tertiary care teaching hospital.

Methodology

Study site: Study was conducted in Medicine and OBG department of GovernmentMedical College, Kannur. It is a 1200 bedded tertiary care teaching hospital.

Study duration: The study was conducted for a period of 6 months.

Study population:

- **Inclusion**- Adult patients (between 18 – 65 years) diagnosed with Urinary tractinfection in Medicine and Gynaecology department both inpatient and outpatient [8].

Sample size: The study includes the sample size of 270 antibiotic prescribing pattern.

$n=Z^2pq/d^2$
$= [(1.96)^2 \times 22.8 \times 77.2]/ 25$
$=270$
Z = 1.96 [95% confidence interval]

n = required sample size
P = prevalence of antibiotic prescribing pattern (p= 22.8)
q = proportion free from antibiotic prescribing pattern (100-22.8=77.2)
d =absolute precision (5%)

Study design: A prospective observational study was conducted over a period of 6 months in Government Medical College, Kannur.

Brief procedure

The inpatients and outpatients who diagnosed with UTI in Medicine and Gynaecology department were included in the study. The patient consent was obtained before commencement of the study. A suitable data collection form was designed for the collection of data. The demographic details and laboratory data of selected studypopulation were entered in pre- designed data collection form. The patient demographicdata, laboratory data, medication details of the outpatients diagnosed with UTI were collected and documented in data collection form. The study required data included in medical record of the inpatient were also documented in the data collection form and theinpatients were followed till the discharge. The available microbiological data was documented in data collection form for the assessment of antibiotic resistance pattern.

Statistical consideration

The collected data was entered in to spreadsheet format using Microsoft office excels. Data was processed using statistical software IBM SPSS statistic version 21. Descriptive statistics were performed for all variables to found out the mean and standard deviation, correlation was performed for which $P < 0.05$ was considered statistically significant. Nominal variables statistics were performed using Chi- Squaretest. Nominal with ordinal variables correlations is performed by spearman correlationand for quantitative variables Pearson's correlation.

Ethics and consent

The study was approved by the Institutional Human Ethics Committee of College of Pharmaceutical Sciences, Govt. Medical College, Kannur filed under IEC No.47/2019GMCK. Permission to conduct the study was obtained fromthe Medical Superintendent of Govt. Medical College, Kannur.

Results and Discussion

A prospective observational study was conducted for a period of 6 months in Government Medical College, Kannur. The inpatients and outpatients who diagnosed with UTI in Medicine and Gynaecology department were included inthe study. A total of 270 patients satisfying the inclusion criteria were includedin the study. The duration of study was six months and the data were collected from the Medicine, OBG Department of Govt. Medical College, Kannur.

Demographic Details

Out of 210 patients, 128 (60.95%) were female and 82 (39.05%) were male. Femalesare much prone to urinary tract infections than males which were similar to the results [9] shown in study conducted by Samira Kumar Nail et al in which males with UTI (15.98%) and females with UTI (55.39%) due to anatomical differences, because of short urethra near the colon, and bacteria are easier to enter. The mean age of the patients was 49.04 ±15.303 with age distribution between19-65 years. Majority of patients who received antibiotics for UTI were in the age group 56-65(50.9%) followed by 15.7% (18-25 years), 14.28% (46-55 years) 9.5% (26-35)

and (36-45 years). According to the study done by Martin Odoki et al. [10] the majority of UTIs diagnosed were under the age group of 20-29 years, but in our study it was found to be between 56 -65 year patients havingcomorbidities and who were undergone urological procedures (catheterization).

Complaints of UTI

Majority of patients 145 (69%) diagnosed with UTI had complaints of abdominal pain [11], shown in (Figure 1) which is similar to the study conducted by Sinisa Franjic et al. They concluded that the common symptoms of UTI were painful, difficult urination, pain in the lower part of the back and abdomen and fever. In another study conductedby Mahesh E et al. [12] fever (29.4%) and dysuria (26.8%) were the most common symptoms of UTI, which has a less similarity to our study.

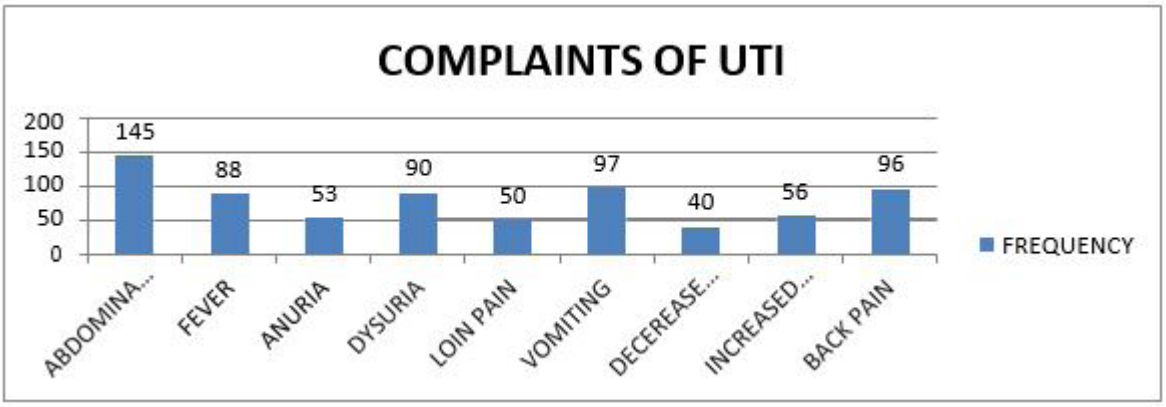

Figure 1: Complaints of UTI

Distribution of comorbidities

54 (25.7%) patients admitted in the hospital without comorbidities. The comorbiditiesobserved were HTN 22 (10.5%), HTN + DM 21 (10%), and least found were hyperthyroidism and HTN + CRF 1 (0.5%). HTN 113 (53.81%) and DM 103 (49%) were the mostly observed comorbidities in the study population. According to the study [12] done by Mahesh E et al. DM was the most common risk factor associated with UTI due to high blood sugar. The high blood sugar level gives favorable growth environment to the pathogens.

Statistic showed significant correlation between sex and medical history of UTI (Chi-Square Tests, P = 0.040), 28 patients had medical history of UTI. Out of that, 22 (78.57%) were females and 6 (21.43%) were males Odds ratio calculated for Sex withmedical history of UTI was 0.380 (95% CI= 0.147- 0.983) which indicates patients with medical history of UTI have higher chances of developing UTI than patients withno medical history of UTI. Odds ratio for Male to Female with medical history of UTI was 0.426 (95% CI = 0.180 – 1.005) which indicates Females with medical history ofUTI have 58% more chances of developing UTI than males with medical history of UTI.

Lab investigations

From the laboratory findings, 77 (36.7%) patients had a WBC count in the range of 11- 15×10^3µL. WBC count get elevated mostly in the case of infections and inflammations. 86 (41%) and 75 (35.7%) patients had a neutrophil count in between 61- 80 and 81-100. Elevation of neutrophil count may be an indicator of bacterial infection. 100 (47.6%) patientshad ESR ranging in between 26-50mm/hr, all these data suggest that there was infection.

On urine routine examination 38 (18%) patients had elevated pus cell value in between 16-20/hpf and epithelial cells values of patients 10 (4.8%) were 11-15/hpf. Albumin waspresent in 76 (36.2%) patients and sugar was present in 34 (16.2%) patients. Generally epithelial cells in large amount indicates infection or kidney disease. Common cause of pus cell elevation indicates infection in bladder and rise of urine sugar mostly seen in diabetic or GDM patients.

Percentage of organisms obtained from urine culture

Out of 210 patients, 50 (23.8%) patients underwent urine culture test, the microorganism identified were E.coli 30 (14.3%), klebsiella pneumoniae 9 (4.3%), klebsiella + acinetobacter 3 (1.4%), proteus mirabilis and enterococcus + E.coli 2 (1%), 1 (0.5%) ofenterococcus species, pseudomonas species, acinetobacter and staphylococcus.

According to Syed Suhail Ahmed et al. [13] the commonly isolated microorganism were E.coli (27%), klebsiella pneumoniae (12.4%) and proteus mirabilis (4.5%).

Distribution pattern of antibiotics

174 patients received monotherapy (82.86%) and 36 received antibiotic dual therapy (17.14%). Among all the prescribed drugs, cephalosporins 113 (53.8%) were prescribedextensively, followed by 89 (42.4%) penicillin category of antibiotics as shown in the Figure 2. This result is in accordance with the study done by Samira Kumar Naik et al [9] were they came to an end that the highest number of antibiotic prescribedwere from the cephalosporin category (60.3%).

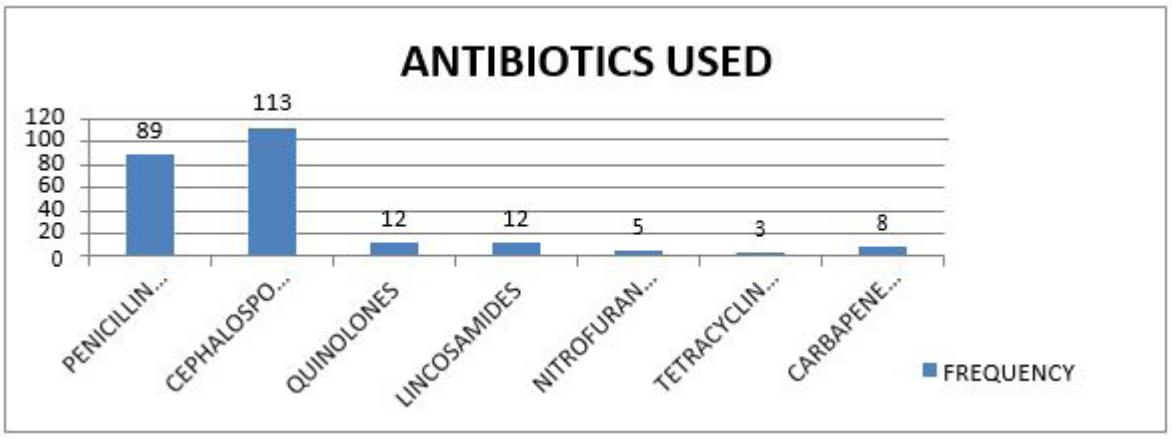

Figure 2: Antibiotics used

Mostly prescribed cephalosporins

Study done by Sunil S Gidamudi et al. [14] concluded that cephalosporins were used most commonly as first line drug and they say that this group should be reserved forcomplicated UTIs Figure 3.

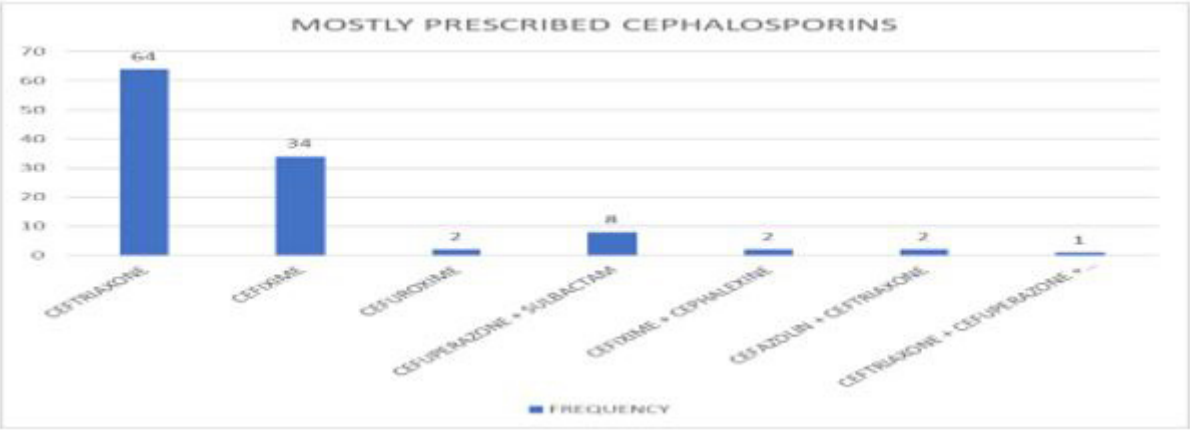

Figure 3: Mostly prescribed cephalosporins

Duration of antibiotic therapy and length of stay

105 patients had duration of antibiotic therapy for 7 days and 92 patients were treated with antibiotics for 5 days. As the duration of antibiotic therapy increased,the length of stay also got increased simultaneously. Length of hospital stay of patients was 7 days for 81 patients, 5 days for 45 patients, 8 days for 36 patients respectively.

According the study conducted by Veroniek Spoorenberg et al. [15] appropriate antibiotic prescription can reduce length of stay. In our study, culture and antibiotic sensitivity test were not done for majority (76.6%) of patients and this may lead to antibiotic resistance or ineffectiveness. Due to this initial antibiotic therapy became unsuccessful; as a result the patients were switched on to more effective antibiotics (dual therapy) in later phase of treatment schedule. By this means study noticed increased length of stay and indicates the need of proper antibiotic prescription audit. Appropriate prescribing with an evidence of proper culture and antibiotic sensitivity test can reduce the length of stay.Statistic showed significant correlation between duration of therapy and dual therapy (Pearson Correlation, P= 0.000). Dual therapy increases duration of antibiotic therapy.

Conclusion

6 months study period included 210 subjects who received antibiotics for urinary tract infection. Based on the results the third generation cephalosporins (53.8%) in which ceftriaxone (30.5%) were the most widely prescribed antibiotic for UTI in our hospital setup. Antibiotic prescription for UTI was more in the age group 56-65 (50.9%) years. Females are much prone to urinary tract infections than males due to anatomicaldifferences, because they have a short urethra near the colon, and bacteria are easier to enter. Most of the antibiotics used for UTI were not supported by culture and sensitivityreports. Proper urine culture and antibiotic sensitivity test can contribute to an effective antibiotic therapy and thereby reduce the length of hospital stay or better quality of life.

The study bring to a close that there is a need for antibiotic stewardship programin the hospital for the rationale use of antibiotics thereby decreasing the resistanceand promoting cost effective therapy and measures to prevent ADR associated. An effective antibiotic stewardship program and implementation of standard protocol or guideline can improve antibiotic usage and it helps patient's pharmacoeconomical parameters.

Limitations of the study

- In six months duration we were not able to incorporate all the patientsreceiving antibiotics who had have visited our hospital.
- Preparation of guidelines regarding antibiotic use for UTI was notfeasible within the study period.
- Due to Covid 19 pandemic we were not able to collect the requiredmicrobiological data.
- Emergence of bacterial resistance were not reported in the patient record.

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