

Evaluation of Prescription Pattern and Cost Minimization Analysis of Antibiotics Prescribed For Urinary Tract Infection Treatment

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Abstract: The study was conducted to review the utilization of antibiotics matched is in accordance with the hospital antibiotic policy and cost minimization analysis for urinary tract infection. This was a retrospective study collected for a period of six months in a quaternary care hospital. The data obtained was subjected to descriptive statistical analysis using Microsoft and chi-square test. Out of 100 prescriptions, female patients accounted for 66% while male patients accounted for 34%. Most of the patients were in 40-60 years old age group (39%). The investigation was done in 77 (77%) prescriptions whereas other 23(23%) lack required investigations. Following the hospital antibiotic policy 28(28%) patients were categorized as type 1, 57(57%) as type 2 and 15(15%) as type 3. In presumptive therapy 57 (57%) prescriptions comply with hospital antibiotic policy whereas 43(43%) deviated from the policy, similarly in continue therapy 21(21%) prescriptions comply and 71(71%) deviated. The study find out that according to chi-square test our alternate hypothesis claim that prescriptions are not following the hospital antibiotic policy and the result is significant. As per CMA, the incremental cost of continue medications has more costly interventions of 33215 rupees than presumptive therapy of 17116 rupees. From the present studies we found that most of the prescriptions were deviated from the hospital antibiotic policy.

Keywords: chi-square test, continue therapy, cost minimization, presumptive therapy and incremental cost.

Date of Submission: 25-01-2018

Date of acceptance: 12-02-2018-

I. Introduction

Urinary tract infection is one of the complicated and dangerous infections which if left untreated or mistreated may lead to chronic kidney disease and renal failure. Antibiotics are used commonly for urinary tract infection. But if they are used irrationally then it increases chances of resistance of bacteria as well as increase in duration of morbidity and total cost of therapy. It is very important to choose appropriate antibiotic for treatment of urinary tract infection or otherwise it may lead to kidney damage or systematic spread of the infection. If the choice of antibiotic is inappropriate or the infection left untreated it may relapse or produce resistance to initial common antibiotic treatment. In this study we are going to review the prescription pattern of antibiotic used for urinary tract infection. The objectives are to review the utilization of antibiotics in accordance with the recent BGS Global hospital antibiotic policy and to study the cost minimization analysis for the treatment of urinary tract infection.

II. Methodology

The study was conducted at a quaternary care hospital, BGS Global hospital, Kengeri, Karnataka. This was a retrospective study. The study was conducted for a period of six months.

INCLUSION CRITERIA-Patient with diagnosed of urinary tract infection including both male and female and of all age group. Patient with any other infection related to urinary tract infection. Patients with the prescribed antibiotics medication from the hospital in-patient and outpatient as well.

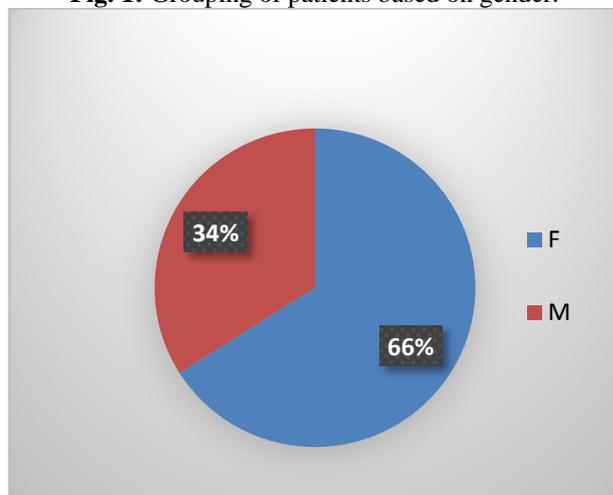
EXCLUSION CRITERIA-Patients who are administering any other class of antibiotics unrelated to urinary tract infection. Patient with any other condition which may affect wbc count or any other investigation method. Descriptive statistical method with Chi-square test and a probability of $P < 0.05$ was considered statistically significant. Microsoft Excel has been used.

This study was approved by Institutional Ethical Committee of P E S College of Pharmacy, Bengaluru. The recent BGS Global Hospital Antibiotic Policy. The antibiotic prescribed both in current and discharge medications were reviewed for their cost using CIMS application and report the cost minimization for the same.

III. Results

This was a concurrent retrospective study conducted over 6 months. During the study, a total of 100 prescriptions were collected and analysed. Out of 100 prescriptions 67 (67%) were females and 33 (33%) were males.

Fig. 1: Grouping of patients based on gender.



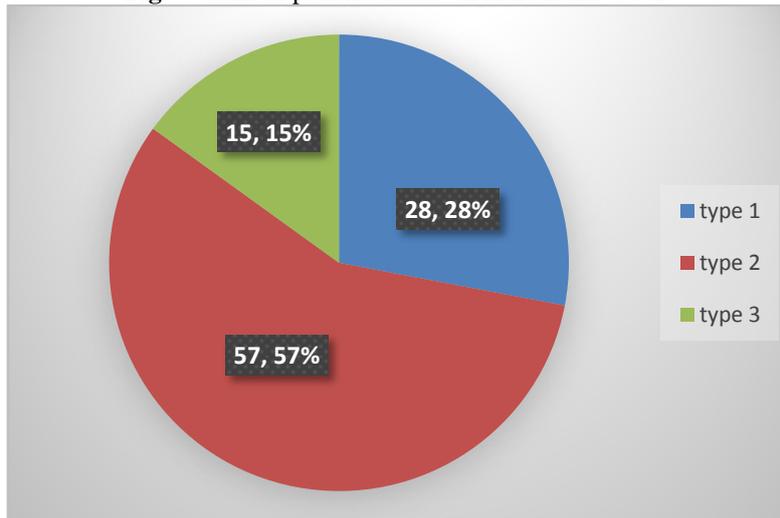
Out of 100 prescriptions, 1 patient was of age <10 years(1%),1 patient was between 10-19 years(1%),27 patients were between 20-39 years(27%),39 patients were between 40-59 years(39%) and 32 patients were >60 years(32%).

Fig. 2: Distribution of patient based on age.



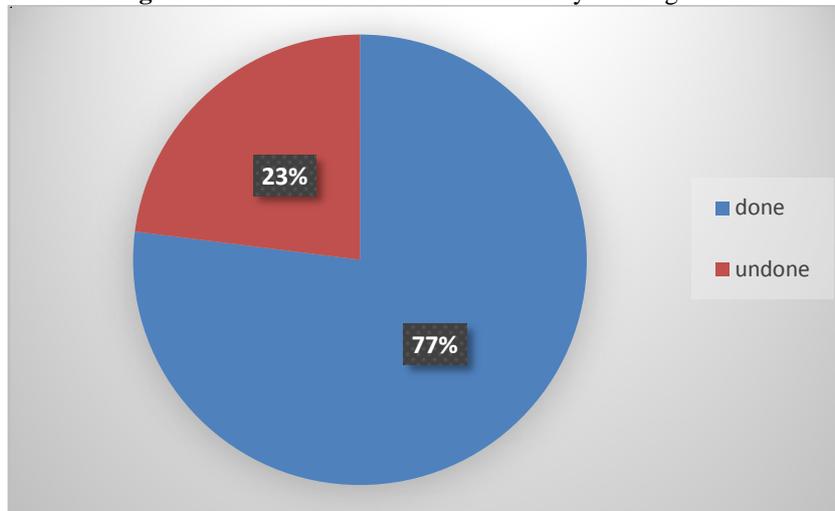
Following the hospital antibiotic policy protocol, classification of patients based on risk stratification were found that out Of 100 patient,type2 accounted the most with 57 number of patient(57%), followed by type 1 with 28 number of patients(28%) and 15 number of patients for type 3 (15%).

Fig.3: count of patients based on risk stratification.



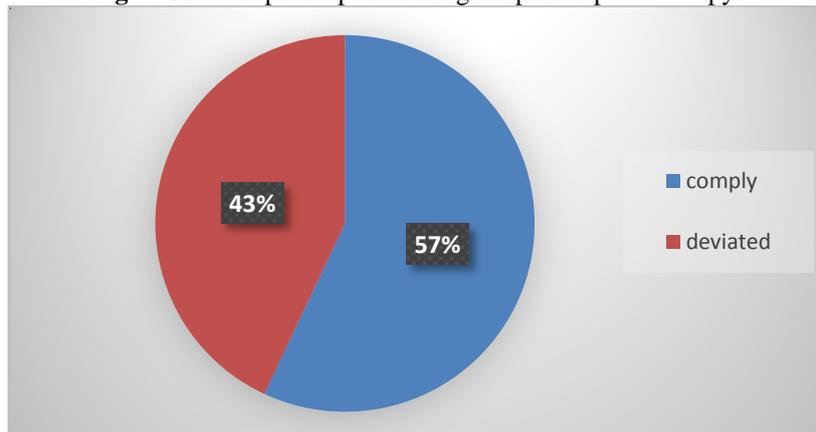
Investigation on the performance of urine culture and sensitivity, out of 100 prescriptions, 77 prescriptions with urine culture and sensitivity were done (77%) and 23 prescriptions without urine culture and sensitivity (23%).

Fig. 4: count of urine culture and sensitivity investigation.



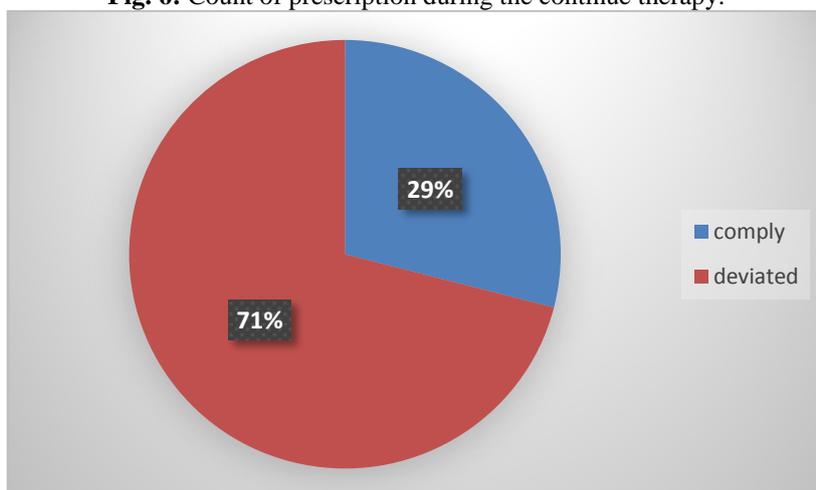
Out of 100 prescriptions which were prescribed from the hospital antibiotic policy, 57 prescription were comply with the hospital antibiotic policy during the presumptive therapy (57%) and 43 prescription were deviated from the hospital antibiotic policy during the presumptive therapy i.e. antibiotics prescribed before the culture tests.

Fig. 5:Count of prescription during the presumptive therapy.



Similarly during the continue therapy i.e. antibiotics prescribed after receiving the culture sensitivity report, out of 100 prescriptions, 29 prescriptions were comply with the hospital antibiotic policy (29%) and 71 prescriptions were deviated from the hospital antibiotic policy.

Fig. 6: Count of prescription during the continue therapy.



The table 3 below shows the number of prescription as comply and deviated during presumptive and continue therapy which were prescribed from the hospital antibiotic policy.

The percentage distribution of the most commonly prescribed antibiotics the current medications were meropenem 24%, ceftriaxone 21%, cefoperazone+sulbactam 18%, amikacin 15%, piperacillin+tazobactam 14%, levofloxacin 5%, amoxicillin+clavulanate 5%, cefixime 5%, moxifloxacin 3%, nitrofurantoin 2% and others accounted as 1%.

Table 1. Commonly prescribed antibiotics in the current medication.

SL NO.	ANTIBIOTICS PRESCRIBED	NO. OF PRESCRIPTIONS (N=100)	PERCENTAGE %
1.	M e r o p e m e n	2 4	2 4 %
2.	C e f t r i a x o n e	2 1	2 1 %
3.	C e f o p e r a x o n e + s u l b a c t a m	1 8	1 8 %
4.	A m i k a c i n	1 5	1 5 %
5.	P i p e r a c i l l i n + t a z o b a c t a m	1 4	1 4 %
6.	L e v o f l o x a c i n	1 1	1 1 %
7.	A m o x i c i l l i n + c l a v u l a n a t e	5	5 %
8.	A z i t h r o m y c i n	5	5 %
9.	C e f i x i m e	5	5 %
10.	M o x i f l o x a c i n	3	3 %
11.	N i t r o f u r a n t o i n	2	2 %
12.	O t h e r s	1	1 %

The percentage distribution of the most commonly prescribed antibiotics in the discharge medications were nitrofurantoin 18%, meropenem 14%, cefixime 14%, levofloxacin 10%, amoxicillin+clavulanate 10%, ciprofloxacin 6%, cefoperaxone + sulbactam 5%, piperacillin+ tazobactam, faropenem 4% ceftriaxone 3%, imipenem 2% and others accounted as 1%.

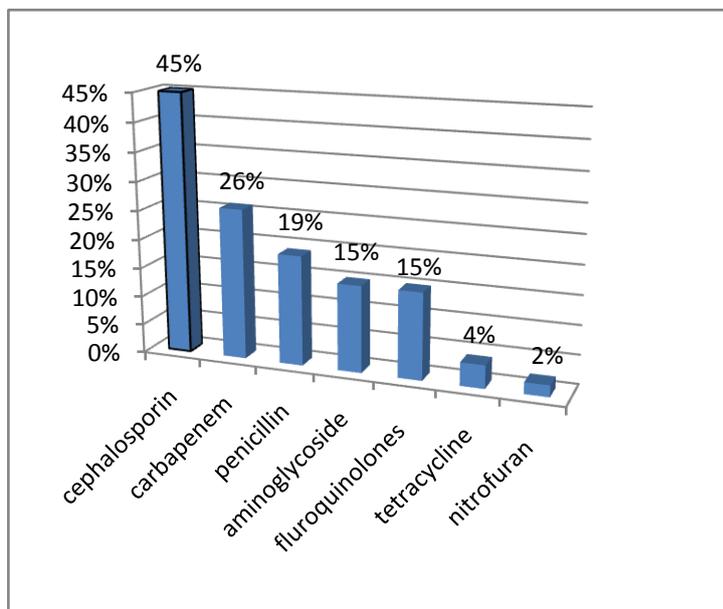
Table 2: Commonly prescribed antibiotics in discharge medication.

SL NO.	ANTIBIOTICS PRESCRIBED	NO.OF PRESCRIPTION (N=100)	PERCENTAGE%
1	Nitrofurantoin	1 8	1 8 %
2	M e r o p e n e m	1 4	1 4 %
3	C e f i x i m e	1 4	1 4 %
4	L e v o f l o x a c i n	1 0	1 0 %
5	A m o x i c i l l i n + c l a v u l a n a t e	1 0	1 0 %
6	C i p r o f l o x a c i n	6	6 %
7	C e f o p e r a z o n e + s u l b a c t a m	5	5 %

8	Piperacillin+tazobactam	4	4 %
9	F a r o p e n e m	4	4 %
10	C e f t r i a x o n e	3	3 %
11	I m i p e n e m	2	2 %
12	O t h e r s	1	1 %

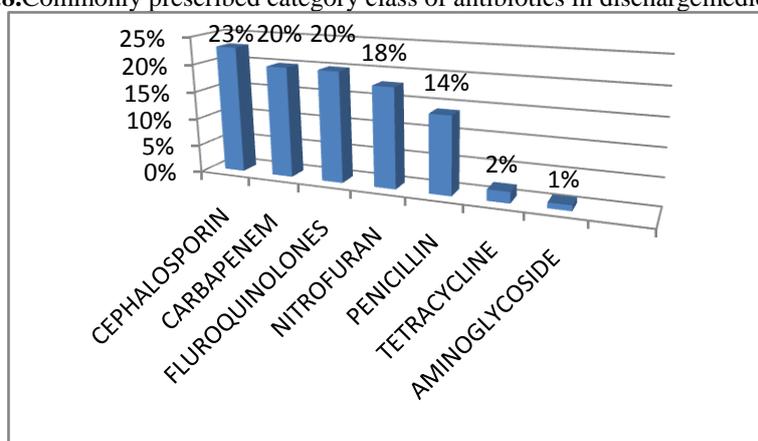
Among the various classification of antibiotics prescribed in current medications as shown in figure 7, cephalosporin were the most commonly prescribed antimicrobial agents (45%) followed by carbapenem(26%),extended spectrum penicillin(19%) ,aminoglycosides and fluoroquinolones (15%) ,tetracycline(4%) and nitrofurantoin 2%.

Fig. 7.commonly prescribed class of antibiotics in current medication



Among the classification prescribed in the discharge medication as shown in figure 8.cephalosporins were the most commonly prescribed antimicrobial agents (23%),followed by carbapenems and fluoroquinolones of 20%,nitrofurantoin 18%, penicillin 14%,tetracycline 2% and aminoglycoside 1%.

Fig.8.Commonly prescribed category class of antibiotics in discharge medication



Chi square test result:

- $3.84 \leq 7.84$

So the alternate hypothesis approved and choices of medication deviate from hospital antibiotic policy

- Significant level : 0.0051

It conclude the study also is significant and the result can be trusted

Null hypothesis: The antibiotics prescribed in accordance from the hospital antibiotic policy.

Alternate hypothesis: The antibiotics choice of antibiotic deviate from the hospital policy.

Result: The value from chi square test was found to be 7.84.

- $3.84 \leq 7.84$

So the alternate hypothesis approved and choices of medications deviate from hospital antibiotic policy

- Significant level : The P-value was found to be 0.0051

It concludes the study also is significant and the result can be trusted.

Cost Minimization Analysis:

The average total cost of hundred prescription during the presumptive therapy were found to be rupees 17116.21rs were metronidazole (1405rs)and piperacillin+ tozabactam (1057rs)were accounted the most. The average total cost of hundred prescription during the continue therapy were found to be rupees 33215 rs in which ertapenem (2462rs) and metronidazole (1405rs) were accounted the most. As per CMA the presumptive medication has 17116 rupees incremental cost and continue medication had 33215 rupees incremental cost which shows continue medications has more costly interventions.

IV. Discussion

In this study we found 66% of patients are female whereas 34% are male out of total study population which shows majority of patient are female and it can be explained due to short urinary tract structure in female and environment it's more prone to infection compare to male population hence it can be justified by comparing the physical structure and condition of urinary tract in male and female.

Also, we learned that patient population dramatically rise after age 20 till 39 to 27 % which can be concluded after marriage the chance for infection also increase compare to age below 19 which include only 1% so by proper public education to adult we can control the rate of infection for this population. We also observe the majority of the patient population belong to age range between 40 – 59 with 39% of total study population which could be due to rise in age issue and altered immunity status in people.

Another important aspect of this study was a stratification of the patient as per risk and severity of the disease which has done according to hospital antibiotic policy. It demonstrate that majority of study population belong to type 2 infection stratification which according to hospital antibiotic policy the main criteria to fit into that group is age where elderly patient falls into that category and it match with our previous finding about the age group of the patients that majority are fall into elderly age patients, where it can be due to decrease in immunity strength of the body.

While evaluating the patient's data we observe that 23% of patient's data lacking complete laboratory investigation mainly culture test which considers the as big number and it could be either due to the efficacy of the presumptive therapy and decision of the respective physician or health care staff felt to attach laboratory report to patient profile form.

With further evaluating the patient data we came to our main objective of our study which is drug utilization evaluation where we compared prescribed medication whether it comply with hospital antibiotic policy or not, hence we found out in presumptive therapy 57% of prescribed antibiotics comply with hospital antibiotic policy whereas 43% deviate from guidelines Whereas in continue therapy after receipt of test reports only 29% complies with antibiotic policy and 71% deviated from it, which it shows hospital antibiotic policy couldn't be followed by physician practically due to certain limitations which need through investigation and another study to list out the reasons why guidelines didn't follow by physicians to either improve the policy or change it. While we checking the prescribed antibiotics we observed the majority of prescriptions contain cephalosporin class of antibiotic with 45% of total antibiotics use for treatment of UTI in BGS hospital which shows this class is most efficacious among other classes and bacteria causing the infection in the region are more sensitive to this class of antibiotic whereas in most cases of UTI fluoroquinolones are prescribed in many countries but as per BGS hospital antibiotic policy because this class are most effective in pneumonia cases of infection due to prevent resistant production in bacteria it suggested not to prescribe in UTI cases unless its severe or type 3 infection.

In statistical analysis since our study includes comparing the study population data and results to hospital antibiotic policy which considers as historical reference in our study we chooses chisquare test as analysis method with null hypothesis which says medication follows the hospital antibiotic policy and alternate hypothesis which shows medication deviate from it and while performing analysis we find out the medication is deviating from the policy. From cost minimization analysis, we concluded that, there is rupees 17116.00 incremental cost in presumptive therapy and rupees 33215.00 incremental cost in continue therapy which shoes continue therapy has higher incremental cost compare to presumptive therapy which also shows physicians take more consideration in prescribing medication in presumptive therapy

V. Conclusion

This study proved that most of the prescriptions for treatment of UTI are deviate from the hospital antibiotics guidelines. Finally, we have conduct cost minimization analysis in our study for antibiotics used in presumptive and continue therapy in hospital and it showed continue therapy which includes discharge medication have more incremental cost compare to presumptive therapy which shows physician take more consideration for ward medication dispensing and inpatient compare to outpatient medication. Some of the limitations are the data of the patient collected were not satisfied due to the missing details of some cases. The culture report and investigation of some cases were not up to the mark for efficacy treatment.

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IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS) is UGC approved Journal with Sl. No. 5012, Journal no. 49063.

“Evaluation of Prescription Pattern And Cost Minimization Analysis of Antibiotics Prescribed For Urinary Tract Infection Treatment.” IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS), vol. 13, no. 1, 2018, pp. 67-74.