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Across-Sectional study on Drug Utilization and it's cost analysis in the Urological Disorders and other Health issues in Patients of a Tertiary Care Hospital

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ABSTRACT

Objective: To evaluate drug utilization patterns in terms of WHO indicators, urological disorders, and other health issues in patients of a tertiary care hospital. Methods: After obtaining approval from the Institutional Ethics Committee, a cross-sectional study was carried out among 200 inpatients in a tertiary care hospital in Bangalore. The data were collected from the patient case profile and prescriptions and noted in a self-designed data collection form. The statistical analysis of the collected data was performed using SPSS software and Excel. Results: In a study of 200 patients with urological disorders (129 males and 67 females), common co-morbidities included diabetes, hypertension, and hypothyroidism. Benign Prostate Hyperplasia (BPH) and Urinary Tract Infections (UTI) were the prevalent diagnoses. Prescribed drugs included analgesics, antipyretics (26.7%), antibiotics (18.1%), proton pump inhibitors (18.0%), anti-hypertensives (8.7%), anti-emetics (7.9%), anti-hyperlipidemic (7.6%), vaccines (7.5%), and loop diuretics (5.5%). Average drugs per prescription were 6.94, with 23.79% prescribed generically. Antibiotics accounted for 48% of encounters, and injectables were used in 52% of cases. All the drugs came from the essential list. Polypharmacy affected 58% of patients over 50 years, with 32 major interactions and observed adverse drug reactions. Conclusion: The current research provides valuable insights into the overall pattern of drugs used in urological disorders. Physicians should be encouraged to increase generic prescribing to reduce medication cost burdens as well as to avoid unessential drugs, which may lead to polypharmacy and may result in other medication-related problems.

Keywords: Benign Prostatic Hyperplasia, Urinary Tract Infection, Erectile Dysfunction, Drug Utilization Analysis, Cost Analysis, Drug Interactions.

INTRODUCTION

Urology is a surgical specialty that treats diseases of the male and female urinary tracts and male genitalia. Various urological diseases include urinary tract infections, prostatitis, kidney stones, BPH and LUTS/prostate enlargement, frequency/overactive bladder, prostate cancer, impotence/erectile dysfunction, bladder cancer, kidney cancer, testicular cancer, and urethral cancer. This can lead to drug interactions, adverse treatment outcomes, and increased medical costs, leading to patient mortality. Therefore, drug use studies are usually conducted in health care settings, analyzing trends in drug prescription and whether drugs are rational or irrational. Different brands of the same drug are available to the patient and provide the same therapeutic effect. An analysis of these costs can reveal "price differences between brands" that can cause significant financial burdens and moral and ethical problems for patients. Therefore, in this work, the use and cost analysis of medicines is necessary to improve the general state of health and health care. The majority of infections tend to affect the lower urinary tract, which includes the bladder and the urethra. A urinary tract infection, on the other hand, has the potential to extend into the kidneys, resulting in significant health complications. Symptoms are not always presented by UTIs. Typically, when bacteria infiltrate the urinary tract via the urethra and begin to disseminate within the bladder, it induces pelvic discomfort in females, particularly concentrated in the middle of the pelvis and surrounding the region affected by UTIs. The purpose of the urinary system is to prevent the entry of bacteria. Prostatitis frequently leads to discomfort or hindrance during urination, accompanied by pain in the groin,

pelvic region, or genitals. Chronic bacterial prostatitis is characterized by an ongoing or recurring bacterial infection that typically presents with milder symptoms. Chronic prostatitis, or chronic pelvic pain syndrome, refers to an enduring or recurrent discomfort in the pelvic region along with urinary tract symptoms, despite the absence of any infection.

Kidney stones can potentially affect any part of your urinary tract, extending from the kidneys to the bladder. Prostate cancer is a disease that affects the small, walnut-shaped gland in males responsible for producing seminal fluid. Another type is adenocarcinoma, where the cancer originates in cells that produce mucus and other fluids. The most commonly prescribed drug classes in urology are alpha-blockers: which relax the muscles in the bladder and neck to improve urine flow, and 5-alpha-inhibitors, which treat an enlarged prostate by preventing the production of male hormones associated with prostate enlargement. Alpha-blockers, also called alpha-adrenergic antagonists, are used to treat certain symptoms of benign prostatic hyperplasia (BPH). This is a non-cancerous enlargement of the prostate gland. Alpha-blockers currently approved to treat BPH symptoms are short-acting drugs that work quickly but only last a few hours. These medications are usually used in combination with alpha-blockers to improve urine flow and bladder emptying in men with genetic BPH. They are sometimes used with alpha-blockers or 5-alpha-reductase inhibitors for genetic men with BPH and OAB. Anticholinergic medications currently approved to treat overactive bladder include: anticholinergic medications can cause side effects such as confusion, dry mouth, constipation, blurred vision, and rapid heartbeat (tachycardia). These drugs can also slow the flow of urine in men with BPH. Cost analysis is a type of partial pharmacoeconomic evaluation that compares the costs of two or more alternatives, regardless of outcomes. Different brands of the same drug are available to the patient and provide the same therapeutic effect. Analysis of these costs can reveal "price differences between brands" that can cause significant financial burdens and moral and ethical problems for patients.

MATERIALS AND METHODS

Sources of data and materials
Patient case sheet, Medication Error Forms, Drug-drug interaction forms, ADR (Adverse Drug Reaction) forms, Patient counseling forms, Prescribing indicator form.

Method of collecting data
A standard data collection form devised for the study, a drug list, and a facility care indicator form for the institution were used as study instruments, fulfilling the eligibility criteria, and included in the study. Demographic characteristics like age, gender, educational status, and occupation were recorded. Information regarding diagnosis (cause for admission), comorbidities, medical history, ongoing treatment, documented adverse drug reactions (ADRs), and investigations performed was collected from the patient records available in the wards. The drug utilization pattern among male and female patients was evaluated using the prescribing indicators recommended by the WHO: average number of drugs per prescription, percentage of prescriptions (encounters), injections prescribed, percentage of drugs prescribed by generic name, and essential drug list. Additionally, detailed information about the medications prescribed, demographic details, medication history, laboratory data, drug class, route of administration, dose, frequency, and duration of administration The data collected has been noted in a self-designed patient data collection form.

Statistical analysis
The data was collected and entered in Microsoft Excel software 2019 and interpreted by descriptive statistics that were presented to analyze and express the report as counts and percentages in the form of tables, charts, and graphs. The statistical analysis of the collected data was performed using IBM SPSS version 26 statistical software. A p-value of >0.05 was taken as significant.

Ethical consideration
Confidentiality was maintained throughout the study. Written informed consent was obtained from all the participants. There is no physical harm to the participants, as there is no intervention.

Ethical clearance
The study was submitted for ethical clearance to the ethical committee of the Sapthagiri Institute of Medical Sciences and Research Center. This study was based on the analysis of approved surveillance data.

RESULTS

Patient's Age Wise Categorisation
Out of 200 cases, the patients are divided into seven categories according to their age. Patients who are aged between 50 and 64 have a high probability of being admitted to the hospital with urological disorders. A total of 128 patients were above 50 years of age, while 72 were below 50 years of age.

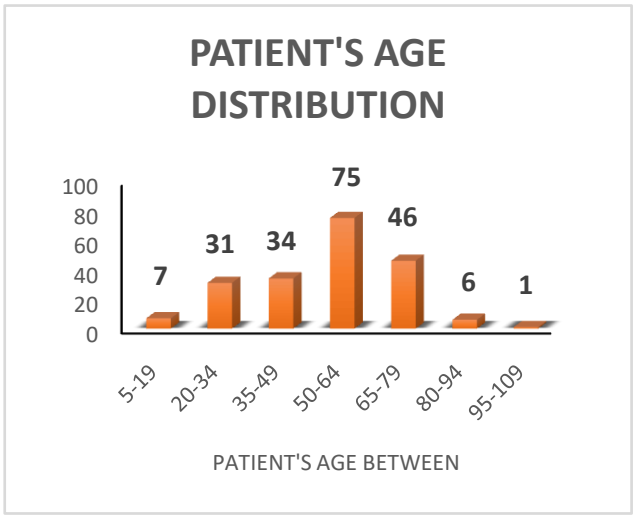


Fig. 1: Patient's Age Wise Categorization

Gender Distribution

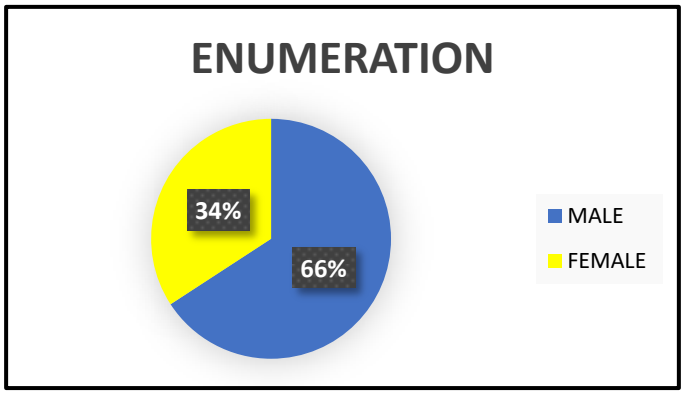


Fig. 2: Gender Distribution

In the current study, the dominant gender was male (129) and the remainder was filled by the female gender (67).

Patient's Diagnosis

Out of 200 cases, the patients' diagnoses of various urological disorders are listed below in the table and depicted in the chart.

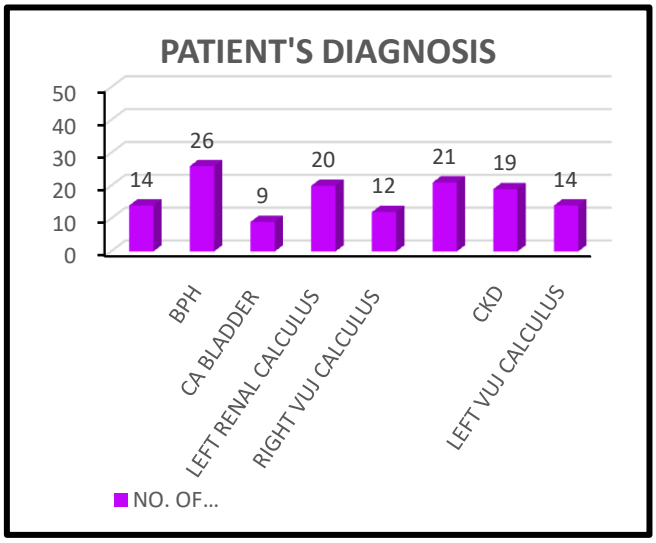


Fig. 3: Patient's diagnosis

PATIENT WITH COMORBIDITIES

The highest number of patients with more than two co-morbidity diseases is 45 (22.5%), and the patients with no co-morbidities are 118 (59%).

Table 1: Patient Distribution with Co-Morbidities

COMORBIDITIES	NO. OF PATIENT	PERCENTAGE
Hypertension +diabetes mellitus +other	45	22.5%
Diabetes mellitus	15	7.5%
Hypertension	10	5%
Hyperthyroidism	2	1%
Cerebral venous thrombosis	1	0.5%
Ischemic heart disease	2	1%
Tuberculosis	3	1.5%
Hypothyroidism	3	1.5%
Rheumatoid arthritis	1	0.5%
No co morbidities	118	59%

TOTAL PATIENTS WITH CO-MORBIDITIES

Out of 200 cases, 82 patients were assessed with co-morbidities, while 118 patients were free of co-morbidities.

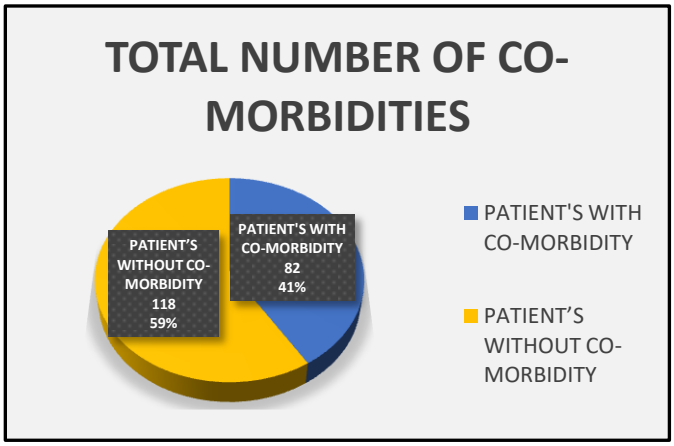


Fig. 4: Total Patient's with Co-Morbidities.

Class of Drugs Prescribed

For 200 patients diagnosed with urological disorders, the classes of drugs prescribed are listed in the table below. The major portion belongs to analgesics and antipyretics (274), followed by antibiotics (186). The least prescribed class of drug is loop diuretics (with only 56). The data is given in the table and chart below.

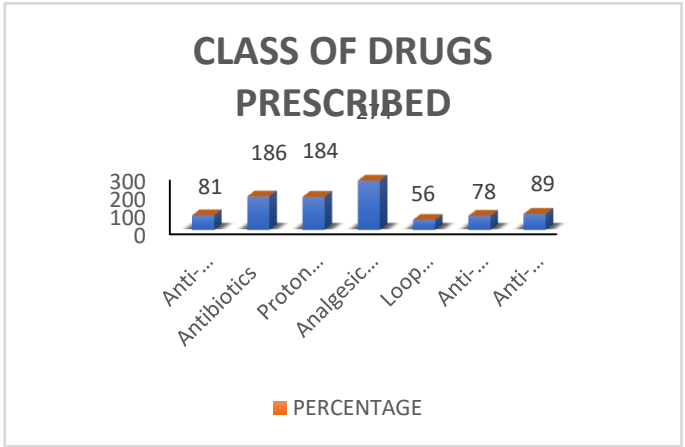


Fig. 5: Class of Drugs Prescribed

Spread of Drugs Prescribed

In the 200 cases collected for the current study, the most prescribed drugs for the treatment of urological disorders were tabulated below. A total of 938 drugs were prescribed, out of which T. DOLO (paracetamol) is the most prescribed tablet and Inj. KEPHAZONE is the most prescribed intravenous drug. The following data is depicted in a table.

Table 2: Spread of Drugs Prescribed

BRAND DRUGS	ENUMERATION	NO. OF DRUGS PRESCRIBED
Inj. Amikacin	8	0.85%
Inj. Dexona	4	0.43%
Inj. Dolo	24	2.56%
Inj. Emeset	94	10.02%
Inj. H. Actrapid	8	0.85%
Inj. Kephazone	96	10.23%
Inj. Lasix	20	2.13%
Inj. Magne x forte	8	0.85%
Inj. Meropenem	6	0.64%
Inj. Metrogyl	10	1.07%
Inj. Monocef	28	2.99%
Inj. Ofloxon	4	0.43%
Inj. Orni o	6	0.64%
Inj. Pan	84	8.96%
Tab. Dolo	142	15.13%
Inj. Piptaz	20	2.13%
Inj. Rabkon	8	0.85%
Inj. Tt and xylocaine	96	10.23%
Inj. Vit k	8	0.85%
Inj. Xone	22	2.35%
Inj.lasix	8	0.85%
Ivf.dns/ns/rl	18	1.92%
Ivf.ns/rl	52	5.54%
Neb.budecort and duolin	22	2.35%
Proctolysis enema	10	1.07%
Syp. Ascoril	6	0.64%
Syp. Looz	16	1.71%
Tab. Amlong	12	1.28%
Tab. Anxit	36	3.84%
Tab. Cardivas	10	1.07%
Tab. Chymoral forte	14	1.49%
Tab. Dytor plus	14	1.49%
Tab. Ecosprin av	18	1.92%
Tab. Lasix	6	0.64%
Total	938	100%

Cost Minimisation Analysis

Out of 200 cases, the total medication cost for the treatment of urological disorders was calculated and listed below in the table. The cost of brand and generic drugs is taken into account to perform a cost minimization analysis. The generic drugs are endorsed with the same effectiveness as their respective brand-name counterparts. The total cost of medication for 200 patients while on brand and generic drugs is 250668.1 and 118921.531, respectively. The average cost for a patient if prescribed with brand drugs is estimated at around 1253 rupees, but it reduces to 594 rupees when on generic medication.

Table 3: Cost Minimization Analysis

Measures	Brand Medication Cost	Generic Medication Cost
Mean (average)	**1253.3405**	**594.607655**
Std. Error of mean	88.62456	42.04511
Median	726.6703	397.3038
Std. Deviation	744.8242	279.0297
Variance	554763.1045	77857.6
Minimum	5.21	2.56
Maximum	5138	3569.29
Sum	250668.1	118921.531

Drugs Per Encounter:

In the 200 cases studied, the average number of drugs in a single prescription was found to be 6.94. The WHO indicated that the average number of drugs per single encounter falls to two per prescription.

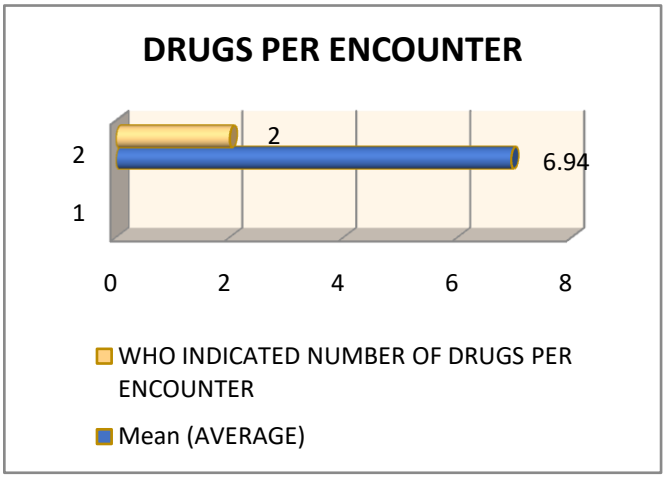


Fig. 6: Drugs Per Encounter

Number of Prescription According To who Prescribing Indicator:

The number of prescriptions the physicians prescribed according to the WHO indicators is only 34 out of 200, while the rest of the cases contain two or more drugs in a single encounter. The data is listed below and charted.

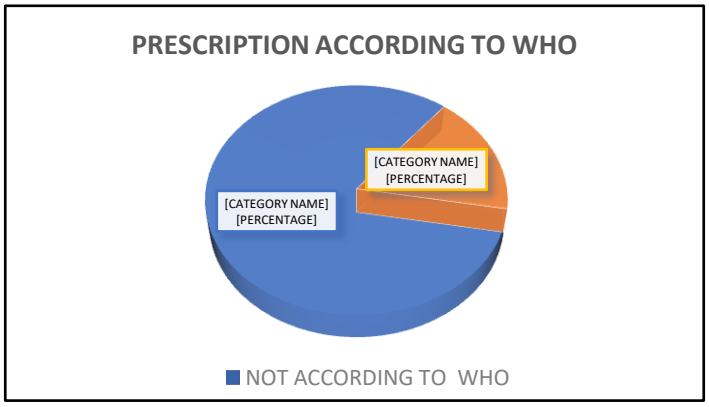


Fig. 7: No. of Prescriptions According to the WHO Indicator

Drug Count Distribution

Among the 200 cases analyzed, the maximum number of drugs prescribed on a single prescription was 14 for one patient. Notably, prescriptions containing 7 or 8 drugs per encounter were the most common, occurring 43 times. This data highlights a concentration in prescription complexity, with a significant frequency of prescriptions involving 7 or 8 drugs per patient encounter.

Table 4: Drugs Per Encounter

NUMBEROF PRESCRIPTIONS	FREQUENCY	PERCENT
1	2	1
2	1	0.5
3	2	1
4	1	0.5
5	8	4
6	40	20
7	43	21.5
8	43	21.5
9	20	10
10	20	10
11	4	2
12	10	5
13	5	2.5
14	1	0.5
Total	200	100

Drugs Prescribed By Generic Name Total Number of Drugs Prescribed

For 200 patients, 1769 drugs were prescribed for the treatment of urological disorders. For these drugs, 421 (23.79%) were given as generic drugs, while the remaining 1348 (76.20%) were prescribed by their brand name.

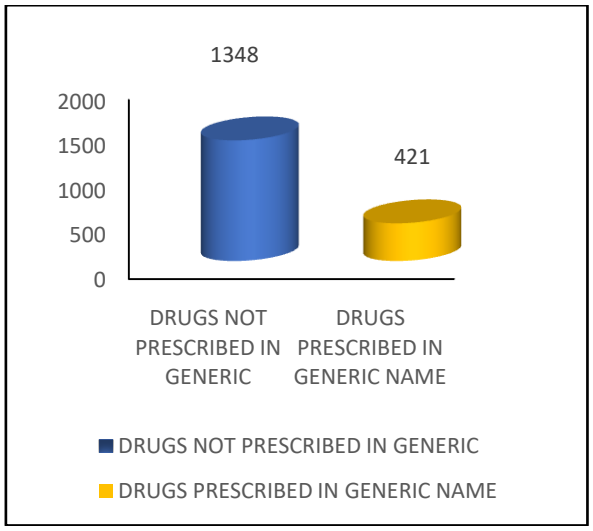


Fig. 8: Medication Written Down by Generic Name

Number of Generic Drugs According To Who Indicator

The percent recommended by the WHO for prescribing generic drugs is 100. In the study with 200 cases, 23.79 percent were given generic drugs.

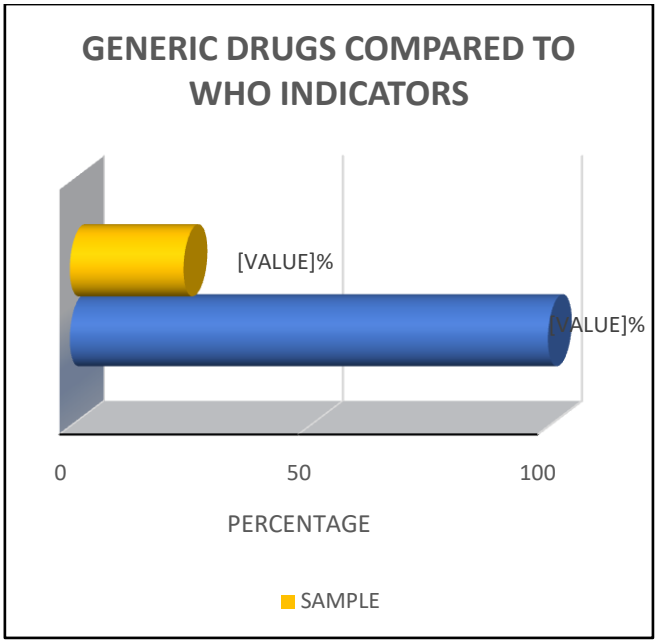
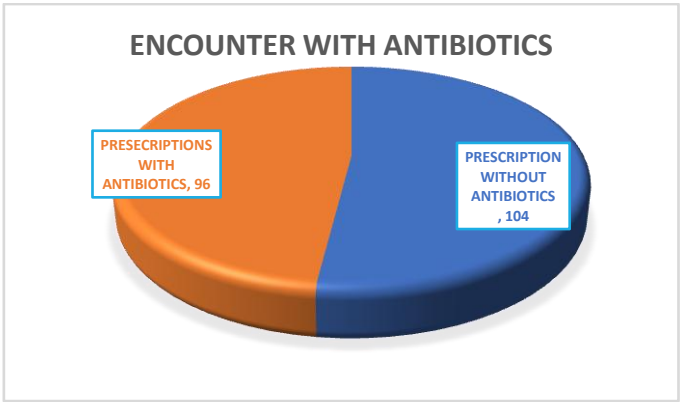


Fig. 9: Generic Drugs Compared to the WHO Indicator

Encounters with Antibiotics:
For 96 patients out of 200, the physician has prescribed an anti-biotic medication along with other urological treatment drugs. The 104 patients who are not prescribed antibiotics have a preponderance over other patients.



Encounters With Injections
Out of 200 cases, 96 (48%) patients had not been administered injections. The number of patients who were given at least one injection fell to 104 (52%). The data is given below in the table.

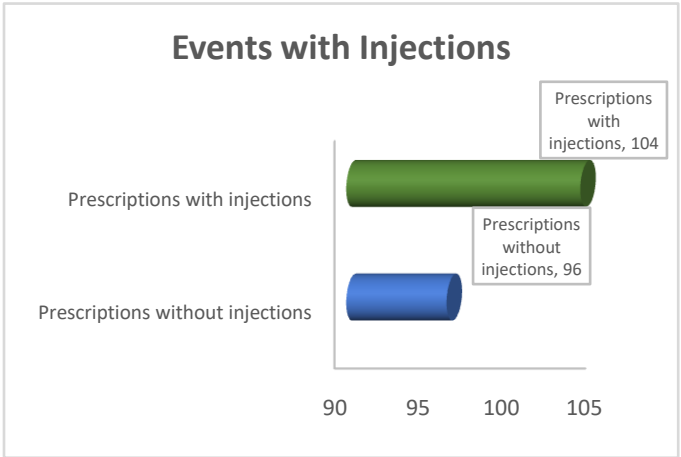


Fig. 11: Events with Injections

Drugs Prescribed From National Drug Formulary:
1769 drugs are prescribed for 200 patients. All the drugs that are prescribed for the treatment of urological disorders are listed on the National Drug Formulary, which ensures their efficacy and safety.

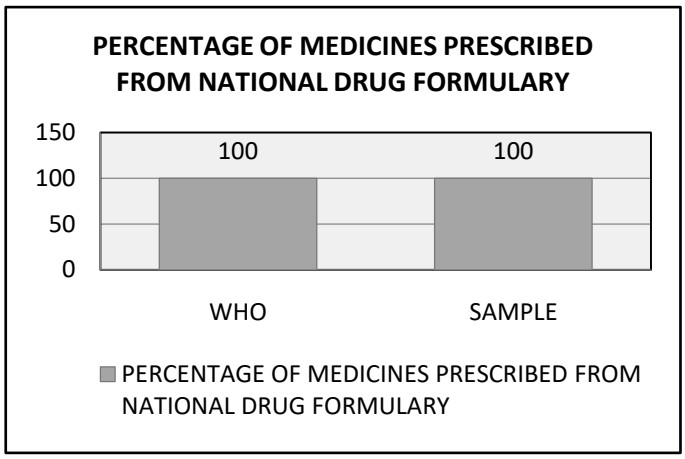


Fig. 12: Percentage of Medicines Prescribed from the NDF

Polypharmacy In Treatment Of Urological Disorders.
Out of 200 patients, 128 were over the age of 50 years. In these 128 patients, 116 were prescribed five or more drugs, which eventually resulted in polypharmacy. The percent of patients having more than five drugs is 58%, which is quite high. The collected data is shown below.

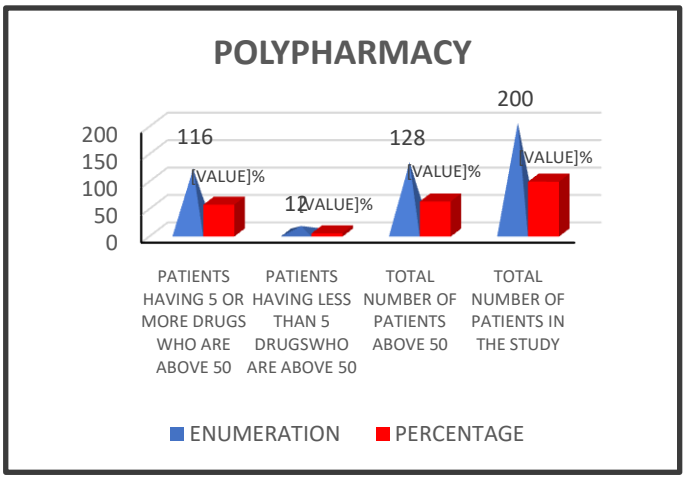


Fig 13: Polypharmacy in Treatment of Urological Disorder

Drug Interactions
Out of 200 cases, a total of 50 cases had drug interactions. In which 100 drug interactions were found, 32 of them were major drug interactions and 68 were moderate drug interactions.

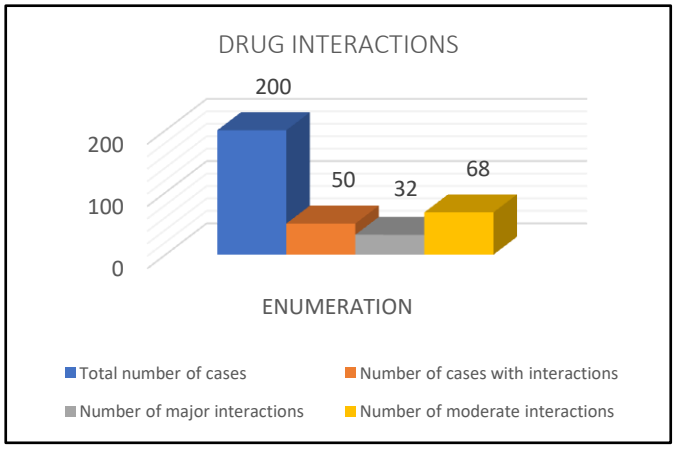


Fig. 14: Drug Interactions

Adverse Drug Reaction

Out of 200 cases, a total of 29 cases had adverse drug reactions. Major reactions with the ceftriaxone (9) cases are seen, and the data collected are shown below.

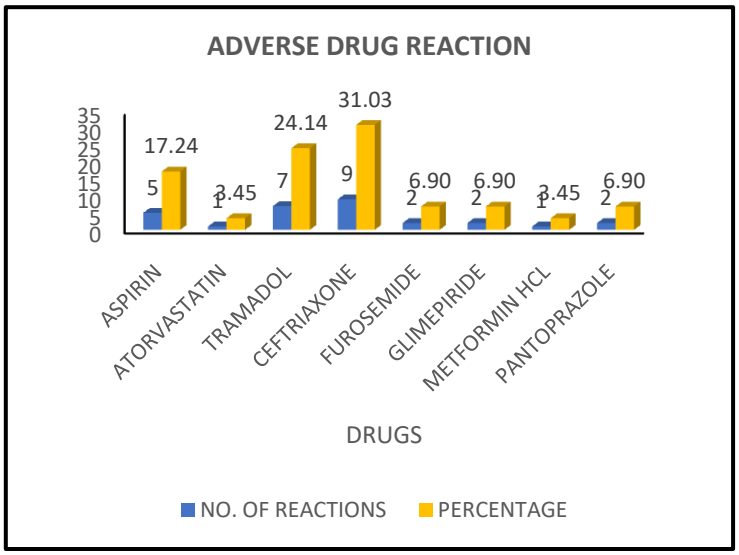


Fig. 15: Adverse Drug Reaction

ADR Occurrence

Out of 200 cases, according to age, polypharmacy, and concurrently interacting drugs, the incidence of ADR (adverse drug reaction) was 44 cases, respectively.

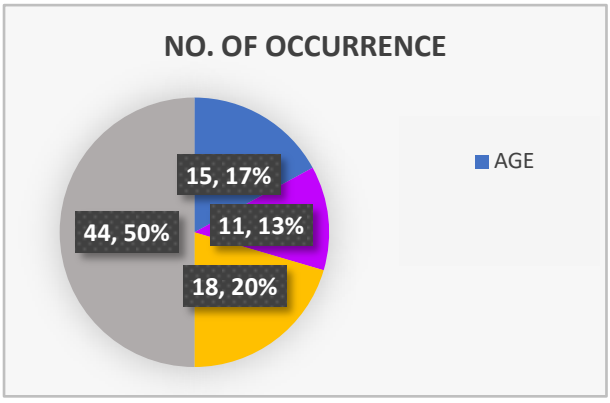


Fig. 16: ADR Occurrence

ADR Management

The ADR management for the total number of patients can be seen below.

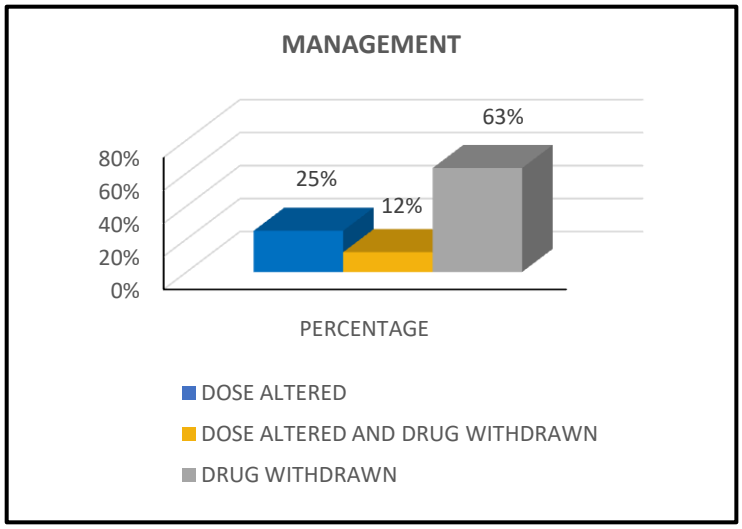


Fig. 17: ADR Management

DISCUSSION

Among the 200 cases collected for our study, we found that the majority of patients aged between 50 and 64 (37.50%) had a higher percentage of being admitted to the hospital. A total of 128 were above 50 years of age, and 72 were below 50 years of age. The study was found to be consistent with the study conducted by Rajiv Ahlawat et al., which indicated that male patients are more prevalent when compared to female patients. (Fig: 1)

Out of 200 cases, the majority were males (129, 66%) and females (67, 34%). (Fig:2)

Out of 200, 26% were diagnosed with benign prostatic hyperplasia (BPH), followed by 21% with urinary tract infection (UTI), 20% with left renal calculus, 19% with CKD, 14% with left VUJ calculus and acute gastroenteritis, 12% with right VUJ calculus, and 9% with CA bladder. The common diagnosis was found to be BPH and UTI. (Fig:3)

In our study, patients with co-morbidities were found to be 82 (41%), and patients without co-morbidities were 118 (59%). (Fig:4)

Patients with more than two comorbidities of hypertension and diabetes mellitus and others were 45 (22.5%), which indicates that hypertension followed diabetes mellitus and hyper and hypothyroidism were the most common comorbidities associated with various urological disorders. The morbidity and mortality rate can be reduced by controlling risk factors like hypertension, diabetes mellitus, and others. (Table:1)

200 prescriptions from patients suffering from urological disorders were collected. 274 prescriptions of analgesics and antipyretics followed 186 antibiotics, and the least prescribed drug was only loop diuretics (56) constituting 26.7%, 18.1%, and 5.5%. (Fig:5)

In 200 cases, a total of 938 drugs were prescribed. The most prescribed drugs for the treatment of urological disorders were T. DOLO (paracetamol)-166 (17.69%), which is the most prescribed tablet, and INJ. KEPHAZONE-96 (10.23%), which is the most prescribed intravenous drug. (Table:2)

The average standard mean of brand cost was 1253.3405 and generic cost was 594.607655. The total cost of medication on brand and generic drugs is 250668.1 and 118921.531. The average cost of brand drugs prescribed is 1253 rupees and 594 rupees for generic drugs, implying that the average cost of generic medication is less expensive than the cost of brand drugs. Less economic burden will be placed on the patients if drugs are prescribed under generic names, assuming they have the same efficacy as the branded drugs. (Table:3)

The average drug per single prescription was 6.94, and the WHO indicated that the average drug per single encounter falls at 2 per prescription. (Fig:6)

The drugs prescribed according to the WHO indicator are only 34 cases out of 200, while the rest of the cases contain two or more drugs in a single encounter. According to the WHO, 17%, and not according to the WHO, 83%. (Fig:7)
Among the 200 cases analyzed, the maximum number of drugs prescribed on a single prescription was 14 for one patient. Notably, prescriptions containing 7 or 8 drugs per encounter were the most common, occurring 43 times. This data highlights a concentration in prescription complexity, with a significant frequency of prescriptions involving 7 or 8 drugs per patient encounter. (Table:4)

For 200 patients, 1769 generic drugs were prescribed for the treatment of urological disorders. Of these 421 drugs (23.79%) given as generic drugs, the remaining 1348 (76.20%) were prescribed by their brand name. (Fig:8)

WHO prescribing indicators with generic drugs are 100%, and out of 200 cases, 23.79% were given with generic drugs. (Fig:9)

Out of 200 cases, 96 patients were prescribed an antibiotic drug along with other drugs, and 104 patients were not prescribed an antibiotic. (Fig:10)

Out of 200 cases, 96 (48%) patients were not administered injections. The number of patients given at least one injection was 104 (52%). (Fig:11)

The percentage of drugs prescribed in the national drug formulary was 100. (Fig:12)

Polypharmacy was also observed in our study. Out of 200 patients, 128 (64%) were over the age of 50. In these 116 patients prescribed 5 or more drugs, the percentage of patients having more than 5 drugs is 58%, which is quite high. 12 patients were prescribed less than 5 drugs, and the percentage of patients having less than 5 drugs is 6%. (Fig:13)

In a total of 200 cases, 50 had drug interactions. In which 100 drug interactions were found, 32 were major drug interactions, and 68 were moderate drug interactions. (Fig:14)

Out of 200 cases, a total of 29 cases had adverse drug reactions (ADR). major reactions with ceftriaxone 9 (31.03%) and least with tramadol 7 (24.14%), aspirin 5 (17.24%), furosemide 2 (6.90%), glimepiride 2 (6.90%), pantoprazole 2 (6.90%), atorvastatin 1 (3.45%), and metformin HCL 1 (3.45%). (Fig:15)

Out of 200 cases, based on age, polypharmacy, and concurrently interacting drugs with the occurrence of ADR, there were 44 (100%) cases, respectively. Based on age, the number of occurrences is 15 (34.09%), the polypharmacy number of occurrences is 11 (25%), the concurrent interacting drug number of occurrences is 18 (40.09%), and the total number of occurrences is 44 (50%). (Fig:16)

In 200 cases of ADR management, 63% of drugs were withdrawn, 25% of doses were altered, and in 12% of patients, doses were altered and drugs were withdrawn. (Fig:17)

CONCLUSION

This study offers health care information and drug utilization trends for professionals who manage associated co-morbidities in hospitalized cases of urological disorders.
In our study, patients with co-morbidities were found to be 82 (41%), and patients without co-morbidities were 118 (59%). Patients with more than two comorbidities of HTN and DM and others were 45 (22.5%), which indicates that hypertension followed diabetes mellitus and hyper and hypothyroidism were the most common comorbidities associated with various urological disorders. The morbidity and mortality rate can be reduced by controlling risk factors like HTN, DM, and others.

In our study, the overall prescription pattern of drugs is satisfactory in the urology department and provides valuable insight.

Our study shows that most of the drugs are not prescribed by brand name, which results in high treatment costs.

The physicians should be encouraged to prescribe the drugs with a generic name to the maximum that could reduce the cost burden on the patients, receive rational treatment for the disease, and avoid polypharmacy or other medical-related problems.

The result of our study was to help physicians or prescribers enhance patient management by bringing rationality to prescription. Polypharmacy, overuse of analgesics and antipyretics, and proton pump inhibitors were areas of concern. Prolonged and irrational use of antibiotics for treatment was noted in patients in the urology department.

Out of 200 cases, 96 patients were prescribed an antibiotic along with other drugs, and 104 patients were not prescribed an antibiotic.

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