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Original Research Article

Assessment of postoperative medication utilization in a surgical ward of a Tertiary Care Teaching Hospital

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ABSTRACT

Objective: The primary aim of this study was to evaluate the drug utilization pattern of post-operative medications using World Health Organization (WHO) drug use indicators in post-operative patients in the surgical ward. The goal was to promote the rational use of medicines and reduce adverse effects in surgical patients in a tertiary teaching hospital.

Materials and Methods: A prospective observational study was conducted at D Y Patil Medical College, Navi Mumbai, India, involving post-operative surgical patients. A total of 493 prescriptions and case records were reviewed. Data were analyzed using WHO drug use indicators.

Results: Of the 493 cases analyzed, 60% were male and 40% female. Appendicitis (37.93%) and various types of hernias were the most common reasons for admission. The average number of drugs per patient encounter was 7.69. The most commonly prescribed drugs were antiulcer agents, analgesics, antibiotics, and intravenous fluids. Antibiotics were prescribed in 99.59% of encounters, and injections in 100%. Drugs were prescribed by their generic name in 87.16% of cases, and 99.1% of prescriptions were from the National List of Essential Medicines 2022.

Conclusions: This study highlights the drug use patterns in post-operative patients at a tertiary care hospital. Widespread use of injectable medications and polypharmacy were noted, which suggests room for improvement in prescribing practices. Rational use of antibiotics is recommended to minimize the risk of antibiotic resistance.

1. Introduction

Drug utilization, as defined by the World Health Organization (WHO), refers to the "systematic study of the marketing, distribution, prescribing patterns, and usage of drugs within a society, with a focus on the medical, social, and economic implications of these practices."[1]

The surgical management process is inherently dependent on the use of antimicrobial and analgesic drugs, as infections at surgical sites are among the leading causes of postoperative morbidity and mortality.[2]

Irrational drug use is a widespread global issue, manifesting in practices such as prescribing by brand names, polypharmacy, overprescription of antibiotics, and excessive use of injections.[3] Overprescribing antibiotics contributes to drug resistance and higher treatment costs, while the overuse of injections raises the risk of tissue damage and the transmission of blood-borne diseases like HIV/AIDS and Hepatitis B. Additionally, injections are generally more expensive compared to oral medications.[4]

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Studies on medication use in India have revealed a higher prevalence of prescribing drugs by brand names, which contributes to increased healthcare costs and potential challenges in promoting the use of generic alternatives.[5] The World Health Organization (WHO) developed drug use indicators to assess and evaluate drug use patterns in healthcare institutions, particularly in developing countries, with the goal of promoting rational drug use and improving overall healthcare outcomes.[6]

Polypharmacy is linked to a higher risk of drug–drug interactions and contributes to the rise in antimicrobial resistance, as well as an increased incidence of adverse drug reactions, prolonged hospital stays, and heightened morbidity and mortality. Effective drug prescribing is a crucial skill that requires ongoing evaluation and refinement.[7] It reflects not only the physician's knowledge of pharmacology and pathophysiology but also their diagnostic ability and approach to selecting the most cost-effective and appropriate treatment.

There is limited research focusing on overall drug utilization patterns among surgical post-operative inpatients. Therefore, this study was conducted to evaluate the drug utilization patterns in post-operative patients admitted to the inpatient ward of the Department of Surgery.

2. Materials and Methods

2.1. Study design

A prospective, observational, descriptive study was conducted at a tertiary care teaching hospital in Navi Mumbai, following approval from the institutional ethics committee (IECBH reference no. 2023/076). The study included a sample of 493 patients and was carried out from January 2023 to July 2023.

All case sheets were reviewed, and findings were recorded, focusing on gender differences, diagnosis, and ongoing treatment. Detailed information on the drugs used, including drug name, dosage schedule (form, route, and frequency), and duration of treatment, was extracted from the patients' medical records.

The data were analyzed for sex-wise distribution and the types of surgeries performed, along with their mean duration of hospital stay. Additionally, the rationality of prescriptions was assessed using the WHO core drug prescribing indicators to evaluate adherence to established guidelines and best practices in drug utilization. The percentage of fixed-dose combinations (FDCs) was also calculated. These WHO prescribing indicators evaluate the extent of polypharmacy, the prescription of drugs by their generic names, and the use of antibiotics and injections, providing insights into the rationality of prescribing practices within the study population.[8]

2.2. Inclusion criteria

1. All post-operative patients in the surgery ward of the hospital until discharge; only adults (both males and females) were included.
2. Only drugs prescribed after the surgical procedures were considered, excluding any medications that were already being administered prior to the operations.

2.3. Exclusion criteria

1. Patients who died postoperatively before discharge
2. Patients who absconded or were discharged against medical advice
3. Patients referred to a higher centre for further treatment
4. Patients under 18 years of age

Data analysis: Then these data were entered, documented and analysed using Microsoft Excel 2010 and results were discussed. Different parameters were given as percentage.

3. Results

The age and sex distribution of the sample population in our study is presented in Table 1. Many patients were male (60%), with most patients falling within the 25-50 years age group, accounting for 52.94% of the sample.

Displays the various types of surgeries included in our study, along with their mean postoperative duration of stay in the ward. The most performed surgical procedure was appendicectomy, which constituted 37.93% of the cases, followed by various types of hernia repairs at 12.98%. The mean duration of hospital stay for these patients was 11 days.

The most prescribed drugs included antiulcer medications, analgesics, antibiotics, and intravenous fluids, as shown in Table 3. A total of 3,795 drug products were prescribed across 493 encounters. Among these, 33.99% (1,290) were antibiotics. The most frequently prescribed injections included Pantoprazole (95.94%), Diclofenac (84.98%), Metronidazole (83.77%), and Ceftriaxone (62.88%).

Table 4shows that out of the total 3,795 formulations prescribed, 49 (1.29%) were fixed-dose combinations (FDCs). The most prescribed FDC was Piperacillin + Tazobactam, accounting for 75.51% of the FDCs.

The total number of drugs prescribed per encounter ranged from a minimum of two to a maximum of eleven drugs. Most patients received 7–8 different medications, with an average of 7.69 drugs per encounter, as illustrated in Table 5.

llustrates that antibiotics were prescribed in 491 encounters, representing 99.59% of the total encounters. Most encounters included a minimum of one antibiotic, with some cases containing up to five antibiotics.

Table 1: Age andsex wise distribution

Characteristics	No. of patients	Percentage (%)
Male	295	60%
Female	198	40%
Age in years:		
Less than 25 years	107	21.70%
25-50 years	261	52.94%
More than 50 years	125	25.35%
Total	493	100%

Table 2: Morbidity Pattern with their mean duration of hospital stay

S.no	Type of surgery	Number of surgeries done (%)	Mean stay (days)
1.	Appendicectomy	187 (37.93)	8.93
2.	Hernias (Inguinal Hernia, Incisional, epigastric, umbilical)	64 (12.98)	11.10
3.	Hydrocele	59 (11.96)	11.21
4.	Breast surgeries	36 (7.30)	12.13
5.	Colorectal surgery	31(6.28)	13.11
6.	Gastroduodenal surgery	29 (5.88)	11.81
7.	Renal surgeries	24 (4.86)	11.96
8.	Fissurectomy	23 (4.66)	5.56
9.	Haemorrhoidectomy	18 (3.65)	5.59
10.	Circumcision	6 (1.21)	4.95
11.	Cellulites	6 (1.21)	15.76
12.	Incision and drainage	6 (1.21)	6.74
13.	Thyroid surgeries	2 (0.40)	7.83
14.	Amputation	2 (0.40)	30.82
	Total	493 (100%)	Mean = 11

Table 3: Most frequently prescribed drugs with percentage

S.no	Name of the drug	n (Percentage %)
1.	Inj. Pantoprazole	473 (95.94)
2.	Inj. Diclofenac sodium	419 (84.98)
3.	Inj. Metronidazole	413 (83.77)
4.	Inj. Ringer's lactate	394 (79.91)
5.	Dextrose Normal Saline	324 (65.72)
6.	Inj. ceftriaxone	310 (62.88)
7.	Inj. Amikacin	298 (60.44)
8.	Inj. Normal saline	229 (46.45)
9.	Inj. Tramadol	192 (38.94)
10.	Inj. Ondansetron	186 (37.72)
11.	Inj. 5% dextrose	174 (35.29)
12.	Tab Cefixime	89 (18.05)
13.	Inj. Ciprofloxacin	62 (12.57)
14.	Inj. Cefazolin	61 (12.37)
15.	Tab Paracetamol	53 (10.75)
16.	Tab Diclofenac	32 (6.49)
17.	Tab Ranitidine	31 (6.28)
18.	Inj. Levofloxacin	14 (2.83)
19.	Inj. Penicillin's	11 (2.23)
20.	Tab Multivitamins	10 (2.02)
21.	Laxatives	9 (1.82)
22.	Inj. Cefotaxime	4 (0.81)
23.	Inj. Cefoperazone	4 (0.81)
24.	Inj. Meropenem	3 (0.60)

Table 4: Fixed; dose combinations

S.no	Type of Therapy	n Percentage (%)
1.	Piperacillin + Tazobactam	37 (75.51)
2.	Cefoperazone + Sulbactam	2 (4.08)
3.	Amoxicillin + Clavulanate	2 (4.08)
4.	Ceftriaxone + Sulbactam	2 (4.08)
5.	Diclofenac + Paracetamol	3 (6.12)
6.	Tramadol + Paracetamol	1(2.04)
7.	Amikacin + cefotaxime	1(2.04)
8.	Cefotaxime + metronidazole	1(2.04)

Table 5: Total number of drugs per encounter

Number of drugs	Number of encounters (%)
2	1 (0.20)
3	1 (0.20)
4	5 (1.01)
5	9 (1.82)
6	42 (8.51)
7	158 (32.04)
8	168 (34.07)
9	74 (15.01)
10	28 (5.67)
11	7 (1.41)

Table 6: Number of antibiotics prescribed in an encounter

Number of antibiotics prescribed	Number of encounters
0	2
1	48
2	148
3	284
4	6
5	5

Table 7: The WHO core prescribing indicators

WHO prescribing indicators	Number/percentage (%)	Number
Total number of encounters		493
Total number of drugs prescribed		3795
Average number of drugs prescribed per encounter		7.69 (3795 / 493)
Percentage of drugs prescribed by generic name	87.16 (3308 / 3795)	3308
Percentage of encounters in which an antibiotic was prescribed	99.59 (491/493)	491
Percentage of encounters with an injection prescribed	100 (493/493)	493
Percentage of drugs prescribed from NLEM 2022	99.1 (3761/ 3795)	3761

4. Discussion

We gathered data from 493 patients who met the inclusion criteria, underwent surgery, and stayed in the post-operative ward until their discharge. A male predominance was observed, with 295 patients (60%) being male. Similar trends have been noted in other studies, including those by Patel DJ et al.[1] (62.5%), Patel KM et al.[9] (60.60%), and Kumar et al.[10] (61.77%).

Most patients fell within the age group of 25-50 years (52.94%). This could potentially be attributed to their active lifestyle and long working hours, making them more susceptible to conditions requiring surgical interventions. This observation aligns with findings from other studies.[11]

While Bhansali et al. reported that 57.08% of patients were from 40 to 60 years age groups.[12]

In our study, surgery for appendicectomy was the most common procedure done and reported for a total of 187 (37.93%) patients, which was consistent with the finding of Kumar R et al.[10] and Ali et al.[13]

However, in other studies like by Sadaf et al.,[11] appendicectomy was the 2nd most performed procedure, in study by Sharma et al,[14]renal stone was leading operative procedure.

The second most common procedure in our study was hernia repair surgery, accounting for 64 cases (12.98%). This is lower compared to observations in other studies, such as Shaikh et al.[15] (15.9%), Manzar et al.[16] (9%), Sneha et al.[17] (24.13%), and Ali et al.[13] (33.47%).

In our study, the average number of drugs per encounter was 7.69, ranging from 2 to 11. This is higher compared to findings by Mondal et al.[18] (6.27), Khade et al.[19] (5.1), and Varaiya S et al.[20] (2.5), but lower than Patel KM et al.[9] (8.94). The high average number of drugs per patient is partly due to the frequent administration of IV fluids. It is well-established that polypharmacy on this scale can lead to more adverse drug reactions, drug interactions, and increased therapy costs. Polypharmacy is common in post-operative patients, making it crucial to strike a balance between the number of medications and effective pharmacotherapy

In the 493 patient encounters analyzed, 3234 injections were prescribed, representing 85.21% of all medications used. These injections included injectable antibiotics, injectable analgesics, and intravenous fluids. The injections prescribed most frequently included Pantoprazole (95.94%), Diclofenac (84.98%), Metronidazole (83.77%), and Ceftriaxone (62.88%). These findings can be compared to the study by Mohammad Arshad et al.,[21] which reported similar results, as well as to the research by Salman MT et al.,[22] which indicated that Injection Ceftriaxone was the most frequently used medication in postoperative patients, followed by Diclofenac sodium.

The percentage of encounters in which an injection was prescribed was 100%, consistent with the findings of Bhansali et al. However, this result differs from those reported by Baba Sulemana Mohammed et al.[23] and Ahmed Alkahtani et al.[24], where the percentages were only 14% and 23%, respectively

The physicians' high regard for the efficacy of parenteral therapy, combined with patient demand for injections and incentives for physicians to prescribe them, may contribute to the increased use of injectable medications. The average number of injections prescribed per prescription, including parenteral fluids, was 6.55, which is comparable to findings by Patel K et al.[9] The high average number of drugs per patient is also attributed to the extensive administration of IV fluids.

Post-operative pain is one of the most reported complaints following surgery, making the use of analgesics essential. In our analysis, Diclofenac (84.98%) was the most frequently used analgesic, consistent with findings by Kumar et al.[10] and Siddhartha M et al.[25] who also reported it as the most prescribed analgesic. However, in the study by Patel K et al.[9], Diclofenac was the second most prescribed analgesic, with Tramadol being the most used.

Parenteral fluids constituted 29.53% of all prescribed drugs. The most prescribed fluids were Ringer's lactate (79.91%), Dextrose Normal Saline (65.72%), followed by Normal Saline (46.45%) and Dextrose (35.29%). These findings align with those from other studies.[1] Parenteral fluids are essential for nourishment, hydration, electrolyte replacement, and medication infusion.

The prescription of parenteral fluids leads to the use of injectable formulations, an increased number of medications, and higher costs.

In our study, 491 patients received antimicrobial agents, resulting in a usage rate of 99.59%. Antibiotics were administered as a preventive measure to reduce the risk of post-operative infections at the surgical site. The average number of antibiotics used was 2.61, which is comparable to another study that reported an average of 2.86.[26]

The significant use of antibiotics in healthcare facilities can be attributed to the various conditions affecting inpatients, which creates pressure on prescribers to utilize these medications for disease prevention and treatment. However, this trend may contribute to the development of antibiotic-resistant microbes. This observation aligns with the findings of the study conducted by Mudenda S et al.[27,28]

In this study, the percentage of drugs prescribed by generic name was 87.16%, which is comparable to the 87.27% reported by Sharma N et al. However, the percentage reported by Mishore KM et al. was notably higher at 94%.[29]

In the present study, the percentage of drugs prescribed from the essential drug list was 99.1%, comparable to the findings reported by Mohammad et al.[23] (99.8%). This rate is significantly higher than that observed in other studies conducted across India, such as Siddhartha et al.[25] (54.89%) and Sharma et al.[14] (52.96%). The increased use of essential medicines contributes to more rational medication therapy.

In our study, 1.06 % of drugs were in the form of FDCs which is very less than other studies such as Sneha et al. (18.47%)[17] and Kumar et al. (12.42%)[10]

5. Limitation

The number of cases in the current study may not be sufficient to represent the overall prescribing pattern. A repeated prescription audit is needed to evaluate changes in prescribing behaviour.

6. Conclusions

Our study provides a general pattern of drug use in post-operative patients in the surgical ward of a tertiary care hospital, revealing that polypharmacy is widespread. Consequently, an institutional antimicrobial policy is necessary. The establishment of prescribing guidelines

and educational programs is essential to promote the appropriate use of antibiotics during the postoperative period. We advocate for minimizing the use of injectable medications whenever possible and recommend prescribing drugs from the essential medicines list by their generic names, considering cost-effectiveness.

7. Source of Funding

None.

8. Conflict of Interest

None.

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