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Original Research Article

Prescription patterns of antibiotics and analgesics in postoperative care at government cancer hospital: a prospective observational study

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ABSTRACT

Background: The prescription patterns of antibiotics and analgesics in postoperative care are critical for optimal recovery. This study aims to analyse the utilization of these medications in postoperative cancer patients at a government cancer hospital.

Methods: A prospective, cross-sectional observational study was conducted at the government cancer hospital, Aurangabad, from March 2023 to August 2024. Prescription data were collected from 321 postoperative cancer patients, focusing on demographic details, drug classes, monotherapy versus combination therapy, and adherence to WHO prescribing indicators.

Results: A total of 321 patients were included, resulting in a male-to-female ratio of 1.23. Antibiotics were prescribed 612 times, with inj. Metro being the most frequently used (33.01%), followed by inj. Augmentin (26.80%). Analgesics totalled 600 prescriptions, led by inj. PCM at 42.17% and inj. tramadol at 31.33%. Monotherapy accounted for 33.96% of antibiotic prescriptions and 16.82% of analgesics, while combination therapy was more common (41.43% for antibiotics and 83.18% for analgesics). Opioid analgesics comprised 58.33% of analgesic prescriptions, highlighting their role in postoperative pain management. Brand drugs were predominantly prescribed, 76.24% of the total. The average number of drugs per prescription was 3.78, and nearly all prescribed drugs (98.84%) were from the NLEM of India.

Conclusions: The prescribing patterns adhered to WHO-DUS parameters, highlighting a strong preference for generic medications. Nitroimidazole and non-opioid analgesics were the most frequently prescribed drug classes, indicating a structured approach to postoperative care in cancer patients.

Keywords: Antibiotics, Analgesics, Postoperative care, Prescription patterns, WHO-DUS indicators, Cancer patients

INTRODUCTION

Cancer is a prevalent and serious disease marked by uncontrolled cell growth and spread.[1] With over 8 million fatalities each year, it poses a significant challenge to global health and socio-economic development. Treatment modalities encompass surgery, radiotherapy, chemotherapy, immunotherapy, and targeted therapies.[2] Ensuring rational drug use involves providing patients with appropriate medications in suitable doses at minimal costs. WHO guidelines for prescribing patterns are essential for assessing treatment trends and enhancing healthcare practices.[3]

Antibiotics are commonly prescribed to post-operative cancer patients to prevent or treat infections, as cancer treatments like chemotherapy and radiation can weaken the immune system, making patients more susceptible to infections.[4] Surgery itself can also introduce bacteria into the body, increasing the risk of postoperative infections. In this context, antibiotics help reduce infection rates, promote recovery, and prevent complications that could

delay cancer treatment. Some antibiotics even show potential in supporting cancer therapy by promoting cancer cell death and inhibiting tumor growth, adding to their value in post-operative care.

However, the use of antibiotics in post-operative cancer care requires careful consideration due to the risks of antibiotic resistance and disruptions to the gut microbiota. Overuse of antibiotics can lead to the development of resistant bacteria, complicating future treatments and reducing the effectiveness of antibiotics. Additionally, changes in the gut microbiome can impair immune function and increase inflammation, potentially influencing cancer progression. Thus, further research is essential to determine the optimal use of antibiotics in this setting, focusing on minimizing risks while enhancing therapeutic outcomes for cancer patients.

Pain management is essential for cancer patients recovering from surgery, as many experience significant postoperative pain. Studies show that up to 80% of patients face pain after surgery, with 11-20% enduring severe discomfort.[5] Despite the availability of analgesics like opioids, pain is often inadequately managed. Effective pain relief not only improves comfort but also speeds recovery and reduces the risk of long-term complications like chronic pain or opioid dependence. A tailored approach, combining medications and therapies based on individual needs, is crucial for optimal pain control.[6]

Given the complexity of cancer pain, ongoing research is needed to refine pain management strategies, especially after surgery. Current guidelines, such as the WHO's analgesic ladder, " a step-by-step approach to pain relief. It starts with non-narcotic medications, then moves to weaker narcotics, and, if necessary, stronger ones. Adjuvant medications are also used to enhance the effects. When used properly, this method provides significant pain relief, helping cancer patients feel better and reducing their suffering.[7]

When it comes to prescribing antibiotics and pain medication for cancer patients after surgery, the approach should always be guided by the latest evidence and tailored to each patient’s unique situation. Given the complexities of postoperative care in cancer patients, regular prescription surveys are necessary for effective management. Therefore, this study was planned to analyze the prescription patterns of antibiotics and analgesics in postoperative care at the government cancer hospital, a tertiary care center, with the aim of providing insights to optimize patient outcomes.

METHODS

This study was designed as a prospective, cross-sectional, observational investigation at the department of pharmacology, GMCH Aurangabad, in collaboration with the government cancer hospital, Aurangabad. The aim of the study was to assess the prescription patterns of antibiotics and analgesics in the postoperative care of cancer patients. Participants included postoperative cancer patients of all ages who agreed to take part in the study. Patients who declined to participate were excluded.

Ethical approval taken from institutional ethics committee along with that a blanket no objection certificate (NOC) will be obtained from the officer on special duty (OSD) and the Head of the relevant Department. The investigator will thoroughly explain the study's benefits and procedures to the Head of the Department. All patients who underwent surgery at the government cancer hospital between March 2023 to August 2024 will be included in the study. According to world health organization (WHO) guidelines, a minimum of 300 encounters is recommended for conducting a prescription audit in a cross-sectional study. A total of 321 prescriptions were analysed.

Data on prescriptions will be collected for each patient, specifically focusing on the antibiotics and analgesics used during their postoperative care. Patients who opt to withdraw from the study at any time will be excluded from the analysis. Relevant patient information will be recorded in a case record form (CRF). All collected data will be treated as confidential, with only anonymized study parameters used for analysis and publication. Source documents will consist of case record forms of inpatient department (IPD) patients and records from the medical records section of the cancer hospital. The gathered data will be organized and analysed using Microsoft Excel, with categorical data presented as percentages.

Given these factors, it raises an important question about the need for routine prescription surveys. This study was therefore designed to explore the prescription patterns at government cancer hospital, Aurangabad, a key cancer care hospital in the Marathwada region of the Maharashtra.

RESULTS

This study included a total of 321 patients, with a gender distribution showing that 55.14% were male (177 patients) and 44.86% were female (144 patients) (Table 1). Analysing the age demographics, the largest group comprised patients aged 31 to 50 years, which accounted for 40.19% of sample. Notably, the 18-30 age group consisted entirely of males, while the 51-70 age group showed a predominance of the males at 61.90 percentages (Table 2).

Table 1: Gender distribution of patients.

Gender distribution	N	Percentage (%)
Male	177	55.14
Female	144	44.86
Total	321	

In terms of treatment, we evaluated the most frequently prescribed antibiotics, totalling 612 prescriptions. The

most common antibiotic was inj. Metro, making up 33.01% of prescriptions, followed by inj. Augmentin at 26.80% (Table 3). Similarly, 600 analgesic prescriptions were recorded, with inj. PCM at 42.17% and inj. Tramadol at 31.33% (Table 3), indicating a strong use of both opioid and non-opioid options for pain management.

When examining treatment approaches, 33.96% of patients received monotherapy for antibiotics, while two-drug therapy was the most prevalent, comprising 41.43% (Table 4). For analgesics, a significant 83.18% of patients were treated with two-drug therapy, reflecting a common strategy in pain management (Table 4).

In the context of monotherapy for antibiotics, beta lactam-penicillin were the most utilized class, with 64.22% of patients receiving these medications, primarily inj. Augmentin (67 patients) (Table 5). For analgesics, opioid analgesics, specifically inj. Tramadol, represented 58.33% of prescriptions, highlighting their critical role in treatment (Table 5).

Expanding on these individual treatment methods, we also assessed combination therapies. Among antibiotics, the most frequently used combination was Penicillins with Nitroimidazole, prescribed to 82 patients (Table 6). Three-drug therapies were also noted, with combinations such as penicillin, nitroimidazole, and aminoglycosides used in 50 patients, as well as cephalosporins, nitroimidazole, and aminoglycosides used in 29 patients (Table 8).

For analgesics, a significant majority of patients (267, or 83.18%) received two-drug combinations, notably inj. PCM combined with inj. Diclo (111 patients) and inj. Tramadol paired with inj. PCM (126 patients) (Table 7). Additionally, a total of 6 patients (1.87%) were treated with three-drug combinations, which included inj. Tramadol, inj. PCM, and inj. Diclo (Table 9).

Prescriptions were analysed according to WHO-DUS prescribing indicators, with results tabulated in Table 10. And drugs prescribed by generic names is calculated in Table 10.

Table 2: Age-wise gender distribution.

Age group (in years)	N	Percentage (%)	Male, N (%)	Female, N (%)
18-30	21	6.54	21 (100)	0 (0)
31-50	129	40.19	61 (47.29)	68 (52.71)
51-70	126	39.25	78 (61.90)	48 (38.10)
>70	45	14.02	17 (37.78)	28 (62.22)
Total	321	100	177	144

Table 3: Most prescribed antibiotics and analgesics.

Drug class	Drug name	Number	Percentage (%)
Antibiotics			
Beta lactam-penicillins	Inj. Augmentin 1.2 gm	164	26.80
	Tab. Augmentin 625 mg	1	0.16
	Inj. Piptaz 4.5 gm	39	6.37
Beta lactam-cephalosporins	Inj. Taxim 1 gm	92	15.03
	Inj. Xone 0.5/1 gm	6	0.98
	Inj. Magnex 1.5/3 gm	6	0.98
Nitroimidazole	Inj. Metro 400/500 mg	202	33.01
Aminoglycosides	Inj. Amikacin 500 mg	47	7.68
	Inj. Gentamicin 80 mg	34	5.56
Polymyxin	Inj. Colistin 1 million units	8	1.31
Carbapenem	Inj. Meropenam 1 gm	11	1.80
Fluoroquinolones	Tab. Ciproflox 500 mg	1	0.16
Oxazolidinones	Inj. Linox 600 mg	1	0.16
Total		612	
Analgesics			
Non opioid analgesics	Inj. PCM 0.5/1 gm	253	42.17
	Inj. Diclo 25/50/75 mg	149	24.83
	Tab. PCM 500 mg	6	1.00
	Tab. Diclo 25/50/75 mg	4	0.67
Opioid analgesics	Inj. Tramadol 50/100 mg	188	31.33
Total		600	

Table 4: Treatment approaches for antibiotics and analgesics.

Therapy type	No. of patients receiving antibiotics	Percentage (%)	No. of patients receiving analgesics	Percentage (%)
Monotherapy	109	33.96	48	14.95
2 drugs	133	41.43	267	83.18
3 drugs	79	24.61	6	1.87
More than 3 drugs	0	0.00	0	0.00
Total	321		321	

Table 5: Monotherapy drug classes for antibiotics and analgesics.

Monotherapy class	No	Percent (%)	Drug name	Count	Percent (%)
Antibiotics					
Beta lactam-penicillin	70	64.22	Inj. Augmentin	67	61.47
			Inj. Piptaz	2	1.83
			Tab. Augmentin	1	0.92
Beta lactam-cephalosporins	36	33.03	Inj. Taxim	31	28.44
			Inj. Xone	4	3.67
			Inj. Magnex	1	0.92
Nitroimidazole	1	0.92	Inj. Metro	1	0.92
Fluoroquinolones	1	0.92	Tab. Ciproflox	1	0.92
Oxazolidinones	1	0.92	Inj. Linox	1	0.92
Total	109			109	
Analgesics					
Non opioid analgesics	20	41.67	Inj. PCM	10	20.83
			Inj. Diclo	6	12.50
			Tab. PCM	3	6.25
			Tab. Diclo	1	2.08
Opioid analgesics	28	58.33	Inj Tramadol	28	58.33
Total	48			48	

Table 6: Combination therapy for antibiotics.

Drugs class	N	Percent (%)	Drug 1	Drug 2	Count	Percent (%)
Penicillins + nitroimidazole	82	61.65	Inj. Augmentin	Inj. Metro	72	54.14
			Inj. Piptaz	Inj. Metro	10	7.52
Penicillin + penicillin	1	0.75	Inj. Augmentin	Inj. Taxim	1	0.75
Cephalosporins + aminoglycosides	2	1.50	Inj. Taxim	Inj. Gentamicin	2	1.50
Cephalosporins + nitroimidazole	29	21.80	Inj. Taxim	Inj. Metro	22	16.54
			Inj. Xone	Inj. Metro	2	1.50
			Inj. Magnex	Inj. Metro	5	3.76
Cephalosporins + polymyxin	8	6.02	Inj. Taxim	Inj. Colistin	8	6.02
Carbapenem + nitroimidazole	11	8.27	Inj. Meropenam	Inj. Metro	11	8.27
Total	133				133	

Table 7: Combination therapy for analgesics.

Drug 1	Combination used	No. of patients	Percent (%)
Inj. PCM	Inj Diclo	111	41.73
Tab. PCM	Tab Diclo	2	0.75
Inj. Tramadol	Inj PCM	126	47.37
Inj. Tramadol	Inj Diclo	27	10.15
Total		266	

Table 8: Three-drug therapy for antibiotics.

Drugs class	N	Percent (%)	Drug 1	Drug 2	Drug 3	Count	Percent (%)
Penicillins + nitroimidazole + aminoglycosides	50	63.29	Inj. Augmentin	Inj. Metro	Inj. Amikacin	8	10.13
			Inj. Piptaz	Inj. Metro	Inj. Amikacin	18	22.78
			Inj. Augmentin	Inj. Metro	Inj. Gentamicin	16	20.25
			Inj. Piptaz	Inj. Metro	Inj. Gentamicin	8	10.13
Cephalosporins + nitroimidazole + aminoglycosides	29	36.71	Inj. Taxim	Inj. Metro	Inj. Amikacin	21	26.58
			Inj. Taxim	Inj. Metro	Inj. Gentamicin	8	10.13
Total	79					79	

Table 9: Three-drug therapy for analgesics.

Drug 1	Drug 2	Drugs 3	N
Inj. Tramadol	Inj. PCM	Inj. Diclo	5
Inj. Tramadol	Tab. PCM	Tab. Diclo	1
Total			6

Table 10: WHO-DUS prescribing indicators.

Prescribing indicators	Counts and percentages
Total number of prescriptions analysed	321
Total number of drugs prescribed	1212
The average number of drugs per encounter	3.78
Percentage of drugs prescribed by generic name	23.76% (288)
Percentage of drugs prescribed from essential drug list (India 2022)	98.84%
Percentage of drugs prescribed from essential drug list (WHO 2023)	71.36%
Percentage of encounters with an injection prescribed	99.68%

DISCUSSION

The gender distribution of patients shows a higher number of male patients (177, 55.14%) compared to female patients (144, 44.86%) in the study population. This is consistent with general patterns observed in Maheshwari et al where 72% of the participants were male and 28% were female, and Samreen et al in which 79% of the patients were male and 21% were female.[8,9]

The age distribution highlights the largest patient cohort in the 31-50 years age group (40.19%), followed by the 51-70 years group (39.25%). This reflects the fact that middle-aged and older adults are more likely to require medical care due to the onset of chronic diseases or age-related health issues, similar to findings in Samreen et al. (2019), where the 31-50 years age group accounted for 42.18%.[9] Interestingly, the population of elderly patients (>70 years) was notably higher in females (62.22%) compared to males (37.78%), which is consistent with demographic data indicating higher life expectancy among women in many regions.

The most frequently prescribed antibiotics were from the beta-lactam class, particularly inj. Augmentin (26.80%), followed by inj. Metro (33.01%) from the nitroimidazole class. These findings suggest that broad-spectrum antibiotics remain the cornerstone of therapy in this patient cohort, a typical approach in many healthcare settings where empiric treatment is initiated before specific pathogens are identified. Kamath et al found that beta-lactam antimicrobials, other than penicillins, were the most common pharmacological class of drugs prescribed (47.41%).[10] In Maheshwari et al the most commonly prescribed antibiotic classes were cephalosporins (40%).[8]

Combination therapy was common, with the majority of patients receiving two-drug antibiotic regimens (41.43%). This finding was similar to the study by Kamath et al where two-drug antimicrobial combinations (57%) were the most commonly preferred regimen, followed by three-drug combinations (30%). The most frequent combination was penicillin + nitroimidazole (61.65%), notably inj. Augmentin + inj. Metro, which accounted for 54.14% of two-drug regimens. This combination is often used to treat mixed infections, particularly those involving anaerobic bacteria. The use of cephalosporins + nitroimidazole (21.80%) also suggests that broad-spectrum coverage is a common strategy in the studied population. Similar findings were observed in Hotwani and Madkholkar, where nitroimidazole with penicillins or cephalosporins was the most frequently used combination in two-drug regimens.[11]

The relatively low use of more complex regimens, such as three-drug therapy, accounted for 24.61% of patients, with

the combination of penicillin + nitroimidazole + aminoglycosides being the most common. This approach is likely used for severe infections where multiple pathogens are suspected, necessitating more aggressive empirical treatment.

The analgesics data highlight a clear preference for non-opioid analgesics, with inj. PCM (42.17%) and inj. Diclo (24.83%) being the most frequently prescribed, consistent with findings by Varshney and Arya, where non-opioid analgesics, such as inj. PCM (19.43%) and inj. Diclo (37.30%), were commonly used in the postoperative period, more so than opioid analgesics.[12]

The most commonly used analgesic in our study was paracetamol, which contrasts with the study by Dasta et al which reported that morphine was the commonly used analgesic in postoperative pain management.[13] However, this finding is consistent with Kanjamala et al where paracetamol (39.7%) was the most frequently prescribed analgesic in general surgery.[14] These non-opioid options are often preferred due to their efficacy in managing mild to moderate pain and a lower risk of addiction and other adverse effects compared to opioids.[15] Opioid analgesics, particularly inj. tramadol, were also commonly prescribed (31.33%), reflecting the ongoing need for pain management in patients with moderate to severe post-surgical pain.

Like antibiotics, combination therapy (85.05%) was more common than monotherapy for analgesics. The majority of patients received two-drug combinations (83.18%) within the combination therapy, primarily involving inj. Tramadol + inj. PCM (47.37%) or inj. PCM + inj. Diclo (41.73%), both of which are well-established combinations for managing pain of varying severity. Comparable results were noted in the study by Sen et al and Chandran et al where the most common combination drugs prescribed were tramadol + paracetamol emphasizing the role of adjunctive analgesia in managing pain.[16,17]

The prescribing indicators provide additional insights into prescribing practices. The average number of drugs per encounter was 3.78, which is within an acceptable range but suggests that polypharmacy is common, especially in older patients who may be managing multiple chronic conditions. The average number of drugs prescribed per patient ranged from 1.78 to 9.03 (Patel et al and Sen et al).[16,18] A striking finding was the low percentage of drugs prescribed by generic name (23.76%). This is a significant concern, as generic prescribing is generally encouraged to reduce healthcare costs and promote accessibility. However, the high percentage of drugs prescribed from the national essential drug list (India, 2022) at 98.84% and from the WHO-EML (Essential medicines list) at 71.36% indicates that the medications prescribed were consistent with national guidelines, suggesting a focus on cost-effective and essential therapies.[19,20]

The high percentage of encounters with an injection prescribed (99.68%) is noteworthy. The frequent use of injectable medications, particularly in a hospital or inpatient setting, could reflect the severity of the conditions being treated or institutional preferences for injectable formulations. However, it also points to potential areas for improvement in promoting oral alternatives when appropriate to reduce the risks associated with injections (e.g., infections, complications).

Limitations

This study has some limitations worth considering. Since it was conducted at just one hospital, the findings may not be applicable to other healthcare settings with different patient groups or resources. The focus was on prescription patterns, but important factors like infection rates, pain management, or potential side effects weren't assessed. Additionally, the study didn't explore the cost-effectiveness of the medications or the long-term impacts, such as the risk of antimicrobial resistance.

CONCLUSION

The study shows that the prescribing practices closely follow the WHO-DUS guidelines, indicating a well-organized approach to managing medications. Commonly prescribed drugs like Nitroimidazole and non-opioid pain relievers suggest a strong focus on controlling infections and managing pain effectively. There was also a noticeable preference for brand-name medications. The use of combination therapies highlights a thoughtful, all-encompassing strategy aimed at improving recovery and treatment outcomes after surgery. Regularly reviewing prescription practices is crucial to maintaining high standards of care and ensuring the best possible recovery for cancer patients' post-surgery.

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