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Original Article

Assessment of Drug Utilization and Adequacy of Analgesics Usage among Postoperative Patients in Orthopedics Department in a Tertiary Care Hospital: A Prospective Observation Study

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ABSTRACT

Background: According to WHO Drug Utilization research, it is defined as "the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social, and economic consequences." Effective postoperative pain management is crucial to improve patient care outcomes after surgical intervention. The current study aimed to assess the utilization of analgesics and determine the most commonly prescribed analgesic for postoperative pain management. The study also aimed to evaluate the intensity of pain and the adequacy of analgesic use. **Materials and Methods:** A hospital-based prospective observational study of 133 patients was conducted over a period of 6 months in the Department of Orthopedics at KIMS SAVEERA Hospital in Anantapur, Andhra Pradesh, India. **Results:** On Day 0, 1, 2, and 3, the majority of participants were administered Inj. Diclofenac 75 mg. However, on Day 3, the number of participants prescribed Tab. Aceclofenac 100 mg+Paracetamol 325 mg increased. Adequate pain management was observed in 55.6% of patients on POD-0, which increased to 82.7% and 100% on POD-1 and POD-2, respectively, showing statistical significance. **Conclusion:** The study concluded that NSAIDs, particularly diclofenac, were the most commonly prescribed analgesics for postoperative pain relief. The average number of drugs prescribed per encounter was high (4.6), and the percentage of drugs prescribed by generic name and from the Essential Medicine List were lower (21.3% and 31.6%, respectively) compared to WHO standards. It is recommended that drugs be prescribed by generic names rather than brand/trade names, and healthcare providers should be educated on the essential list of medicines and encouraged to adhere to rational prescribing practices.

Keywords: Analgesics, Orthopedics, Drug Utilization, Pain intensity.

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INTRODUCTION

Drug utilization research was defined by World Health Organization (WHO) in 1977 as "the marketing, distribution, prescription, and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences". Since then, a number of other terms have come into use and it is important to understand the interrelationship of the different domains (Bachhav & Kshirsagar, 2015). The rational use of drug means that a well-documented drug is prescribed at an optimal dose at an optimal dose at an affordable price, together with the correct information (Özdamar & Özdamar, 2021). It is hard to advocate for responsible drug use or suggest ways to change prescription practices without understanding how medications are prescribed and used. The foundation of any audit system is data regarding previous prescriber performance (Vijayakumar *et al.*, 2023). Pain is defined by International Association for the study of pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage (Kasahun *et al.*, 2023). Postoperative Pain is one of the important concerns of patient in the postoperative period. Improved patient outcome after surgery depends on the pain management, if the pain control is scant, it can lead to increased length of stay in hospital (Gan, 2017). Globally the prevalence of postoperative pain is 50-70%. Complications such as immobilization, delayed healing and delayed recovery will occur if postoperative pain is

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not treated properly, which further may lead to chronic pain and may result in impaired quality of life, therefore, effective pain management is crucial in the postoperative period (Coccolini *et al*., 2022; Singh *et al*., 2016). Undertreated postoperative pain can show physiological consequences that may trigger inflammatory, endocrine and metabolic processes that may lead a way to organ dysfunction (Al Samaraee *et al*., 2010). Good postoperative analgesic management carries benefits other than increased patient comfort. Market is flooded with variety of analgesics which may lead to the problem of irrational prescription (Ofori-Asenso & Agyeman, 2016). So, there is always a scope for continuous research to recognize more effective and safer drug utilization pattern of analgesics among postoperative patients. The current study aimed to assess pattern of use of analgesics and evaluate the adequacy of the analgesics use among postoperative patients in the department of orthopedics.

MATERIALS AND METHODS

Study site

This study was conducted in the Department of Orthopedics of KIMS-SAVEERA Hospital, Anantapur, Andhra Pradesh, India.

Study duration

The study was conducted for Six Months.

Study design

Prospective observational study.

Study criteria

The study was conducted among the postoperative patients from the department of orthopedics.

Inclusion criteria

1. Patients of both gender, age of >18 years who underwent operative procedure in the department of orthopedics.
2. Postoperative patients who received analgesics and stayed at least for 1 day in hospital.

Exclusion criteria

1. Patients who are not willing to participate in this study are excluded.

Sample size

The sample size for this study was estimated to be 133, with 95% level of confidence, 5% precision level, 0.5 estimated proportion, with a population size of 200 by using Cochran's equation.

Tools Used

Numerical Rating Scale was used to record the pain score. Adequacy of analgesia was assessed by using Pain Management Index (PMI). Analgesic potency was classified as: 0-no analgesic drug, 1-NSAIDs, 2-Weak opioid, and 3-Strong opioid. Pain intensity was classified as: 0-no pain, 1-mild pain, 2-moderate pain, 3-Severe pain. PMI was obtained by subtracting pain intensity from analgesic potency (PMI=AP-PI). PMI can thus range from -3(a patient with severe pain receiving no analgesic drug) to +3 (a patient receiving a strong opioid and reporting no pain). Negative PMI score indicates inadequate pain management, and 0 or higher score indicates adequate pain management (Sharma & Sitaula, 2021).

Statistical Tools

Statistical data analysis was done using SPSS. Analysis was done using Friedman's test. Values of $p<0.05$ were taken to indicate significance with a confidence interval of 95%.

RESULTS

Gender distribution of patients

A total of 93 (70%) patients were male and 40 (30%) were female. 12 (9%) patients were 18-20 years old; 46 (34.5%) patients were between 21-40 years old; 36 (27%) patients were between 41-60 years old; and 39 (29.3%) patients were above 60 years of age.

Pattern of analgesic usage during Postoperative period (POD)

On the day of surgery (Day 0), 15 (11.2%) patients were prescribed oral analgesics such as Paracetamol and Aceclofenac+Paracetamol. 118 (88.7%) patients were prescribed injectable analgesics. Diclofenac was the most commonly prescribed injectable analgesic (54.8%), followed by Paracetamol (15.7%), Diclofenac+Paracetamol (13.5%), Tramadol+Diclofenac (2.2%), and Tramadol (2.2%). On the 1st post-operative day (Day 1), 15 (11.2%) patients were prescribed oral analgesics such as Paracetamol and Aceclofenac+Paracetamol. 118 (88.7%) patients were prescribed injectable analgesics. Diclofenac was the most commonly prescribed injectable analgesic (58.6%), followed by Paracetamol (14.2%), Diclofenac+Paracetamol (12.7%), Tramadol+Diclofenac (1.5%), and Tramadol (2.2%). On the 2nd post-operative day (Day 2), the number of patients prescribed with oral analgesics increased. Nineteen (14.2%) patients were prescribed oral analgesics such as Paracetamol and Aceclofenac+Paracetamol. One hundred fourteen (85.7%) patients were prescribed injectable analgesics. Diclofenac was the most prescribed injectable analgesic (56.3%), followed by Diclofenac+Paracetamol (13.5%), Paracetamol (12.7%), Tramadol+Diclofenac (1.5%), Tramadol (0.7%), and Tramadol+Paracetamol (0.7%). On the 3rd post-operative day (Day 3), the number of patients prescribed with oral analgesics increased. 48 (36%) patients were prescribed oral analgesics such as Paracetamol and Aceclofenac+Paracetamol. 114 (85.7%) patients were prescribed injectable analgesics. Diclofenac was

the most commonly prescribed injectable analgesic (47.3%), followed by Paracetamol (9.7%), Diclofenac+Paracetamol (5.2%), Tramadol (0.7%), and Tramadol+Paracetamol (0.7%). As shown in Table 1.

On postoperative day 0, 68 patients experienced moderate to severe pain, and 6 patients received opioids. On postoperative day 1, 25 patients had moderate to severe pain, and 5 patients received opioids, with 3 of them experiencing moderate to severe pain. On postoperative day 2, only 2 patients had moderate to severe pain and received opioids. Some patients with no or mild pain also received opioids. No patients were given opioids on postoperative day 0. Two patients out of 108 patients and two patients out of 131 patients with no or mild pain received opioids on the 1st and 2nd postoperative days, respectively. As shown in Table 2.

In our study, 55.6% had adequate pain management on POD-0, but this number increased to 82.7% and 100% on POD-1 and POD-2, respectively, which was statistically significant. As shown in Table 3.

The average number of drugs per prescription was 4.6. The percentage of drugs prescribed by their generic name was 21.3%, while the percentage of encounters involving an antibiotic and injection was 89% and 75%, respectively. Approximately 31.6% of the drugs prescribed in the current study were on the essential medicine list. As shown in Table 4.

Among all analgesics used in orthopedics, Diclofenac was found to be the most commonly used, accounting for 56.64%, followed by Paracetamol at 15.29%. Tramadol was used to a lesser extent.

DISCUSSION

The present study was conducted on 133 inpatients of the orthopedic department at KIMS-SAVEERA Hospital, Anantapur. The demographic parameters of patients reveal that 70% were male and 30% were female. The patients admitted to the

Table 1: Pattern of analgesic usage during post-operative period.

Analgesics	POD 0	POD 1	POD 2	POD 3
Paracetamol	22(16.5%)	19(14.2%)	20(15%)	17(12.7%)
Diclofenac	73(54.8%)	78(58.6%)	75(56.3%)	63(47.3%)
Diclofenac+Paracetamol	18(13.5%)	17(12.7%)	18(13.5%)	7(5.2%)
Tramadol+Paracetamol	0(0%)	0(0%)	1(0.7%)	1(0.7%)
Diclofenac+Tramadol	3(2.2%)	2(1.5%)	2(1.5%)	0(0%)
Tramadol	3(2.2%)	3(2.2%)	1(0.7%)	1(0.7%)
Aceclofenac+Paracetamol	14(10.5%)	14(10.5%)	16(12%)	44(33%)

Table 2:Distribution of patients according to analgesics received and pain intensity in POD 0, POD 1, POD 2.

Post-op	Analgesic	Pain Intensity				Total
		No pain	Mild	Moderate	Severe	
POD O	No drug	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
	NSAID	5(3.76%)	60(45.11%)	61(45.86%)	1(0.75%)	127(95.49%)
	Weak opioid	0(0.00%)	0(0.00%)	6(4.51%)	0(0.00%)	0(4.51%)
	Strong opioid	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
	Total	5	60	67	1	133(100.00%)
POD 1	No drug	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
	NSAID	10(7.52%)	96(72.18%)	22(16.54%)	0(0.00%)	128(96.24%)
	Weak opioid	0(0.00%)	2(1.50%)	3(2.26%)	0(0.00%)	5(3.76%)
	Strong opioid	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
	Total	10	98	25		133(100.00%)
POD 2	No drug	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
	NSAID	54(40.60%)	75(56.39%)	0(0.00%)	0(0.00%)	129(96.99%)
	Weak opioid	0(0.00%)	2(1.50%)	2(1.50%)	0(0.00%)	4(3.01%)
	Strong opioid	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
	Total	54	77	2		133(100.00%)

Table 3:Pain management evaluation in different postoperative periods.

PMI	POD-0	POD-1	POD-2	*p*-value
Adequate	74(55.6%)	110(82.7%)	133(100%)	0.00001
Inadequate	59(44.3%)	23(17.2%)	0	

Table 4: Indicating WHO core prescribing indicators.

Sl. No.	Core indicators	Total in number	Results
1.	Average no of drugs prescribed per encounter.	622	4.6
2.	Percentage of encounters with antibiotics.	119	89%
3.	Percentage of encounters with injection.	463	75%
4.	Percentage of drugs by generic name.	133	21.3%
5.	Percentage of drugs from EML	197	31.6%

orthopedic department in the age range of 21-40 years were more in number. Fractures were the most common diagnosis among patients, with approximately 6.8 million people seeking medical care for fractures in India. The study shows that the most common indication for hospitalization was a fracture, which is consistent with a previous study by Pooja Agrawal *et al*., 2016. The most commonly used NSAID was diclofenac (56.64%), followed by paracetamol (15.29%). This finding is similar to studies by Joshi S *et al.*, 2021; Chandrakantha T *et al.,* 2020. The Numerical Rating Scale was used to measure pain intensity. The study found that on postoperative day-0, diclofenac was used as monotherapy in 54.8% of cases, with combination drugs being least preferred. Only 55.63% of patients had adequate pain management on postoperative day-0, but this number increased to 82.71% on postoperative day-1 and 100% on postoperative day-2. The inadequacy in pain management decreased from postoperative day-0 to postoperative day-2. The improvement in pain management over time may be due to the reduction in pain intensity from severe-moderate to moderate-mild, allowing the prescribed analgesics to adequately manage the pain. In postoperative day-0, 68 patients had moderate to severe pain, with 6 patients receiving opioids. On postoperative day-1, 25 patients had moderate to severe pain, with 5 patients receiving opioids, and 3 of them had moderate to severe pain. On postoperative day-2, only 2 patients had moderate to severe pain and received opioids. Some patients with no or mild pain also received opioids. No patients were given opioids on postoperative day-0. Two patients out of 108 and 2 patients out of 131 with no or mild pain received opioids on the 1st and 2nd postoperative days, respectively. This finding is slightly similar and mostly contrasting when compared to the study by Bishnu Dev Sharma *et al.,* 2021. Generally, non-opioid drugs produce fewer side effects than opioid drugs. Tramadol was prescribed to 4.4% of patients on the day of surgery and then shifted to NSAIDs. This indicates that severe pain was controlled by tramadol along with other NSAIDs, which were shifted to non-opioid drugs to prevent opioid addiction. This observation is in line with Siddharth Ghosh *et al*., 2019. The study showed that the usage of generic names (21.36%) was less compared to brand names (78.7%). This result is similar to other studies by Baghel R *et al*., 2018. The average number of drugs per prescription was found to be 4.6, which is high compared to WHO standards.

LIMITATIONS

This is an observational study, so no interventions have been conducted. The patients were not followed up for any potential adverse drug reactions or drug interactions.

CONCLUSION

Based on the observations of the present study, it is concluded that among NSAIDs, diclofenac was the most commonly prescribed analgesic, and in opioids, tramadol was used to a limited extent for postoperative pain relief. Most patients reported experiencing pain in the postoperative period. The intensity decreased from moderate to severe pain on the day of surgery to mild to moderate pain in the first and second postoperative periods. In our study, 55.6% had adequate pain management on POD-0, but this number increased to 82.7% and 100% on POD-1 and POD-2, respectively. Greater attention should be given to assessing and managing pain. This should involve a team approach including nurses, surgeons, and anesthesiologists to improve the quality of care provided to patients. In our study, the usage of generic names (21.3%) was found to be very low compared to WHO standards, so brand names were mostly preferred for writing prescriptions in the hospital. The average number of drugs per prescription was also found to be high (4.6) compared to WHO standards. Due to the availability of various drug combinations in the market, irrational prescribing can occur. Therefore, there is a need for pharmacists to create awareness and educate healthcare providers on rational prescribing practices.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

POD: Post-operative day; **NSAID:** Non-steroidal anti-inflammatory drugs; **PMI:** Pain management index; **AP:** Analgesic potency; **PI:** Pain intensity; **SPSS:** Statistical Package for the Social Sciences: **EML:** Essential medical list; **ADR:** Adverse drug reaction; **WHO:** World health organization.

ETHICAL APPROVAL

This project was obtained ethical clearance from Institutional Ethical Committee of Raghavendra Institute of Pharmaceutical Education and Research (RIPER) and having IEC No: RIPER/IRB/PP/2023/009.

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