E-ISSN: 2616-3470
P-ISSN: 2616-3462

www.surgeryscience.com
2018; 2(2): 36-40
Received: 12-02-2018
Accepted: 17-03-2018

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Postoperative pain control in Indian abdominal surgery

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DOI: https://doi.org/10.33545/surgery.2018.v2.i2a.1064

Abstract
Aims: Patients who are hospitalized often experience a high incidence of postoperative discomfort. The treatment provided by hospitals is influenced by various therapeutic traditions and the attitudes of their respective medical staff. This study aims to investigate the prescription and utilization of analgesic medicines for postoperative pain management. Its objective is to determine the prevalence and severity of postoperative pain, as well as the variations in pain management.
Methods: The research encompassed a descriptive cross-sectional analysis of drug utilization within a sample. The participants consisted of a randomly selected group of consecutive patients who underwent abdominal surgery and were admitted to the Department of General Surgery, Sree Lakshmi Narayana Institute of Medical Sciences, Puducherry from January 2017 to December 2017. Prospective data was collected for each patient regarding the surgical approach employed and the administration of analgesics. The intensity of pain was assessed on the first day following surgery using a visual analog scale (VAS) and a six-point scale ranging from "none" to "intolerable."
Results: The study included a total of 950 patients, with 547 of them being male. The most commonly performed surgical operations were inguinal hernia repair (315, 32%), cholecystectomy (268, 27%), appendectomy (140, 14%), bowel resection (137, 14%), and stomach surgery (58, 6%). Out of the total number of patients, 59% (587) were exclusively prescribed nonopioid analgesics, 9% (89) were exclusively prescribed opioid analgesics, and 27% (263) were prescribed both opioid and nonopioid analgesics. The drugs that were administered most commonly were methizole, which was given to 667 patients, and pethidine, which was given to 213 patients. While the majority of physician instructions included the scheduling of analgesic administration, the majority of actual doses were delivered on an as-needed basis. The mean daily administration of analgesics was found to be lower than the recommended dosages. 371 out of 967 patients, which accounts for 38 percent, experienced severe to dreadful maximal pain on the first day. Significant interhospital variance was observed in the surgical techniques performed, the analgesics supplied, and the pain scores recorded by patients. The prevalence of acute or excruciating pain among patients in each facility ranged from 22% to 67%.
Conclusions: The persistent occurrence of substantial pain among patients in India following abdominal surgery can be attribuxted to the inadequate utilization of analgesics. Significant disparities were seen among institutions in the management and frequency of postoperative pain.

Keywords: Analgesics, drug use evaluation, drug utilization studies, hospital, postoperative pain

Introduction
The issue of postoperative pain remains unclear, and conducting extensive population studies on its repercussions will contribute to the improvement of current treatment methods [1]. The findings of six national surveys conducted from 2010 to 2020 regarding acute surgical and nonsurgical pain indicate that a majority of patients across all surveys reported experiencing pain ranging from moderate (rated between 4 and 6 on a 0-10 numeric rating scale, NRS) to severe (rated as NRS 7). Furthermore, despite the introduction of novel treatments, there was no observable improvement in acute pain outcomes. Various national authorities have implemented updated standards for postoperative pain management [2-3], which involve doing multidimensional pain evaluations [4], in order to address this lack of progress. At present, there is a lack of empirical evidence to substantiate the postoperative pain results within the Indian community. The most precise approach for quantifying pain outcomes is considered to be a multidimensional pain assessment [5-7]. In addition to pain severity, it may be beneficial to investigate other pain-related outcomes, including the impact on sleep and daily activities, the negative effects of analgesic medication, and the level of satisfaction with pain treatment [8-11].

A complete self-administered questionnaire has been utilized in recent studies to assess postoperative outcomes in various European countries and the United States. This questionnaire establishes a connection between pain outcomes and the administration of analgesics [12]. All individuals consistently demonstrate a notable occurrence of postoperative pain, with the most severe pain intensity ranging from 5.0 to 8.4 on a 10-point scale (NRS 0-10) [13]. Postoperative pain (POP) adversely affects the patient's immediate and prolonged recuperation, and might result in the emergence of acute medical complications and extended hospitalizations. Furthermore, numerous studies suggest that following standard surgical interventions, 30 to 50% of individuals may experience enduring pain, with a severity rate ranging from 1% to 10%. Prolonged postoperative pain has been associated with moderate to severe acute postoperative pain, among other factors. Various therapeutic techniques have been proposed to mitigate the intensity of postoperative pain (POP) and maybe prevent the onset of chronic pain after surgery. Nevertheless, there is now limited understanding of the optimal analgesic treatment for minimizing postoperative pain (POP) [14], as well as the favorable and unfavorable consequences of both acute and chronic opioid usage (Figure 1). This study addresses the aforementioned issues by employing the PAIN-OUT registry as a means to conduct an observational investigation on a substantial cohort of Indian patients.

The pain-out registry provides observational data that allows for the replication of daily practice and international comparison. However, it is important to note that causal associations cannot be deduced from this data [15-18]. The Pain out database is an online platform designed to enhance clinical decision-making and postoperative outcomes through the systematic recording of pain management practices and outcomes from hospitals across Europe and other global regions. To obtain a thorough comprehension of postoperative treatment in India, we assessed the outcomes of pain-out in thirteen tertiary care hospitals. The objectives of this study are threefold: Firstly, to assess and compare the postoperative outcomes and anaesthetic/analgesic management in patients undergoing orthopaedic surgery (ORT) and general surgery (GEN); secondly, to examine the effects of analgesic therapy on outcomes and opioid dosage; and thirdly, to evaluate and compare outcomes and analgesic management based on different surgical procedures.

Methods

The present study is a cohort study carried out from January 2017 to December 2017, analysis comprised a total of 950 patients, derived from an initial sample size of 950 individuals. The study included patients who received GEN or ORT operations and completed the PAIN-OUT questionnaire on the first day after the operation. The procedure was approved by the Research Ethics Committee of each participating hospital. The Department of General Surgery, Sree Lakshmi Narayana Institute of Medical Sciences, Puducherry was centre of study. The RAs refrained from making clinical judgments or administering analgesic interventions. The RA enrolled all patients who consented to participate and satisfied the inclusion criteria. Patients were assigned randomly by computer if the number of surgeries beyond the capacity of the RA. During the initial day after the surgery, patients who willingly provided their verbal agreement, following an explanation by the RA, completed the questionnaire (which was completely anonymous). The questionnaire consisted of a letter including information and a request for participation on the first page. Patients experiencing weakness, fatigue (as a result of surgery), or inability to read or write were subjected to verbal interrogation.

Inclusion and Exclusion Criteria

Inclusion criteria

>18-year-old surgical patient who gave informed consent, was in the first postoperative day and in the ward for at least 6 hours.

Exclusion criteria: Non-participation, sedation, unconsciousness, nonattendance during data collection, or communication difficulties resulting from cognitive disability or limited proficiency in the Indian language. The excluded criteria included: 1) failure to complete more than 50% of the International Pain Outcome (IPO) Questionnaire; 2) failure to answer the "worst pain" question; 3) absence of the ICD-9 code (type of surgery) in the Process Questionnaire (PQ); and 4) having undergone surgeries other than GEN or ORT, such as gynecologic, urologic, ENT, etc.

Results

The study consisted of a total of 950 patients, with 547 of them being male, accounting for 55% of the sample. The median age of the participants was 58, with a range of 14-91. Out of the total, 13% were beyond the age of 70. Out of the individuals, 573 (57%) did not have any connected condition. Hypertension and/or heart failure were the most common issues, affecting 224 patients. Chronic respiratory disorders affected 114 patients, while dyspepsia and/or peptic ulcer affected 98 individuals.

The most common surgical procedure performed was inguinal hernia repair, performed on 315 patients (32%). This was followed by cholecystectomy, performed on 268 patients (27%), appendectomy, performed on 140 patients (14%), colon resection, performed on 137 patients (14%), and stomach surgery, performed on 58 patients (6%). A total of 25 patients underwent nonspecific laparotomy, 25 patients underwent hepatopancreatic and splenic surgery, and 6 patients underwent gynecological surgery.

Out of all the patients included in the study, just 54 individuals (5%) did not receive any analgesics. The distribution of surgical operations among this group shown no significant differences when compared to the overall population. A total of 587 participants (59%) were only administered a nonopioid analgesic, whereas 89 patients (9%) were exclusively administered an opioid analgesic.

Out of the total number of patients, 263 individuals (27%) were administered both metamizole and opiates, with 62% of these cases. The following medications were administered to patients: Methimizole (677 patients, 68%), pethidine (213 patients, 21%), morphine (108 patients, 119%), diclofenac (105 patients, 10.5%), ketorolac (74 patients, 7%), clonixin (63 patients, 6%), tramadol (55 patients, 5%), pentazocine (21.2%), buprenorphine (5 patients, 0.5%), and paracetamol (4 patients, 0.4%). In each surgical procedure category, the percentages of patients who received at least one dose of an opioid analgesic were as follows: 44% in category one, 48% in category two, and 61% in category three (x Pearson 15.1; $p<0.001$). Additionally, the proportions of patients who received both opioid and nonopioid analgesics were 12%, 20%, and 32%, respectively (Gamma 2 * Pearson = 37, $p<0.001$).

There were no significant differences observed in the usage patterns of individuals with analgesic contraindications, such as chronic respiratory disease for opiates or peptic ulcer, dyspepsia, hypertension, or heart failure for NSAIDs, as compared to other patients.

A total of 1773 prescriptions for analgesics were recorded on the initial day. In 1242 instances (70 percent), the administration route was intravenous, 364 cases (20.6%) were intramuscular, 103 cases (6%) were subcutaneous, 57 cases (3%) were other (oral, rectal), and 7 cases (0.4 percent) had an unknown route.

In 941 medical orders (54.5%), analgesics were scheduled at regular intervals (around the clock). In 524 cases (30.3%), analgesics were administered as needed. In 57 cases (3.3%), analgesics were prescribed at specified intervals with a rescue analgesic. In 42 cases (2.5%), analgesics were administered as patient-controlled analgesia. The dosage schedule was not mentioned in 209 medical instructions, accounting for 11.8% of the total.

Out of the 1,773 medical orders that were assessed, 1025 of them included explicit directions for dose and administration. A total of 651 prescriptions, accounting for 63.5% of the total, resulted in the actual administration of drugs. The observed compliance rate shown a higher level of adherence when a single dose was administered (248 out of 273, 88%). However, this rate declined to 64% (165 out of 258), 59% (178 out of 301), and 35% (68 out of 193) when two, three, or four or more doses were recommended (Pearson = 1017; P0.0001). Overall, the observed daily quantities administered were found to be lower than the recommended and recommended values described in the medical literature (As shown in Table 1).

Table 1: Prescribed and administered daily doses (mean±SD) of analgesics

Analgesic (RDD[b])	Mean dose (mg)	PDD[c] Mean number of doses	Mean dose (mg)	ADD[d] Mean number of doses	Compliance with ADD/PDD[e] ×100	Prescription % of doses given
Metamizole (3000-8000)	5245 (81)	4.99 (2.61)	645 (62)	2.63 (1.13)	56	46
Pethidine (200-900)	235.6 (8)	5.27 (2.17)	654.5 (4)	2.69 (1.44)	36	42
Diclofenac (100-150)	165.6 (4)	4.89 (2.72)	135.7 (12)	2.55 (1.03)	58	46
Ketorolac (40-180)	76.9 (4)	3.64 (1.25)	64.1 (6)	2.98 (1.15)	66	78
Tramadol (200-600)	231.4 (16)	4.20 (2.77)	546.4 (12)	3.19 (2.48)	62	85
Clonixin (300-1000)	561.3 (18)	4.07 (1.43)	324.2 (17)	3.73 (1.27)	69	62
Pentazocine (240-360)	265.7 (7)	5.67 (2.89)	54.05 (5)	3.33 (1.15)	72	55

a) Morphine is not included in this table, because in the majority of cases it was prescribed as patient-controlled analgesia.
b) RDD=Recommended daily dose (mg).
c) PDD=Prescribed daily dose (mg).
d) ADD=Administered daily dose (mg).
e) (Mean ADD/Mean PDD)×100.

During the first 24 hours after the postoperative surgery, 52% of patients in category I, 65% of patients in category II, and 69% of patients in category III received three or more doses of analgesics.

Table 2 displays the proportion of patients who were classified into the six distinct categories of the most severe pain encountered on the initial day, along with the intensity of pain experienced 24 hours following the surgical intervention, as assessed by a Visual Analog Scale (VAS) and a six-adjective categorical rating scale. The measurements were obtained promptly following the surgical procedure. During this timeframe, 69% of patients reported experiencing pain ranging from mild to dreadful, while 38% of patients reported experiencing pain ranging from severe to excruciating. 69% of participants demonstrated a severity exceeding 30 mm on the Visual Analog Scale (VAS), whereas 47% assigned a rating beyond 50 mm. No correlation was found between the analgesics administered and the level of pain experienced on the first day. The average (standard deviation) VAS score was 3.47.6 mm (28.9) in individuals who received only opiates, 49.2 nini (30.6) in those who received nonopioid analgesics, and 18.5 (30) h in those who received both types of drugs. A total of 58 participants, constituting 0% of the sample, reported experiencing any adverse reactions to the administered analgesics. Out of the total number of patients, 26 had been administered both nonopioid and opioid drugs, 23 had been given a nonopioid analgesic, and 9 had been given an opioid. The bulk of the mild adverse effects seen were of a digestive origin, including abdominal pain, nausea, vomiting, and constipation. Only three patients ultimately experienced respiratory depression.

Table 2: Postoperative pain severity scored by means of an adjective categorical rating scale and by means of a visual analogue scale.

	Worst pain at any time on the first day		Pain at 24 h	
Postoperative pain severity	N	(%)	N	(%)
Categorical rating scale				
no pain	85	(9)	252	(25)
mild	265	(22)	312	(36.5)
moderate	312	(31)	354	(31.5)
severe	295	(24)	52	(5.9)
very severe	168	(11)	11	(1)
unbearable	65	(3)	1	(0.1)
Total number of patients[a]	954	(100)	945	(100)
Visual analogue scale (VAS)				
median, mm (range)	65	(0-100)	21	(0-100)
percentage with >30 mm at VAS	25		39.8	
percentage with >50 mm at VAS	49		13	
Total number of patients[b]	950		950	

a) It was not possible to assess postoperative pain severity with the categorical scale in 26 patients.
b) Severity of pain could not be assessed with the VAS in 79 patients.

Wide interhospital variability in the populations under study (as shown in Table 3) and in the most commonly used analgesic drugs (as shown Table 4) was recorded.

Table 3: Interhospital variability in patients' characteristics

Hospital (Number of patients contributed)	Anaesthesiology recovery ward	Age in years (SD)	Sex (% men)	Type III surgery [a] (%)	Type II surgery [b] (%)	Emergency surgery (%)
1 (n=102)	Yes	53 (20)	58	18	33	49
2 (n=66)	No	60 (14)	37	24	34	22
3 (n=53)	No	49 (21)	56	16	21	33
4 (n=53)	No	56 (15)	65	2	28	0
5 (n=98)	Yes	60 (16)	56	44	21	14
6 (n=98)	Yes	48 (22)	41	54	42	45
7 (n=99)	Yes	53 (19)	57	18	34	37
8 (n=98)	Yes	55 (22)	54	34	12	39
9 (n=98)	No	53 (15)	48	11	29	17
10 (n=52)	Yes	48 (19)	51	25	17	41
11 (n=98)	Yes	54 (16)	65	20	12	3
12 (n=64)	Yes	63 (16) P<0.001	45 P=0.023	28	44 P<0.0001	12 P<0.0001

Table 4: Use of analgesic drugs, by hospital

Hospital (Number of Patients Contributed)	None	Opioid only	% of patients Non-opioid only	Opioid Total	Opioid+ non-opioid[a]
1 (n=102)	7	12	60	27	14
2 (n=66)	7	4	34	54	48
3 (n=53)	3	0	84	9	10
4 (n=53)	5	0	82	9	8
5 (n=9)	3	22	14	78	57
6 (n=98)	4	1	88	5	3
7 (n=98)	1	20	56	39	19
8 (n=95)	2	3	60	34	30
9 (n=95)	12	1	60	22	22
10 (n=46)	11.5	0	70	13.5	13.5
11 (n=98)	0	13	48	49	34
12 (n=62)	5	2	80	10	8

The prevalence of patients receiving solely opioids varied between 0% and 23%, whereas the prevalence of patients receiving solely nonopioid analgesics ranged from 16% to 90%. Additionally, the proportion of patients receiving both types of medicines ranged from 4% to 57%. In numerous healthcare facilities, such as hospitals 2 and 5, patients were commonly administered analgesic combinations comprising both opioid and nonopioid drugs. Metamizole was the most commonly prescribed nonopioid analgesic in the majority of hospitals, administered to the largest proportion of patients (68%). Nevertheless, at specific medical facilities, other analgesics such as diclofenac, ketorolac, and clonixin were the most commonly employed. In general, metamizole was administered to 68% of the patient population. Pethidine, an opioid analgesic, exhibited the highest frequency of administration among all drugs in the majority of hospitals, with a prescription rate of 21% among the overall population under investigation. In addition, several opioids were supplied, such as morphine (11% of patients receiving it), tramadol (5%), and pentazocine (2% of patients receiving it). There was significant variation observed in both the percentage of patients who received a minimum of three doses of analgesics (ranging from 31 to 88%; x 2 Pearson 81.96; P 0.0001) and the mean number of doses of analgesics administered during the initial day of the postoperative period (ranging from 1.96) across different hospitals. This was evidenced by the observation that a minimum of three dosages of analgesics were administered to the patients.

Discussion

The present study demonstrates that despite the availability of efficacious analgesics, a significant proportion of individuals who have undergone abdominal surgery experience intense pain immediately following the procedure [15-17]. Parenteral nonopioid analgesics were the prevailing pharmaceutical agents, typically administered by intravenous route. Analgesics were inadequately utilized in a significant proportion of patients due to their tendency to be supplied on a regular basis for the purpose of alleviating existing pain rather than preventing it, and their dosages were frequently insufficient. Significant variations were observed among hospitals in terms of both the quantity and quality of analgesic utilization. However, these disparities did not appear to be correlated with the average severity of pain experienced in each hospital.

Conclusion

Our findings corroborates previous research conducted in India, which demonstrated that nonopioid analgesics, specifically nonsteroidal anti-inflammatory medications, are the most effective treatment for postoperative pain, in contrast to other regions. The higher utilization of nonopioid analgesics compared to opioids does not appear to be influenced by concerns regarding the adverse effects of opioids, as the potential risks associated with all categories of analgesics were not considered.

38% of patients reported experiencing severe, extremely severe, or intolerable pain on the first day, while 44% indicated that

their discomfort measured more than 50 mm on the Visual Analog Scale (VAS). The prevalence of intense pain should be regarded as a therapeutic failure, as it can be effectively halted. Specialized pain management techniques, such as patient-controlled analgesia, were infrequently employed or entirely absent in certain instances, as exemplified by the utilization of epidural analgesia.

There was significant variation in the utilization of analgesics among different hospitals. A minimum of 9% of individuals in four hospitals did not receive any analgesics. This may be attributed to the non-random selection of individuals in the study group. There were variations in the frequency of severe pain experienced by individuals, however, no correlation was found between this and the utilization of opioid analgesics, nonopioid analgesics, or the regular and complete dosage of any analgesic. However, in the context of a cross-sectional study such as the present one, the absence of a connection should not be seen as conclusive evidence of the treatment's ineffectiveness. The presence of variations among hospitals within the examined populations, such as variances in demographics, surgical techniques, or other factors, can complicate the determination of a causal relationship.

Regrettably, the findings presented herein align with previous research indicating a prevalent tendency to mishandle postoperative pain management. There is a belief among certain individuals that this is due to the lack of consensus among doctors and nurses regarding the severity of pain, the disagreement between patients and doctors over the severity of pain, and the tendency of doctors to prescribe lesser doses than what is indicated. The results of our study support these concepts. In order to enhance their proficiency in addressing this prevalent issue, medical and nursing personnel must continuously acquire knowledge. The nursing staff plays a crucial role in regularly assessing the severity of pain using basic instruments such as pain scales. Incorporating pain charts into regular clinical assessments of patients, in conjunction with documentation of fever, heart rate, and blood pressure, can potentially aid in pain management. These charts can also be utilized for the purpose of assessing the quality of care.

Frequently, the implementation of ongoing education for healthcare personnel has been proposed as a means to facilitate the management of postoperative pain. However, education in isolation is insufficient. The patients' outcomes remained unchanged following their education in a particular study. According to reports, the use of straightforward approaches and comprehensible instructions by a multidisciplinary team in a hospital has been associated with improved postoperative pain alleviation. There has also been a suggestion to frequently assess the quality of patient care. Assessing the prevalence and severity of postoperative pain constitutes an integral component of healthcare evaluation within a hospital environment. The present study will serve as a valuable resource for future assessments of intervention strategies designed to enhance postoperative pain management.

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