

Timely pain management with administration of analgesics in triage room

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ABSTRACT

Background and Aim: Pain management is crucial in emergency departments, and the timely administration of analgesics significantly impacts patient satisfaction. However, many hospitals lack standardized protocols for analgesic administration in triage rooms by nurses. This study aimed to assess the impact of analgesic administration in the triage room on timely pain management in traumatic patients with extremity bone fractures.

Methods: A cohort study was conducted in the emergency department, enrolling patients with traumatic extremity bone fractures. Upon triage, eligible patients were observed based on whether they received ketorolac or no analgesic (control group). Pain severity was evaluated using the Numeric Analogue Scale, and adverse effects and patient satisfaction were also assessed. The collected data were coded and entered into SPSS version 24 for statistical analysis. Descriptive statistics were used to describe the data, and comparisons between the exposed (ketorolac) and non-exposed (control) groups were performed using the chi-squared test (χ^2), independent *t*-test, and paired *t*-test, with a significance level set at $p < 0.05$.

Results: The study included a total of 1,000 traumatic patients. The ketorolac group exhibited significantly lower pain severity at 30 min and 60 min compared to the control group ($p < 0.001$). There was no statistically significant difference in adverse effects between the two groups ($p = 0.468$). Additionally, patients who received ketorolac required fewer subsequent analgesics and reported higher satisfaction with the intervention ($p < 0.001$).

Conclusion: The findings demonstrate that ketorolac administration in the triage room resulted in a significant reduction in pain severity among traumatic patients with bone fractures, and it was associated with increased patient satisfaction.

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Introduction

A lot of patients present to hospitals with the chief complaint of pain, which is an unpleasant experience. Studies have shown that types of pain, whether chronic or acute, increase the length of hospital stay and healthcare-related costs, affecting patients' satisfaction with the provided services [1–3]. According to the World Health Organization, 20% of the world population suffers from unnecessary pain [4]. Moreover, pain is the most common cause

of presentation to healthcare facilities, and 75% of patients presenting to the emergency department have experienced some level of pain [5]. Despite the high prevalence of this symptom in patients presenting to healthcare facilities, oligo-analgesia (defined as the inadequate administration of analgesics for pain alleviation) is still common in these patients, especially those coming to the emergency department. In fact, it is a global problem [6]. According to studies, only about 30% of patients admitted to

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the emergency department with acute pain receive adequate analgesics for their pain [5,7].

Pain management is particularly important in patients with traumatic injuries [8]. In-time and suitable pain management is an absolute right of traumatic patients, and it also accelerates early recovery, reduces hospital stay, healthcare-related costs, the risk of neuroplasticity-induced chronic pain, and trauma-related morbidity and mortality overall [9].

On the other hand, patients have high expectations for pain relief. According to a study, patients expected 72% pain relief on average, while 18% expected complete pain relief. This was also true for painless patients in the emergency department who assumed experiencing pain [3]. Furthermore, pain is a common clinical problem, and the reaction of patients to pain is multifactorial. Failure to provide suitable pain management leads to patient dissatisfaction with the provided service [10]. Also, pain is a subjective experience, and several factors, including cultural and ethnic differences among healthcare providers and patients, affect the accuracy of pain assessment. Therefore, the patient's report is the most reliable and accurate tool for pain severity assessment and is considered the gold standard [11]. Related studies have shown that physicians often prescribe lower analgesic doses than those needed to alleviate the patients' pain effectively [12].

This study aims to provide evidence on the impact of timely analgesic administration in the triage room on pain severity, adverse effects, and patient satisfaction, contributing to the optimization of pain management protocols in emergency settings.

Methods

The present study was a cohort study conducted at the ED of Shohadaye Haft-e-Tir Academic Hospital in Tehran, Iran, in 2019, following the approval of the Ethics Board of Iran University of Medical Sciences.

The study population comprised patients with trauma leading to extremity bone fractures who presented to Shohadaye Haft-e-Tir Hospital, an urban, academic, level 1 trauma center, in 2019. Inclusion criteria were patients older than 18 years with trauma leading to extremity bone pain or deformity and a Glasgow Coma Scale (GCS) score of 15. Exclusion criteria included GCS below 15, absence of extremity bone fracture evidence, patient death before hospital discharge, history of severe adverse

reaction to ketorolac or NSAIDs, history of gastrointestinal bleeding due to active peptic ulcer, and lack of a definitive diagnosis.

Exposure and control groups

Patients were divided into two groups based on whether they received ketorolac (exposed group) or no analgesic (control group) during triage. The control group did not receive any analgesic or placebo intervention during triage. Patients in the ketorolac group received a single dose of 30 mg ketorolac intravenously during triage. Pain severity was recorded at baseline, and subsequent analgesic needs, including opioid or non-opioid doses, were recorded during the emergency department admission. After the initial 60-min observation period, patients in both groups received standard care, including analgesics as needed, based on the attending physician's assessment and hospital protocols.

Data collection and outcome measures

Pain severity was re-assessed and recorded at 30 and 60 min using the Numeric Analogue Scale (NAS) by study investigators. Additionally, potential complications, such as injection site pain, gastrointestinal bleeding, nausea, vomiting, hypotension, and urticaria, were recorded. Patient satisfaction or dissatisfaction with analgesic administration was also documented at the end of their emergency department stays.

Sample size

The sample size of the study was calculated to be 1,072 patients by considering a type 1 error of 0.05, a power of 90%, a 1:1 ratio of exposed to control group, and a 20% probability of sample loss. During the 1-year study period, out of 1,248 patients presenting to the emergency department with trauma leading to extremity bone fractures, 1,000 patients were included in the study.

Participant recruitment and observation

Upon the arrival of eligible patients, who had undergone an initial assessment of injuries, they were observed based on whether they received ketorolac or no analgesic. The patients self-recorded their pain severity using the NAS, which ranges from zero (indicating no pain) to 10 (indicating the most severe pain ever experienced). The NAS has been validated as a reliable tool for pain severity

assessment in patients admitted to the emergency department and hospital wards.

Outcome assessment and data analysis

The primary outcome was the change in pain severity over time, as measured by the NAS. Secondary outcomes included patient satisfaction and adverse effects of the intervention. The collected data were coded and entered into SPSS version 24 for statistical analysis. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to describe the data. The normal distribution of data was evaluated, and comparisons between the exposed and control groups were performed using the chi-squared test (χ^2), independent *t*-test, and paired *t*-test, with a significance level set at $p < 0.05$.

Results

Patient groups were matched in age, gender, weight, height, Body Mass Index, systolic and diastolic blood pressure, drug abuse, mechanism of trauma, and fracture site ($p > 0.05$) (Table 1).

There was no significant intergroup difference in the mechanism of trauma ($p = 0.189$). Motor vehicle crashes were the most common mechanism of trauma in both groups. Moreover, there was no significant intergroup difference in fracture site ($p = 0.889$). Also, the leg bones were the most common site of fracture in both groups.

Pain severity changes assessed using the NAS in patients treated with ketorolac showed a significant reduction at the final assessment compared to the baseline assessment ($p < 0.001$). Moreover, the pain severity at min 30 was significantly lower than the baseline pain severity. Also, the pain severity at min 60 was significantly lower than that of min 30 ($p < 0.001$).

Pain severity changes evaluation in the control group showed a significant reduction at the final assessment compared to the baseline assessment ($p < 0.001$). Moreover, the pain severity at min 30 was significantly lower than the baseline pain severity. Also, the pain severity at min 60 was significantly lower than that of min 30 ($p < 0.001$).

Intergroup comparisons of the pain severity changes using the NAS showed that the ketorolac group was significantly different from the control group in all assessments, including baseline assessments and those at min 30 and 60 ($p < 0.001$) (Table 2).

According to Table 2 and the results obtained using the independent *t*-test, there was no significant intergroup difference in baseline pain severity. However, the pain assessed at min 30 and 60 had a significantly greater reduction in the ketorolac group compared to the control group. Moreover, this difference became more significant over time, so that it was more prominent at min 60.

In terms of complications, the most common complications in both groups were injection site

Table 1. Demographic and clinical characteristics of patients in the ketorolac and control groups.

Characteristic	Ketorolac (N = 500)	Control (N = 500)	P value
Age (years), mean \pm SD	39.83 \pm 17.31	40.21 \pm 17.44	0.730
Sex (male), N (%)	405 (81.0%)	398 (79.6%)	0.633
Weight (kg), mean \pm SD	70.71 \pm 11.54	70.97 \pm 11.44	0.712
Height (cm), mean \pm SD	168.72 \pm 7.33	168.89 \pm 7.47	0.703
Body Mass Index (kg/m ²), mean \pm SD	24.78 \pm 3.35	24.82 \pm 3.31	0.826
Systolic blood pressure (mmHg), mean \pm SD	117.24 \pm 6.48	118.66 \pm 7.14	0.323
Diastolic blood pressure (mmHg), mean \pm SD	77.29 \pm 3.95	78.06 \pm 4.02	0.451
Drug abuse (Yes), N (%)	65 (13.0%)	71 (14.2%)	0.704

Table 2. Comparison of pain severity between the ketorolac and control groups at different time points.

Time point	Ketorolac (N = 500)	Control (N = 500)	P value
Baseline	8.92 \pm 1.18	8.99 \pm 1.10	0.333
30 min after injection	8.16 \pm 1.44	8.44 \pm 1.50	0.003
60 min after injection	7.13 \pm 1.53	7.76 \pm 1.95	< 0.001

pain and pruritus. No serious complications were reported in the groups. Moreover, the two groups were not significantly different in the rate of complications ($p < 0.05$).

Regarding the patients' need for more doses of analgesics, 415 patients (83%) in the ketorolac group needed more doses of analgesics, while 85 patients (17%) did not require more analgesics. Furthermore, 465 patients (93%) in the control group needed more analgesics, while 35 patients (7%) did not require more analgesics. Therefore, there was a significant intergroup difference in the need for subsequent analgesic doses ($p < 0.001$).

In terms of patients' satisfaction with the intervention in both groups, 360 (72%) patients in the ketorolac group were satisfied with the analgesic care received, while 140 (28%) were dissatisfied. Moreover, 200 patients (40%) in the control group were satisfied with the analgesic care, while 300 (60%) were not satisfied. Therefore, the groups were significantly different in patients' satisfaction with the intervention received ($p < 0.001$). The control group patients were significantly more dissatisfied with the intervention received compared to the ketorolac group.

Discussion

Providing timely pain alleviation for patients presenting to the emergency department with various extremity bone fractures is controversial. Many of these patients are triaged at lower levels. Therefore, they are more likely to undergo delayed analgesic administration [13]. The present study investigates the effect of early analgesic administration in the triage room on pain alleviation in patients with trauma leading to extremity bone fractures. According to the results, baseline pain severity is not significantly different between the ketorolac and control groups. Following the intervention, pain severity would be significantly decreased in both groups; however, this reduction is significantly higher in the ketorolac group compared to the control group. This difference grows higher as time passes, so that the need for subsequent analgesic doses would be significantly higher in the control group compared to the ketorolac group.

The significant pain reduction in the control group could be due to the psychological effect of being in a care setting (placebo effect) and the natural pain alleviation mechanisms of the body. Moreover, a feeling of being cared for upon arrival at the hospital, which is not routine care in many

hospitals, could effectively alleviate the pain in the control group.

Up to now, no efficient guideline has been developed for suitable pain management in patients presenting to the emergency department with trauma [14]. A review study in Europe investigated trauma-related pain to identify relevant human studies published during 11 years (from January 2006 to December 2017) using a structured research strategy based on Internet resources. Of a total of 4,325 published studies, 31 met the eligibility criteria. The authors identified numerous obstacles to the effective management of trauma-related pain in the emergency department. These obstacles included the lack of an effective and comprehensive guideline for pain management, lack of pain assessment or delayed assessment, the reluctance of physicians to administer opioid analgesics, and delayed analgesic administration [15].

The timing of analgesic administration is of great clinical importance in the pain management of traumatic patients because delayed administration causes the patient to suffer. Related studies have shown that several patients with moderate to severe pain due to trauma do not receive analgesics within 15 to 20 min upon arrival to the emergency department [16]. The triage room is an important place for in-time analgesic intervention in the emergency department, and initial pain severity assessment of the patients in the emergency department provides an opportunity for effective analgesic administration. Therefore, delay in this process is an obstacle to the timely reduction of pain [17].

Various studies have investigated pain management and effective analgesic administration in patients presenting to the emergency department with trauma and found controversial results. Azizkhani et al. [18] compared the effectiveness of nebulized morphine and ketamine with intravenous morphine in pain management by investigating 88 patients presenting to the emergency department with traumatic long bone fractures. They reported that pain reduction was not significantly different between the two groups 30 min post-intervention. However, considering other factors, such as higher patient satisfaction and lower complications in the nebulizer group, they reported that nebulized ketamine and morphine were more beneficial than IV morphine in the long term. The present study uses ketorolac for analgesia during the patients' triage. Compatible with the mentioned study, the analgesic effects in the ketorolac group became significantly higher than the control group over time.

Barksdale et al. investigated the effect of a pain management protocol in the triage room. The emergency department nurses underwent a 3-month training program on a primary pain management protocol, which was performed for 1,002 patients. They found a significant difference in the mean analgesic receiving time before (238 cases) and after the protocol implementation (168 cases). Therefore, implementing this analgesia protocol could significantly reduce the mean time needed for analgesic receiving [19]. In the present study, there is significant pain reduction 30 min after analgesic administration, and the difference grows higher at min 60. Moreover, pain alleviation is significantly different between the ketorolac and control groups. Therefore, early analgesic administration in the triage room leads to rapid analgesia and increased patient satisfaction.

Blancher et al. [20] compared the effectiveness of intranasal sufentanil with intravenous morphine sulfate in pain management of patients with limb trauma, reporting no significant intergroup difference in pain alleviation and side effects. They concluded that intranasal sufentanil had a similar effect to intravenous morphine sulfate in rapid, effective, and non-invasive pain alleviation of patients with traumatic injuries. Therefore, it may be considered a suitable alternative method for pain management in traumatic patients.

According to the present study results and those of previous studies, it seems that providing analgesia is necessary for patients presenting to the emergency department with moderate to severe pain due to extremity bone fractures, and there is an extensive need for safe, low-risk, and rapid-onset analgesics with limited contraindications and easy injection.

Limitations

The study's limitations include inadequate patient and companion cooperation at admission, limited IV access for analgesic injection in the triage room, and potential data inaccuracies due to unreliable patient history. The study was not blinded, which may have introduced bias in the assessment of pain severity and patient satisfaction. Additionally, the study was conducted at a single, level 1 trauma center in Iran, which may limit the generalizability of the findings to other healthcare systems or settings. Future research should consider multi-center studies for broader applicability.

Conclusion

In conclusion, ketorolac administration in the triage room significantly reduces pain severity in patients with traumatic extremity bone fractures, with increasing analgesic effect over time. Early administration of effective analgesics in the triage room leads to improved analgesia and increased patient satisfaction. Delayed analgesic administration is not advisable for patients with moderate to severe pain. Further research is needed to confirm these findings, compare the effects of different analgesics, and investigate the relationship between early pain management and patient outcomes.

Conflict of interest

None.

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Ethical statements

All participants or their companions gave informed consent for participation and were free to leave the study at any stage. Also, the participants were ensured about their data confidentiality by the research managers. This study has the approval of the Ethics Board of Iran University of Medical Sciences (ethics code: IR.IUMS.FMD.REC.1397.308).

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