A STUDY ON PAIN MANAGEMENT OF TRAUMA PATIENTS IN GCMCH.

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ABSTRACT

Pain is a powerful emotional and sensitive experience for trauma patients, causing discomfort, an increased risk of hypertension, and other deconditioning problems. The major care need in trauma patients is to address acute pain, as insufficient treatment disrupts normal life patterns, lowers quality of life, and raises the risk of sequelae including chronic pain and post-traumatic stress disorder. NSAIDS as and opioid are typical analgesic medications used to treat acute pain. This study sought to evaluate pain assessment of trauma patients admitted to the Emergency Department at Government Cuddalore Medical College and Hospital. There is still an inadequate treatment of acute pain in trauma patients, with two major types: blunt force trauma and piercing trauma (internal trauma). Here we conducted an analysis with total of 155 trauma patients, with 73% receiving diclofenac, majority receiving paracetamol, and few receiving tramadol. This observational study conducted for 6 months. The primary objective of this study is to assess the effectiveness of analgesic drugs in trauma patients and monitor the adverse effects of these drugs. At end of the study we learn that Diclofenac and paracetamol was effective in soft tissue injury, while Tramadol was effective in fracture. To provide best care for pain relief in trauma patients, it is essential to be aware of the best analgesics.

Keywords— Trauma patients, analgesic medications, Tramadol, Diclofenac, paracetamol.

I. INTRODUCTION

Pain, as defined by the IASP in 1996, is a negative sensory and emotional experience connected with tissue damage. It is brought about by an activation acute sensory neurons in epidermal or deeper tissues it is more common in cancer patients. Pain can be visceral or somatic, resulting from tissue inflammation, mechanical deformation, or a chronic injury. It responds effectively to both analgesic drugs and non-drug interventions. Pain's clinical features include location, intensity, duration, and quality. Location aids in the identification of potential causes, although intensity is subjective and difficult to measure. Visual or analogue scales are used to compare pain intensity and duration, categorizing it as extremely strong, strong, moderate, weak, or no pain. The duration distinguishes acute from chronic discomfort. Quality helps evaluate the

origin of pain, with rapid pain suggesting neural origin, girdling pain indicating core, root, burning pain indicating neuropathy, and pulsatory pain indicating vascular pain.

1.1 Pain Transmission

Ascending pain pathways are complicated systems that transport nociceptive information from peripheral tissues to the cerebral cortex, where it is interpreted as pain. These routes connect the peripheral and central neural systems. Nociception, or the early processing of pain, is a set of systems that encode and send the pain signal along an ascending pathway. Primary afferent nerve fibers enter the spinal cord via the dorsal horn, bifurcate in a "T" configuration, and send collateral projections to the gray matter. The signal is subsequently sent to higher locations in the CNS.

Ascending tracts transmit the nociceptive signal rostrally along the spinal cord to supra spinal structures in the brainstem and diencephalon. Third-order neurons further process the signal and transmit it to cortical and limbic structures, where it is interpreted as pain. The most prominent and well-described ascending pathways are the spino thalamic tract and the spino reticular tract.

1.2 TYPES OF PAIN SCALES

Healthcare providers have at least 11 types of pain scales, which can be categorized into numerical rating scales (NRS), visual analog scales (VAS), and categorical scales. These scales provide quantitative measurements, helping healthcare providers gauge treatment response and qualitative measurements, allowing them to understand the cause of pain. There are no universally ideal pain scales, and some are best suited for specific ages or those involved in their own healthcare. Age categories include facial expressions, arm and leg pain, and consolability. VAS is used for older adults and older individuals with advanced dementia.

1.3 CATEGORIZATION OF TRAUMA

MILD	MODERATE	SEVERE		
→GCS: 15/15 →SPO2:>90% →BP:>140 systolic BP →HR:100-109\min	All major single long bone injury without vascular compromise GCS:9-12	→GCS: <8 →SPC2:<85% on room air →BB.250 breathing or <10 min or>40 min →HR: <40 or >130 min or pulse not felt → Not lreathin or <10 min or >40 min		
Laceration without active bleeding	All dislocations	Bleeding wounds		
Upperlimb fracture without my associated injuries	Foreign body other than upper airway	All poly trauna.		
Scalds/burns-9% in the peripheral areas	Found ENT blending without head injury	Irritable behaviour or semiconscious \ unconscious		
Trivial injuries without blendin no LOC	Self fall, sustained injury with stable vital signs	All chest injury \ abdominal injury		

Table 1 Categorization of Trauma

Pain is a major issue in individuals with severe trauma, compromising their respiratory function, immunological response, and wound healing. Inadequate treatment can cause a delay in returning to work, lower quality of life, and raise the risk of problems such as post-traumatic stress disorder. Poor pain control is the leading cause of chronic pain syndrome, a disabling illness. discomfort management strives for a bearable degree of discomfort that allows individuals to operate at their best. Non-opioid analgesics like acetaminophen, aspirin, and NSAIDs are suggested for mild to moderate nociceptive pain. Acetaminophen, which is available both over-the-counter and on prescription, operates on the hypothalamus to generate antiphrasis and may block prost a land in synthesis in the central nervous system. It is not suggested for people who have chronic liver disease or a history of alcohol addiction.

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NSAIDs, are indicated for mild to moderate nociceptive pain. Acetaminophen can be taken over-the-counter or as a prescription in combination with opioids, but chronic liver disease patients should be prescribed lower doses.

Aspirin and NSAIDs have anti-inflammatory properties and are widely used for arthritis, low back pain, and other musculoskeletal disorders. However, their use should be limited to the lowest dose and shortest duration due to the risk of gastric distress, ulceration, bleeding, increased risk of car diovas clarinets, and kid nontoxic city.

Diclofenac is a non-steroidal anti-inflammatory drug prescribed to treat mild-to-moderate musculoskeletal pain, but is not recommended for patients with asthma, severe kidney or liver disease, or treating pain in coronary artery bypass grafts.

Tramadol, a short-acting analgesic with limited opioid receptor action, functions as an SNRI. It has been reclassified as a schedule drug, but dosages must be adjusted to account for renal and hepatic impairment, seizure disorder history, and the risk of serotonin syndrome.

II. LITERATURE SURVEY

2.1 George D.Dilunga, Hendry R. Sawe, Irene B. Kulola, Juma A.Mfinanga, Nanyori J.Lucumay, Elly M.Mulesi and Ellen J.Weber. Safety in Health, 2018 [1].

The study assessed pain and management of trauma patients in an emergency department of a tertiary hospital. The most common injury mechanism was motor vehicle crashes, with 85% involving motorcycles. Pain scores were recorded, and pain medications were given to 46.3% of patients. Opioids were the most prescribed medication, with severe pain patients receiving

more. The study revealed that although pain assessment was well documented, less than half of the patients received pain medications.

2.2 Sivera A.A. Berben, Tineka H.J.M.Meijs, Robert T.M. van Dongen [2] International Journal of the Care of the Injured, 2007.

The study found high pain prevalence in trauma patients in the accident and emergency department (ED), with 91% experiencing pain on admission and 86% at discharge. Pain decreased in 37% of patients, but remained a significant issue. Possible barriers include workload, staff attitude, and knowledge deficits.

2.3 Andrea Fabbri, Antonio Voza, Alessandro Riccardi, Sossio Serra and Fabio De Iaco [3] Journal of Clinical Medicine, 2023.

The study focuses on managing pain in emergency departments (EDs) for trauma patients. It found that most patients suffer from pain, and it is crucial to use validated severity scales and select medications that are least disruptive to hemodynamic status. Ketamine and fentanyl are effective analgesics, while multimodal pain approaches are essential for relief. Policies and procedures promoting multimodal strategies are essential for effective pain management. The study suggests that increasing pain rating scales and developing pain management protocols can reduce healthcare costs and overcome cultural and professional barriers. The treatment cycle for injuries should be systematically and adequately managed to manage pain effectively.

III. PROPOSED SYSTEM

- 1. **STUDY SITE:** Hospital based study in trauma patients, at Government Medical College and Hospital teaching hospital located in rural South India.
- 2. **STUDY PERIOD:** 6 months
- 3. **STUDY DESIGN:** Prospective observational study.
- 4. **STUDY TOOLS:** PROFORMA (Data collection form).
- 5. **SOURCE OF DATA:** Case sheets of trauma patients and personal interaction with patients.

In our study majority of patients were in the age group of 30 years and above, out of 155 participants, male patients were 105(67.7%) and female patients were 50 (32.30%). the major reason for trauma was RTA (i.e. Road traffic accident), (48.40%). Other reasons are Self fall (29.70%), Assault (13.50%) and Accidental injury (8.38%).

Major type of injuries are,

- Soft tissue injury (76.8%).
- Soft tissue injury with fracture(11.6%)
- ➢ Fracture(11.6%)

S.NO	DIFFERENT TYPE OF INJURIES	NO.OF.PATIENTS (n = 155)	PERCENTAGE(%)
1	Laceration - soft tissue injury	3.5	22.5%
2	Abrasion - soft tissue injury	28	18.00%
3	Both Laceration and abrasion	9	5.8%
-4	Tendemess and swelling	15	9.6%
5	Laceration, abrasion , tenderness and swelling	8	5.1%
6	Fractore	17	10.9%
7	Avulsion	2	1.2%
8	Contusion	3	1.9%
9	Intravertebral disc prolapse	1	0.6%
10	Tenderness and swelling, contusion	1	0.6%
11	Sprain	1	0.6%
12	Stab injuries	1	0.6%
13	Abrasion, tenderness and swelling	11	7.09%
15	Laceration , Tenderness and swelling	5	3.22%
16	Fracture, Tenderness and swelling	8	5.16%
17	Laceration , abrassion and fracture	2	1.29%
18	Loceration, fracture , tenderness and swelling	3	1.9%
19.	Abrasion, fracture, contusion	5	3.2%

Table 2 Different Type of injuries

In our study, **Major injuries are Laceration – Soft tissue injury**(22.50%) and Abrasion – Soft tissue injury(18.06%).

3.1 Analgesic Drugs Administered in Traumatic Patients:

- 1. Majority of the patients were administered Diclofenac 2cc- IM (72.09%)
- 2. Most of the patients were administered Neomol -1g IV(14.83%)
- 3. About (12.25%) of the patients were administered Tramadol 2cc- IM.

3.2 Gender Wise Analgesic Drug Distribution In Trauma Patients

S.NO	GENDER	DICLOFENAC	TRAMADOL	PARACETAMOL
1	Male	74	14	15
2	Female	39	5	8

Table 3 Gender wise drug distribution

Drug Distribution Based On Type of Injuries

the availability of different analgesic medications for soft tissue damage and break. 76.64% of diclofenac, 65.2% of paracetamol, and 58% of tramadol were given to individuals with soft tissue injuries, while 42% of tramadol, 34.8% of paracetamol, and 21.36% of diclofenac were given to fracture patients.

PAIN INTENSITY FOR SOFT TISSUE INJURY

(Severity)	Carl and an	Dielofenac	Transfel	Paratelana
0_1 (No Pain)	At admission	0	0	0
	After 30 mins	з	o	0
	After 2 hours	43	1	2
1-3 (Mild)	At admission	12	0	0
	After 30 mins	60	s	5
	After 2 hours	36	8	12
4–6 (Moderate)	At admission	62	6	7
	After 30 mins	25	6	10
	After 2 hours	10	2	1
7-9 (Severe)	At admission	15	5	8
	After 30 mins	2	0	0
	After 2 hours	0	0	0
10 (Worst Pain)	At admission	1	0	0
	After 30 mins	0	0	0
	After 2 hours	0	0	0

Table 4 Pain intensity of diclofenac, tramadol, paracetamol for soft tissue injury

 \Box Diclofenac showed the **fastest and most complete pain relief** within 2 hours in soft tissue injury.

- □ Tramadol performed better than paracetamol but was not as effective as diclofenac.
- □ Paracetamol provided **modest relief**, with a slower response.

PAIN INTENSITY FOR FRACTURE

 Table 5 Pain intensity of diclofenac, tramadol, paracetamol for fracture.

Pain Score	Time Point	Diclofenac	Tramadol	Paracetamol
0-1 (No pain)	At admission	0	0	0
	After 30 mins	0	0	0
	After 2 hrs	0	0	0
1-3 (Mild)	At admission	0	0	0
	After 30 mins	3	0	0
	After 2 hrs	8	1	3
4-6 (Moderate)	At admission	4	0	1
	After 30 mins	15	8	8
	After 2 hrs	15	7	5
7-9 (Severe)	At admission	15	8	7
A CONSTRUCTION OF A	After 30 mins	5	0	0
	After 2 hrs	0	0	0
10 (Worst possible pain)	At admission	4	0	o
	After 30 mins	0	0	0
	After 2 hrs	0	0	0

Among the three drugs used for fracture pain,

- **Diclofenac** showed All 19 patients with severe pain shifted to mild or moderate levels within 2 hours.
- **Tramadol** also reduced pain more effectively management of acute fracture pain.
- **Paracetamol** provided gradual relief, with patients moving from severe to mild/moderate pain over 2 hours.
- Overall, **Tramadol** was the most effective, followed by Diclofenac and Paracetamol.

IV. STATISTICAL ANALYSIS

4.1 Pain Intensity – Before and After Drug Administration for soft tissue injury

PROC MEANS OUTPUT							
The MEANS Procedure							
Drug	Time	N	Mean	Std Dev	Minimum	Maximum	
Diclofenac	After	104	0.74	0.78	0	3	
Diclofenac	Before	94	2.10	0.62	1	4	
Paracetamol	After	16	1.06	0.44	0	2	
Paracetamol	Before	12	2.42	0.51	2	3	
Tramadol	After	13	1.08	0.49	0	2	
Tramadol	Before	12	2.17	0.72	1	3	

Figure 1 Mean output

PROC ANOVA OUTPUT

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Dependent Variable: PainScore					
Source	Sum of Squares	df	F Value	Pr ≻ F	
Drug	3.1628	2	3.4417	0.0336	
Time	110.2884	1	240.0288	<.0001	
Drug:Time	0.3958	2	0.4308	0.6505	
Residual	112.5726	245	nan	nan	



INTERPRETATION

- All drugs significantly reduced pain after 2 hours, with a statistically significant main effect for Time (p < 0.0001).
- The main effect for Drug was also significant (p = 0.0336), indicating that overall pain relief varied by drug.
- However, the interaction between Drug and Time was not significant (p = 0.6505), suggesting that all three drugs reduced pain similarly over time.
- Among the drugs, Diclofenac showed the largest reduction in mean pain score (from 2.10 to 0.74), indicating it may be the most effective, followed by paracetamol.
- 4.2 Pain Intensity Before and After Drug Administration for Fracture.

4

PROC MEANS OUTPUT

PROC MEANS DATA=Fracture;							
The MEANS Procedure							
Drug	Time	N	Mean	Std Dev	Min	Max	
Diclofenac	Before	25	7.0	1.94	4	10	
Paracetamol	Before	8	5.88	1.55	4	7	
Tramadol	Before	6	6.0	1.55	4	7	
Diclofenac	After	25	5.92	1.47	4	7	
Paracetamol	After	8	3.5	1.07	1	4	

Figure 3 Mean output

3.17 0.41 3

PROC ANOVA OUTPUT- BEFORE DRUG

Tramadol After 6

PROC ANOVA DATA=Fracture; The ANOVA Procedure - Before Drug Administration Source DF F Value Pr > F Drug 2 1.5681 0.2224 Error 36

Interpretation: p = 0.2224 > 0.05. No significant difference in pain scores before treatment.

Figure 4 Before drug- Anova output

PROC ANOVA OUTPUT- AFTER DRUG

PROC ANOVA DATA=Fracture;

The ANOVA Procedure - After Drug Administration

Interpretation: p < 0.0001. Significant difference in pain scores after treatment. Paracetamol and Tramadol reduced pain more effectively than Diclofenac.

Figure 5 After drug- Anova output

INTERPRETATION

• The p-value is 0.2224, which is greater than 0.05. This indicates that before drug administration, there was no statistically significant difference in pain scores across the three groups.

- The p-value is < 0.0001, which is highly significant. This means that after drug administration, there is a statistically significant difference in pain scores between the three drugs.
- All drugs reduce pain, but **Tramadol** and **Paracetamol** may reduce it **more effectively.**

Analytical Overview

According to a "National evidence –based guideline", Neomol (paracetamol) was the pharmacological drug of choice for pain management, if necessary with addition use of other NSAIDs or opioids. Fentanyl and Morphine also can be given for severe to unbearable pain during emerency department. Our study shows (14.83%) of total 155 patients were received paracetamol for moderate to severe pain. This drug was better choice for both soft tissue injury and fracture. This result was similar with the study conducted by A.C. Schotten et al (2014).

V. CONCLUSION

In this study, we discovered that male patients are more likely than female patients to suffer trauma as a result of a road traffic accident (RTA). For pain management in trauma patients, analgesic medications such as diclofenac sodium (2ml IM), tramadol (2ml IM), and paracetamol (1g IV) were provided. Diclofenac (88.6%) was more effective in soft tissue damage than in fracture of the three analgesic medications examined. The administration of 2ml of Diclofenac via intramuscular route gradually reduces pain intensity; the pain score was reduced from severe (8-10) to mild(1-3) or no pain(0) within 2 hours. Thus, Diclofenac proved more effective and safer in soft tissue injuries than other analgesics provided at Government Cuddalore Medical College.

Additionally, Diclofenac proved cost effective. However, Diclofenac is not recommended for people with asthma or respiratory issues; severe renal or liver disease; managing pain in a coronary artery bypass graft (CABG); fluid retention or edema. Tramadol (53.3%) was more effective in fractures than in soft tissue injuries. The administration of 2ml of tramadol intramuscularly gradually reduces pain intensity; the pain score reduced from worst possible pain (9-10) and severe (6-8) to mild(1-3) within 2 hours. Patients who take opioids for an extended period of time may require monitoring for the development of physical dependence, addiction disorder, and drug abuse. In general, administering 1g of paracetamol intravenously gradually reduces pain intensity. Paracetamol (69.5%) was more effective in soft tissue injury than fracture.

VI. FUTURE SCOPE

The study reveals a persistent inadequacy in acute pain management among trauma patients, especially those involving blunt force trauma and piercing/internal injuries. Despite the efficacy of commonly used analgesics, there is a need for further research and protocol development. Future research should focus on developing standardized pain management protocols, comparing multimodal analgesia, individualized pain management, integrating non-

pharmacological interventions, introducing validated pain assessment scales and triage tools in emergency departments, evaluating the long-term impact of untreated or under-treated acute pain, and integrating technology for real-time monitoring. These efforts will help improve pain management and reduce the need for delayed drug administration.

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