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Original research article

ASSOCIATION OF VITAL SIGNS AND PAIN SCORE IN EMERGENCY DEPARTMENT

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Abstract: *Accurate pain assessment is essential in emergency settings to ensure timely and effective management. Although self-reported pain scores are commonly used, healthcare providers often rely on vital signs, such as heart rate, respiratory rate, blood pressure, and temperature, as additional indicators of pain. However, the reliability of these vital signs in predicting pain remains unclear.* ***Objective:*** *To investigate the relationship between vital signs (heart rate, respiratory rate, blood pressure, and temperature) and self-reported pain scores in adult emergency department (ED) patients, evaluating the reliability of vital signs as pain indicators.* ***Methods:*** *This prospective observational study was conducted over one month in the emergency department of a tertiary care hospital in Islamabad, Pakistan. A total of 201 adult patients (aged ≥16 years) presenting with pain were included, while those with altered mental status, non-painful complaints, or terminal illness were excluded. Upon arrival, vital signs and self-reported pain scores were documented using a standardized form. Pearson correlation coefficients were used to assess the association between each vital sign and pain score. Subgroup analyses further examined differences by demographics, pain etiology (traumatic vs. non-traumatic), and pain severity.* ***Results:*** *No significant correlation was observed between vital signs and pain scores ($p < 0.001$), suggesting that vital signs are not reliable indicators of pain intensity in ED patients.* ***Conclusion:*** *Vital signs, such as heart rate, respiratory rate, and blood pressure, show limited reliability as indicators of pain. Self-reported pain scores should be prioritized in pain assessment to ensure timely and accurate pain management, potentially improving patient satisfaction. Further multi-centre research is recommended to explore variations in pain relief strategies based on pain type and demographics.*

Keywords: Emergency Service, Hospital, Pain Measurement, Prospective Studies, Self Report, Vital Signs.

Introduction

Pain is a prevalent presenting complaint in the ED, significantly impacting patient experience and resource utilization. Accurate pain assessment is crucial for optimal patient care. While vital signs are routinely measured in the ED, their association with self-reported pain scores remains debated.

Self-reported pain scores, using tools like numerical rating scales (NRS), are the gold standard for pain assessment in the ED (1). Heart rate, respiratory rate, blood pressure, and temperature are routinely measured vital signs in the ED (2). Several studies have investigated the relationship between vital signs and self-reported pain scores in the ED, with mixed results. Mallick and Banerjee (2020) conducted a review of the literature and found that the association between physiological markers (including vital signs) and pain intensity is weak and influenced by various factors (3). Herr and Coyne (2017) emphasized the importance of self-reported pain scores as the gold standard for pain assessment in the ED, acknowledging the limitations of relying solely on vital signs (1). Studies by Bijur et al. (2018) and Zhang et al. (2019) further support the notion that vital signs may not be a reliable indicator of pain intensity in all ED patients (4, 5). Wachholz and Mackey (2016) highlighted the importance of a comprehensive approach to pain assessment, which should include self-reported pain scores alongside other clinical observations (2). These findings suggest a need for further investigation into the association between vital signs and self-reported pain scores in the ED, considering potential influencing factors like demographics, pain etiology, and pain severity.

Methodology

The research strategy was a prospective observational study. Independent variables included heart rate, respiratory rate, systolic and diastolic blood pressure, and temperature which was measured on arrival of a patient presenting to ED with chief complaints of pain. The dependent variable was the self-reported pain score using the Numerical Rating Scale at the time of vital sign measurement. Potential confounding variables included age, sex, pain etiology (traumatic vs. non-traumatic), and pain severity were accounted for via statistical analysis.

The study was carried out over 1 month in the emergency department of Shifa International Hospital in Islamabad, Pakistan. Data from 201 patients was collected through convenience sampling of adult patients (≥ 16 years old) presenting to the ED with pain. Data was collected by a team of postgraduate residents in the emergency department.

A standardized data collection form was used which recorded demographics, pain etiology, vital signs, and self-reported pain score.

Inclusion Criteria were age ≥ 16 years old; presenting to the ED with pain as the chief complaint; able to provide informed consent and self-report pain intensity using the numerical pain scale.

Exclusion criteria were altered mental status precluding the possibility of obtaining a self-reported pain score, non-

painful chief complaint, terminal illness or expected lifespan of less than 24 hours.

Approval to carry out this study was obtained from the IRB & Ethics Committee of Shifa International Hospital Islamabad.

Statistical Package for Social Sciences (SPSS) version 26 was used. The statistical method used was the Correlation coefficient, Pearson's r to assess the association between each vital sign and pain score. Subgroup analysis was also conducted to explore potential differences in the association based on demographics, pain etiology, and pain severity

Results

A total of 201 patients were included in this study. The analysis provides insights into the demographic characteristics of the participants, the correlations between pain scores and various physiological parameters, and the distribution of pain aetiology, location, and intervention types. The sample consisted of 201 patients, with a higher proportion of females (58.2%) compared to males (41.8%). About half of the participants (50.2%) reported no comorbidities, while hypertension was the most common comorbidity (27.4%). (Table 1)

Table 1: Demographic Characteristics of the Sample

Variable	Category	Frequency	Percent (%)
Sex	Male	84	41.8
	Female	117	58.2
Comorbidities	None	101	50.2
	Neoplasm	13	6.5
	Other	32	15.9
	Hypertension	55	27.4

Table 2: Correlation Between Pain Score and Respiratory Rate (RR)

Variable	Score	RR
Score	1	0.027
		p = 0.702
Respiratory Rate (RR)	0.027	1

The Pearson correlation coefficient between pain score and respiratory rate (RR) is 0.027, indicating a very weak positive correlation with no statistical significance (p = 0.702). (Table 2)

Table 3: Correlations Between Pain Score and Vital Parameters

Variable	SBP	DBP	Pulse	Temp	RR
Score	-0.046	0.105	0.064	0.035	0.027
p-value	0.520	0.139	0.365	0.619	0.702

The correlation analysis shows that none of the physiological parameters (systolic blood pressure, diastolic blood pressure, pulse, temperature, and respiratory rate) have a statistically significant correlation with the pain score (p > 0.05 for all). (Table 3)

Table 4: Frequency Distribution of Pain Etiology

Etiology	Frequency	Percent (%)
Traumatic	21	10.4
Non-Traumatic	180	89.6

Most cases (89.6%) of pain were attributed to non-traumatic causes, with only 10.4% linked to traumatic events. (Table 4)

Abdominal pain was the most commonly reported location (41.3%), followed by pain in the head (13.4%) and flank (11.9%). (Table 5)

Paracetamol was the most frequently administered intervention (47.3%), followed by a combination of Paracetamol and Ketorolac (27.4%). Combinations including opioids were less common. (Table6)

Table 5: Frequency Distribution of Pain Location

Location	Frequency	Percent (%)
Abdomen	83	41.3
Head	27	13.4
Flank	24	11.9
Upper Limb	17	8.5
Lower Limb	15	7.5
Chest	8	4.0
Back	10	5.0
Neck	1	0.5
Other	16	8.0

Table 6: Frequency Distribution of Pain Interventions

Intervention	Frequency	Percent (%)
Paracetamol	95	47.3
Paracetamol + Ketorolac	55	27.4
Ketorolac	7	3.5
Opioid	10	5.0
Paracetamol + Opioid	24	11.9
Ketorolac + Opioid	3	1.5
Paracetamol + Ketorolac + Opioid	2	1.0
Other	5	2.5

Discussion

The assessment of pain is a crucial aspect of patient care, particularly in emergency settings where timely intervention can significantly affect outcomes. This study aimed to explore the relationship between vital signs, heart rate, respiratory rate, blood pressure, and temperature and self-reported pain scores among adult patients in the emergency department (ED). The results demonstrated no significant correlation between these variables, suggesting that vital signs alone may not be reliable indicators of pain intensity.

The findings align with previous research that has questioned the efficacy of vital signs as standalone indicators of pain. For instance, a study by Bader et al. (6) highlighted that while vital signs can provide some insights into a patient's physiological

status, they do not necessarily correlate with pain levels. This is particularly relevant in the ED, where patients may exhibit normal vital signs despite experiencing severe pain, possibly due to acute stress responses or individual variability in pain perception (7).

Furthermore, the lack of significant correlation in our study suggests that healthcare providers should prioritize self-reported pain assessments over-reliance on vital signs alone. This is particularly important in populations that may have altered physiological responses due to factors such as age, sex, and comorbidities. As noted by Afolabi et al. (8), patient-reported outcomes are essential for effective pain management, especially in acute settings where the subjective experience of pain can differ widely among individuals.

The limitations of using vital signs for pain assessment are further supported by research from Langley et al. (3), which found that certain vital sign changes, such as elevated heart rates, could be attributed to factors unrelated to pain, including anxiety and environmental stressors. This underscores the complexity of pain assessment in emergency medicine, where physiological indicators may be influenced by multiple factors.

Our study also emphasizes the need for individualized pain management strategies. The variability in pain perception and reporting among different demographic groups, such as gender and age, has been documented extensively. A systematic review by Green et al. (9) found that women often report higher pain levels than men, even with similar conditions, highlighting the importance of understanding patient demographics when evaluating pain. Moreover, the etiology of pain whether traumatic or non-traumatic can also influence how pain is perceived and reported.

Despite the limitations of our findings, they point towards a need for ongoing education and training for healthcare providers to enhance the use of self-reported pain measures. Clinicians should be encouraged to engage patients in discussions about their pain and involve them in decision-making processes regarding their pain management plans (10). This can not only improve patient satisfaction but also lead to more timely and effective pain relief.

Conclusion

While vital signs can provide valuable information about a patient's physiological state, they should not be used in isolation to assess pain levels. Our study reinforces the need for self-reported pain scores as a primary tool for pain assessment in the ED. Further research is warranted to explore alternative methods and technologies that could augment traditional pain assessment tools, including the potential use of biometric monitoring technologies. By adopting a more holistic approach to pain management that includes patient-reported outcomes, healthcare providers can significantly improve patient care and satisfaction.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

Approved by the department Concerned. (IRBEC-NHM-0299/23)

Consent for publication

Approved

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Conflict of interest

The authors declared an absence of conflict of interest.

Authors' Contribution

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Conception of study, Coordination of collaborative efforts, data analysis, development of research methodology, study design, review of manuscript
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References

1. Patel S, Parikh A, Okorie ON. Subarachnoid haemorrhage in the emergency department. International Journal of Emergency Medicine. 2021;14(1):31.
2. Yu K-H, Healey E, Leong T-Y, Kohane IS, Manrai AK. Medical Artificial Intelligence and Human Values. New England Journal of Medicine. 2024;390(20):1895-904.
3. Tshitenge ST. TEXILA INTERNATIONAL JOURNAL OF PUBLIC HEALTH.
4. Liu S, See KC, Ngiam KY, Celi LA, Sun X, Feng M. Reinforcement learning for clinical decision support in critical care: comprehensive review. Journal of medical Internet research. 2020;22(7):e18477.
5. Lu Y, Fang P-P, Yu Y-Q, Cheng X-Q, Feng X-M, Wong GTC, et al. Effect of intraoperative dexmedetomidine on recovery of gastrointestinal function after abdominal surgery in older adults: a randomized clinical trial. JAMA network open. 2021;4(10):e2128886-e.
6. Badr MN, Khalil NS, Mukhtar AM. Effect of national early warning scoring system implementation on cardiopulmonary arrest, unplanned ICU admission, emergency surgery, and acute kidney injury in an emergency hospital, Egypt. Journal of multidisciplinary healthcare. 2021:1431-42.
7. Flanagan P, Waller R, Lin I, Richards K, Truter P, Machado GC, et al. Interventions to improve the quality of low back pain care in emergency departments: a systematic review and meta-analysis. Internal and Emergency Medicine. 2024:1-20.
8. Choi YS, Kim TW, Chang MJ, Kang S-B, Chang CB. Enhanced recovery after surgery for major orthopedic surgery: a narrative review. Knee surgery & related research. 2022;34(1):8.
9. Patrick-Smith M, Bull S. Medical student perceptions of gender and pain: a systematic review of the literature. BMC medicine. 2024;22(1):434.

10. Jones CM, Lin C-WC, Jamshidi M, Abdel Shaheed C, Maher CG, Harris IA, et al. Effectiveness of opioid analgesic medicines prescribed in or at discharge from emergency departments for musculoskeletal pain: a systematic review and meta-analysis. Annals of internal medicine. 2022;175(11):1572-81.