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ORIGINAL RESEARCH

Evaluation of the effects of pain scale and analgesic administration on radiological imaging methods and hospitalization in trauma patients admitted to the emergency service

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Abstract

Background: Trauma, one of the major concerns in today's world, exposes societies to important economic, social and health-related problems. Trauma is known to account for 10% of the world's deaths.

Objective: The aim of the study is to evaluate the demographic characteristics of trauma, which is common in emergency services and causes significant loss of workload and function when appropriate diagnosis and treatment methods are not applied, with radiological imaging methods, pain scale and analgesics.

Materials and Methods: This prospective study included 1267 patients over the age of 18, who were admitted to the emergency department due to trauma between 1 January and 31 December 2019. The mean age of patients was 47.01 ± 14.97 year, with a male/female ratio of 1.46. 59.3% of the patients were male and 40.7% were female. Patients' trauma types, radiology results, mortality, numerical pain scale and analgesic administration were evaluated.

Results: Numerical pain scale score of trauma patients in the emergency department was 6.23 ± 2.02. Analysis of radiological imaging methods showed significance with age, numerical pain scale, thoracic and lumbar vertebrae, thoracic and abdominal injuries, types of trauma, consultation, hospitalization, analgesics administration and pain severity. Trauma types were insignificant with age and gender, but a significant relationship was found with all other parameters. Pain intensity was not correlated with gender and tetanus application but was significant with other variables. There was significance in radiological imaging methods and diagnostic types between injury types. Types of diagnosis were found to be correlated with imaging methods, orthopedic consultation, numerical pain scale and injury types. There was a significant correlation with the types of diagnosis, analgesia administration, consultation, and pain classification according to the pain rating scale. There was no correlation between age and gender according to pain intensity. However, there was a strong positive correlation with pain scale scores, consultation, hospitalization, types of trauma, administration of analgesia, and a weak correlation with radiological imaging methods.

Conclusion: Early pain scale with radiological imaging and analgesic administration in trauma patients can reduce morbidity rates and shorten hospital stay.

Keywords

Emergency service; Traumas; Numerical pain scale; Radiology; Analgesia

1. Introduction

Trauma, one of the major concerns in today's world, exposes societies to important economic, social and health-related problems. Despite all the developments, trauma continues to be the leading cause of death among individuals aged 0-40 years and ranks fourth among individuals older than 45 years. Trauma accounts for 50% of deaths under the age of 14, 80% of deaths in the 15-24 age group and 65% of deaths in the 25-40 age group. Of these deaths, 50% occur instantly (within the first few minutes), 30% in the early period (within the first three hours), and 20% in the late period (after the first 3-4 days) [1–3]. Therefore, it has become inevitable to organize the first and emergency aid training, pre-hospital and hospital trauma systems at the national level as soon as possible in our country, which holds the first place in traffic accidents and

where violence, work and home accidents and disasters are on the increase [2, 4].

In the initial evaluation of trauma patients, physical examination, plain radiography, ultrasonography, computed tomography and magnetic resonance imaging are used in correlation with pain according to the clinical characteristics of the patient and resources in trauma centers [5, 6]. A system particularly based on imaging systems delays intervention and treatment of patients. The management of treatment and follow-up at each stage is important as much as clinical correlation is dependent on radiographic findings. The most important patient feedback is pain. Accurate pain management during acute evaluation makes trauma diagnosis and treatment safer for the clinician and the patient. Accurate assessment of the source and severity of pain is critical in applying analgesia to the patient [7]. It is recommended that pain is addressed within 20-25 minutes in the ED [8]. In addition, the treatment should be arranged according to a 50% decrease in pain rating or a decrease below 4/10 in the pain scale, rather than the specific analgesic dose [9].

It is believed that the evaluation of pain expression of a patient is the gold standard as it is a personal and individual experience [10]. However, it may be helpful to use a complementary tool to objectively assess the severity of pain. Pain is a subjective symptom, but it has some objectively measurable consequences and clues. These tools include both behavioral and physiological pain indicators [11, 12]. Pain rating scales are similar, and validated pain scales can evaluate the patient's pain subjectively [11]. In these scales, patients are asked to rate their pain between 0 and 10, with zero indicating the absence of pain, while 10 represents the most intense pain possible. These tools appear simple to use, but pain is often difficult to assess. Despite the widespread use and apparent simplicity of the pain scale in emergency departments, it has been shown that 11% of adults and 25% of the elderly do not understand the concept of its use [13].

The present study aims to evaluate the demographic characteristics of trauma, which is common in emergency services and causes significant loss of workload and function when appropriate diagnosis and treatment methods are not applied, and the effects of radiological imaging methods, pain scale and analgesics administration.

2. Materials and methods

This prospective study included 1267 patients over the age of 18 who were admitted to the emergency department due to trauma between 1 January and 31 December 2019. All patients included in the study were evaluated in the emergency department. Trauma types of the patients were questioned, the site of trauma in the body was determined, numerical pain scale and verbal category scale were applied, and radiological examination was requested. When the procedures were completed, the patients whose general condition was poor and who needed surgery and follow-up were consulted and then hospitalized in the relevant clinic.

Patients who were admitted to the emergency department due to trauma-related reasons after the first 72 hours, those who did not want to undergo examination and imaging, those who did not accept numerical and verbal pain scales, those who did not want to be included in the study, and those with extremity traumas were not included in the study. Those who applied to the emergency department due to thoracoabdominal trauma and who accepted to be included in the study with numerical and verbal pain scores were included in the study and underwent radiological imaging and consultation. Trauma types, injury site in the body, radiological imaging methods, consultation, numerical and verbal pain scores, analgesia and hospitalization results of the patients were evaluated.

Specific groups were formed in order to better analyze the patients, to define the differences between categories, the type of injury and the radiological imaging method, its relationship with numerical and pain score, consultations, requirement of analgesics, and hospitalization. Six groups were formed according to the type of injury: falls from a low height (less than 1 m), falls from a high height (more than 1 m), accident inside and outside the vehicle, penetrating injury, and gunshot injury. The verbal pain scale [14] was modified and divided into three groups as mild, moderate and severe according to the severity of pain. Consultations were collected in three groups as none, single and multiple. Lung injury was divided into three groups according to the presence or absence of a rib fracture and a sternum fracture. Two additional groups were formed according to the need for analgesia, tetanus, thoracic vertebra, lumbar vertebra, intraabdominal injury, and hospitalization. According to the imaging methods used for trauma injuries, five groups were formed: those not requiring radiological imaging, only direct radiography, computed tomography (CT), ultrasonography (USG) and multiple requests.

2.1 Pain classification

The verbal category scale is a simple descriptive scale. It is based on the patient choosing the most appropriate word to describe their condition of pain. The severity of pain is listed from mild to unbearable. The patient is asked to choose the appropriate one among these categories. Verbal Category Scale was used for pain classification [14]. This category was slightly modified to create three groups as mild, moderate and severe. This method, which is aimed at determining the pain intensity, enables the patient to describe their pain with numbers. The numerical scales start with the absence of pain (0) and reach up to the degree of unbearable pain (10-100) [15]. Since the verbal category scale is a simple descriptive data, numerical pain scale was also used.

3. Statistical analysis

The data obtained from this study were analyzed with SPSS 20 (SPSS Inc., Chicago, IL, USA) package program. Kolmogorov-Smirnov test was performed for evaluating the normal distributions of the variables. Descriptive statistics (age and numerical pain scores) were expressed as mean ± standard, while nominal variables were expressed as the number of cases and percentage (%). When evaluating the differences between groups, Kruskal-Wallis H Test was used for the variables that did not conform to normal distribution. Chi-square analysis was used for evaluating

TABLE 1. Analysis of radiological imaging methods with basal characters and variables.

		All patients	Radiological Imaging					*P*-value
			No	X-ray	CT	USG	Multiple	
Basaline Characteristcis								
Age, mean ± SD, yr		47.01 ± 14.97	52.18 ± 13.50	46.38 ± 14.57	48.40 ± 14.92	43.96 ± 14.85	46.08 ± 16.65	**0.001**
Sex, Female/Male		515/752	31/42	213/344	158/210	57/77	56/79	0.649
Scale		6.23 ± 2.02	2.86 ± 0.93	6.67 ± 1.70	5.99 ± 1.90	4.69 ± 0.55	8.37 ± 1.28	**0.001**
Relationship of variables with radiological imaging (n/%)								
Lung contusion	**No**	744 (58.7)	71 (5.6)	501 (39.5)	34 (2.7)	133 (10.5)	5 (0.4)	**0.001**
	Yes	523 (41.3)	2 (0.2)	56 (4.4)	334 (26.4)	1 (0.1)	130 (10.3)	
Pneumothorax	**No**	1181 (93.2)	73 (5.8)	557 (44.0)	368 (29.0)	134 (10.6)	49 (3.9)	**0.001**
	Yes	86 (6.8)	0	0	0	0	86 (6.8)	
Hemothorax	**No**	1232 (97.2)	73 (5.8)	557 (44.0)	368 (29.0)	134 (10.6)	100 (7.9)	**0.001**
	Yes	35 (2.8)	0	0	0	0	35 (2.8)	
Rib Fracture	**No**	754 (59.5)	73 (5.8)	526 (41.5)	7 (0.6)	133 (10.5)	15 (1.2)	**0.001**
	Yes	487 (38.4)	0	31 (2.4)	350 (27.6)	1 (0.1)	105 (8.3)	
	Sternum	26 (2.1)	0	0	11 (3.0)	0	15 (1.2)	
Toracal Vertebra	**No**	1232 (97.2)	73 (5.8)	557 (44.0)	368 (29.0)	134 (10.6)	100 (7.9)	**0.001**
	Yes	35 (2.8)	0	0	0	0	35 (2.8)	
Lumbal Vertebra	**No**	1168 (92.2)	73 (5.8)	557 (44.0)	366 (28.9)	134 (10.6)	38 (3.0)	**0.001**
	Yes	99 (7.8)	0	0	2 (0.2)	0	97 (7.7)	
Intraabdominal Injury	**No**	1176 (92.8)	73 (5.8)	557 (44.0)	366 (28.9)	134 (10.6)	46 (3.6)	**0.001**
	Yes	91 (7.2)	0	0	2 (0.2)	0	89 (7.0)	
Consultation	**No**	989 (78.1)	73 (5.8)	557 (42.4)	232 (18.3)	134 (10.6)	13 (1.0)	**0.001**
	Single	179 (14.1)	0	20 (1.6)	134 (10.6)	0	25 (2.0)	
	Multiple	99 (7.8)	0	0	2 (0.2)	0	97 (7.7)	
Hospitalization	**No**	1046 (82.6)	73 (5.8)	557 (42.4)	281 (22.2)	134 (10.6)	21 (1.7)	**0.001**
	Yes	221 (17.4)	0	20 (1.6)	87 (6.9)	0	114 (9.0)	
Tetanus	**Available**	137 (10.8)	9 (0.7)	62 (4.9)	34 (2.7)	17 (1.3)	15 (1.2)	**0.014**
	Done	1108 (87.5)	62 (4.9)	490 (38.7)	328 (25.9)	116 (9.2)	112 (8.8)	
	Did not	22 (1.7)	2 (0.2)	5 (0.4)	6 (0.5)	1 (0.1)	8 (0.6)	
Analgesic	**No**	714 (56.4)	73 (5.8)	264 (20.8)	232 (18.3)	129 (10.2)	16 (1.3)	**0.001**
	Yes	553 (43.6)	0	293 (23.1)	136 (10.7)	5 (0.4)	119 (9.4)	
Pain Severety	**Light**	263 (20.8)	69 (5.4)	63 (5.0)	84 (6.6)	46 (3.6)	1 (0.1)	**0.001**
	Middle	610 (48.1)	4 (0.3)	303 (23.9)	192 (15.2)	88 (6.9)	23 (1.8)	
	Severe	394 (31.1)	0	191 (15.1)	92 (7.3)	0	111 (8.8)	
Trauma	**Fall**	594 (46.9)	73 (5.8)	349 (27.5)	46 (3.6)	123 (9.7)	3 (0.2)	**0.001**
	FFH	401 (31.6)	0	155 (12.2)	202 (15.9)	9 (0.7)	35 (2.8)	
	In-VTA	129 (10.2)	0	19 (1.5)	60 (4.7)	1 (0.1)	49 (3.9)	
	NonVTA	116 (9.2)	0	29 (2.3)	48 (3.8)	1 (0.1)	38 (3.0)	
	PI	13 (1,0)	0	3 (0.2)	6 (0.5)	0	4 (0.3)	
	GW	14 (1.1)	0	2 (0.2)	6 (0.5)	0	6 (0.5)	

CT, Computed tomography; FFH, Falling from high; GW, Gunshot wound; In-VTA, In-vehicle traffic accident; Non-VTA, Non-vehicle traffic accident; PI, Penetrating injury; USG, Ultrasonography.

the relationship between the groups of nominal variables (gender, lung, lumbar and thoracic vertebra, abdominal injury, etc.). Pearson's correlation analysis was used for the linear relationship between variables. When interpreting the results, values below the significance level of 0.05 were considered statistically significant.

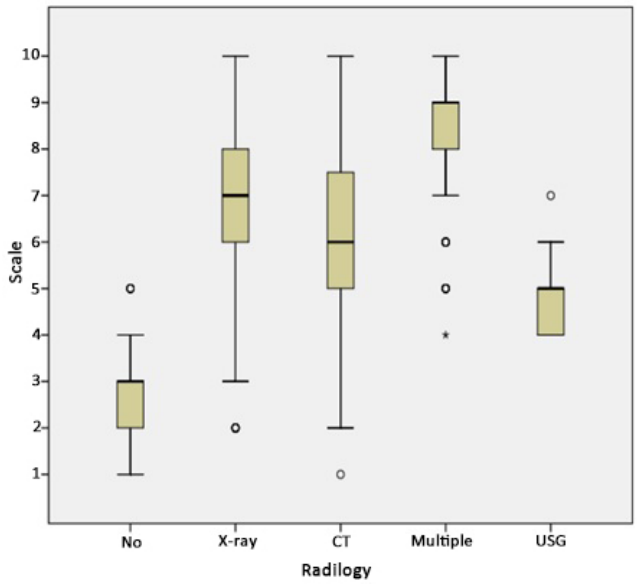

FIGURE 1. Numerical pain score distribution of radiological imaging.

4. Results

The mean age of patients was 47.01 ± 14.97/year. 59.3% were men and 40.7% were women. Numerical pain scale score of trauma patients in the ED was 6.23 ± 2.02. The group with the highest mean age was the patients who did not require radiological imaging. In addition, the group that required USG included the patients with the lowest mean age. The Kruskal-Wallis H Test revealed significance in age and numerical pain score between radiological imaging methods (P = 0.001). The Chi-square analysis between gender and radiological imaging methods showed that the highest number of requests was in the X-ray and CT groups, but there was no statistical significance although there were 515 women and 752 men (P = 0.649). In the chi-square analysis of radiological imaging methods with the variables, lung contusion, hemothorax, pneumothorax, lumbar and thoracic vertebra injury, rib and sternum injury, abdominal organ injury, analgesia, consultation, hospitalization, pain severity and trauma types were found statistically significant (Table 1). Numerical pain score distribution of radiological imaging is shown in Fig. 1.

The Kruskal-Wallis H Test with age and trauma types showed no significance (P = 0.204), but a statistical significance was found with the numerical pain score (P = 0.001). The pain score was highest in the in-vehicle accidents and the lowest in falls from a height lower than 1 m. Although the ratio of gender was highest among falls in the chi-square test between trauma types and variables, it was not statistically significant (P = 0.365). However, it was found

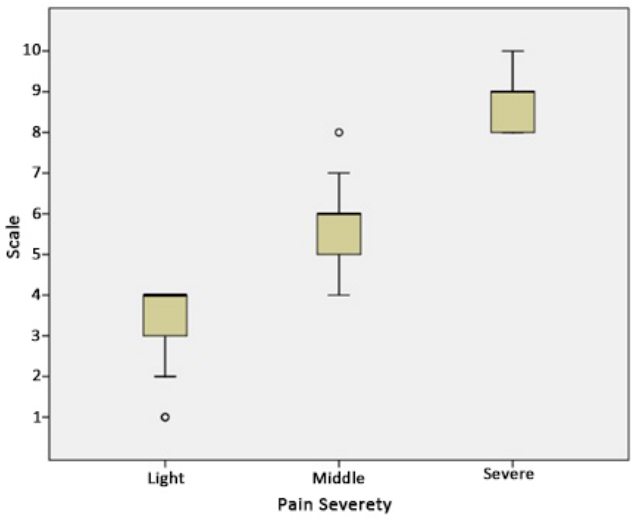

FIGURE 2. Distribution of types of trauma with numerical pain score.

to be statistically significant with the variables of lung injury, pneumothorax, hemothorax, lumbar and thoracic injury, intraabdominal organ damage, consultations, verbal pain scale and hospitalization (Table 2). In addition, the distribution of trauma types with numerical pain scores is shown in Fig. 2.

The Kruskal-Wallis H Test showed statistical significance between the variables in pain severity with age (P = 0.028) and numerical pain score (P = 0.001). While the age was highest in the mild group, the pain score was found to be highest in the severe group. Although the chi-square test between the variables and pain severity showed that most of the cases had moderate pain, it was not statistically significant with gender (P = 0.358). However, it was found to be statistically significant with the variables of lung injury, pneumothorax, hemothorax, lumbar and thoracic injury, intraabdominal organ damage, consultations, verbal pain scale and hospitalization (Table 3). The relationship between pain severity and numerical score distribution is shown in Fig. 3.

The chi-square analysis between mortality and variables revealed a higher rate of mortality in men, but it was not statistically significant (P = 0.671). Among the types of trauma, death was most common in falls from height, followed by accidents outside the vehicle. But there was no death in penetrating traumas. Death most frequently occurred due to abdominal, lung and vascular injuries (P = 0.01). Additionally, a statistical significance was detected with the variables of lung injury, pneumothorax, hemothorax, lumbar and thoracic injury, intraabdominal organ damage, consultations, verbal pain scale and hospitalization (P = 0.01, Table 4).

The correlation of pain severity with variables was insignificant with age and gender. However, there was a strong correlation with numerical pain score, consultation, use of analgesics and hospitalization, a moderate correlation with trauma types, and a weak-moderate and positive correlation with radiological imaging methods (Table 5).

TABLE 2. Analysis of trauma types with baseline characters and variables.

		Trauma						*P*-value
		Fall	FFH	In-VTA	Non-VTA	PI	GW	
Basaline Characteristcis								
Age, mean ± SD, yr		46.09 ± 14.47	48.41 ± 14.83	46.28 ± 16.25	47.70 ± 15.97	44.54 ± 16.26	49.64 ± 16.56	0.204
Sex, Female/Male		240/354	169/232	48/81	48/68	5/8	5/9	0.365
Scale		5.89 ± 1.99	6.25 ± 1.95	6.98 ± 2.05	6.89 ± 1.94	6.85 ± 2.64	6.71 ± 1.38	**0.001**
Relationship of variables with radiological imaging (n/%)								
Lung contusion	**No**	548 (43.3)	145 (11.4)	17 (1.3)	29 (3.7)	2 (0.2)	3 (0.2)	**0.001**
	Yes	46 (3.6)	256 (20.2)	112 (8.8)	87 (6.9)	11 (0.9)	11 (0.9)	
Pneumothorax	**No**	591 (46,6)	374 (29.5)	102 (8.1)	91 (7.2)	11 (0.9)	12 (0.9)	**0.001**
	Yes	3 (0.2)	27 (2.1)	27 (2.1)	25 (2.0)	2 (0.2)	2 (0.2)	
Hemothorax	**No**	592 (46.7)	390 (30.8)	121 (9.6)	104 (8.2)	13 (1.0)	12 (0.9)	**0.001**
	Yes	2 (0.2)	11 (0.9)	8 (0.6)	12 (0.9)	0	2 (0.2)	
Rib Fracture	**No**	539 (42.5)	154 (12.2)	21 (1.7)	34 (2.7)	3 (0.2)	3 (0.2)	**0.001**
	Yes	52 (4.1)	240 (18.9)	98 (7.7)	78 (6.2)	9 (0.7)	10 (0.8)	
	Sternum	3 (0.2)	7 (0.6)	10 (0.8)	4 (0.3)	1 (0.1)	1 (0.1)	
Toracal Vertebra	**No**	592 (46.7)	390 (30.8)	121 (9.6)	104 (8.2)	13 (1.0)	12 (0.9)	**0.001**
	Yes	2 (0.2)	11 (0.9)	8 (0.6)	12 (0.9)	0	2 (0.2)	
Lumbal Vertebra	**No**	591 (46.6)	374 (29.5)	96 (7.6)	85 (6.7)	10 (0.8)	12 (0.9)	**0.001**
	Yes	3 (0.2)	27 (2.1)	33 (2.6)	31 (2.4)	3 (0.2)	2 (0.2)	
Intraabdominal Injury	**No**	591 (46.6)	374 (29.5)	98 (7.7)	90 (7.1)	11 (0.9)	12 (0.9)	**0.001**
	Yes	3 (0.2)	27 (2.1)	31 (2.4)	26 (2.1)	2 (0.2)	2 (0.2)	
Consultation	**No**	573 (45.2)	284 (22.4)	58 (4.6)	59 (4.7)	7 (0.6)	8 (0.6)	**0.001**
	Single	18 (1.4)	90 (7.1)	38 (3.0)	26 (2.1)	3 (0.2)	4 (0.3)	
	Multiple	3 (0.2)	27 (2.1)	33 (2.6)	31 (2.4)	3 (0.2)	2 (0.2)	
Hospitalization	**No**	584 (46.1)	327 (25.8)	66 (5.2)	58 (4.6)	5 (0.4)	6 (0.5)	**0.001**
	Yes	10 (0.8)	74 (5.8)	63 (5.0)	58 (4.6)	8 (0.6)	8 (0.6)	
Tetanus	**Available**	72 (5.7)	34 (2.7)	13 (1.0)	16 (1.3)	2 (0.2)	0	**0.014**
	Done	516 (40.7)	358 (28.3)	112 (8.8)	98 (7.7)	10 (0.8)	14 (1.1)	
	Did not	6 (0.5)	9 (0.7)	4 (0.3)	2 (0.2)	1 (0.1)	0	
Analgesic	**No**	377 (29.8)	222 (17.5)	53 (4.2)	50 (3.9)	6 (0.5)	6 (0.5)	**0.001**
	Yes	217 (17.1)	179 (14.1)	76 (6.0)	66 (5.2)	7 (0.6)	8 (0.6)	
Pain Severety	**Light**	143 (11.3)	85 (6.7)	17 (1.3)	15 (1.2)	3 (0.2)	0	**0.001**
	Middle	306 (24.2)	193 (15.2)	48 (3.8)	51 (4.0)	3 (0.2)	9 (0.7)	
	Severe	145 (11.4)	123 (9.7)	64 (5.1)	50 (3.9)	7 (0.6)	5 (0.4)	

FFH, Falling from high; GW, Gunshot wound; In-VTA, In-vehicle traffic accident; Non-VTA, Non-vehicle traffic accident; PI, Penetrating injury.

5. Discussion

Traumas are injuries with high morbidity and mortality rates due to their functional importance. The economic burden is high due to the fact that a significant portion of the patients with trauma injuries consist of the population that is active in production, along with the disabling effects of the consequences of the injuries and the prolonged recovery and rehabilitation process.

Pain is a subjective symptom and a prominent feature among trauma patients referring to the ED worldwide. Pain assessment and management is vital in the management of patients admitted to the ED. Better pain management leads to increased patient satisfaction and reduced hospital stay [16]. In the evaluation of vital signs in trauma patients, it is recommended to include parameters such as blood pressure, heart rate, respiratory rate as well as pain [17]. Inadequate application of analgesia in patients admitted to the ED with pain may lead to undesirable consequences. Changes in blood pressure, irregular heart rate, stress, anxiety, and fear of death are the main

TABLE 3. Analysis of pain intensity with basal characters and variables.

		Pain Severety			
		Light	**Middle**	**Severe**	***P*-value**
Basaline Characteristcis					
Age, mean ± SD, yr		48.64 ± 14.76	46.22 ± 14.78	47.15 ± 15.33	**0.028**
Sex, Female/Male		117/146	243/367	155/239	0.358
Scale		3.41 ± 0.79	5.89 ± 0.77	8.63 ± 0.68	**0.001**
Relationship of variables with radiological imaging (n/%)					
Lung contusion	**No**	171 (13.5)	388 (30.6)	185 (14.6)	**0.001**
	Yes	92 (7.3)	222 (17.5)	209 (16.5)	
Pneumothorax	**No**	263 (20.8)	602 (47.5)	316 (24.9)	**0.001**
	Yes	0	8 (0.6)	78 (6.2)	
Hemothorax	**No**	263 (20.8)	607 (47.9)	362 (28.6)	**0.001**
	Yes	0	3 (0.2)	32 (2.5)	
Rib Fracture	**No**	170 (13.4)	388 (30.6)	196 (15.5)	**0.001**
	Yes	93 (7.3)	221 (17.4)	173 (13.7)	
	Sternum	0	1 (0.1)	25 (2.0)	
Toracal Vertebra	**No**	263 (20.8)	607 (47.9)	362 (28.6)	**0.001**
	Yes	0	3 (0.2)	32 (2.5)	
Lumbal Vertebra	**No**	263 (20.6)	601 (47.4)	304 (24.0)	**0.001**
	Yes	0	9 (0.7)	90 (7.1)	
Intraabdominal Injury	**No**	263 (20.8)	601 (47.4)	312 (24.6)	**0.001**
	Yes	0	9 (0.7)	82 (6.5)	
Consultation	**No**	261 (20.6)	547 (43.2)	181 (14.3)	**0.001**
	Single	2 (0.2)	54 (4.3)	123 (9.7)	
	Multiple	0	9 (0.7)	90 (7.1)	
Hospitalization	**No**	255 (20.1)	565 (44.6)	226 (17.8)	**0.001**
	Yes	8 (0.6)	45 (3.6)	168 (13.3)	
Tetanus	**Available**	35 (2.8)	61 (4.6)	41 (3.2)	0.318
	Done	222 (17.5)	542 (42.8)	344 (27.2)	
	Did not	6 (0.5)	7 (0.6)	9 (0.7)	
Analgesic	**No**	260 (20.5)	441 (34.8)	13 (1.0)	**0.001**
	Yes	3 (0.2)	169 (13.4)	381 (30.1)	

changes [18, 19]. The method of application, the dose and frequency of analgesia in relieving pain affect the treatment. Different clinical situations and patient characteristics during pain assessment challenge healthcare professionals to evaluate objectively. Therefore, various pain scale methods have been developed. Pain scales based on visual findings include the evaluation of behavioral symptoms such as movement, facial cues, posture and physiological symptoms such as increased heart rate, respiratory rate, blood pressure, sweating and faintness [20]. Methods based on the verbal expression of patients provide faster and more effective results [21].

We used pain intensity based on numerical pain scale and verbal pain scale in our study. Significance of both numerical and pain severity in radiological methods enabled the medical professionals to be more alert. Pathological radiological images were found to be prominent in patients with a numerical pain scale score above 5.9. Severe thoracic and intraabdominal injuries were detected in patients with a score above 8. The pain scale score was 8 points in the analgesic group. We think that this was due to quicker consultation, administration of analgesia and hospitalization of the patients. As patients age, they tend to report less pain, and their communication skills are weakened. It is more difficult to assess pain by the clinician during trauma examination in elderly individuals [22]. In our study, no significant difference in pain scores was found between age in terms of trauma. However, it was significant in terms of radiology and pain severity. It is unclear which pain scale is to be used as the gold standard. What is vital is to determine the pain accurately and clearly prior to any intervention.

Successful treatment of trauma is possible with well-interpreted images in addition to good clinical evaluation.

TABLE 4. The relationship of mortality with variables.

		Mortality		
		No n (%)	**Yes n (%)**	***P*-value**
Gender	**Famale**	507 (40)	8 (0.6)	0.671
	Male	737 (58.2)	15 (1.2)	
Lungs	**No**	743 (58.6)	1 (0.1)	**0.001**
	Yes	501 (39.5)	22 (1.7)	
Lumbal Vertebra	**No**	1168 (92.2)	0	**0.001**
	Yes	76 (6)	23 (1.8)	
Toracal Vertebra	**No**	1232 (97.2)	0	**0.001**
	Yes	12 (0.9)	23 (1.8)	
Pneumothorax	**No**	1180 (93.1)	1 (0.1)	**0.001**
	Yes	64 (5.1)	22 (1.7)	
Hemothorax	**No**	1232 (97.2)	0	**0.001**
	Yes	12 (0.9)	23 (1.8)	
Rib Fracture	**No**	753 (59.4)	1 (0.1)	**0.001**
	Yes	468 (36.9)	19 (1.5)	
	Sternum	23 (1.8)	3 (0.2)	
Intraabdominal Injury	**No**	1176 (92.8)	0	**0.001**
	Yes	68 (5.4)	23 (1.8)	
Vascular injury	**No**	1168 (92.2)	0	**0.001**
	Yes	76 (6)	23 (1.8)	
Consultation	**No**	989 (78.1)	0	**0.001**
	Single	179 (14.1)	0	
	Multiple	76 (6)	23 (1.8)	
Hospitalization	**No**	1046 (82.6)	0	**0.001**
	Yes	198 (15.6)	23 (1.8)	
Radiology	**No**	73 (5.8)	0	**0.001**
	X-ray	557 (44)	0	
	CT	368 (29)	0	
	Multiple	112 (8.8)	23 (1.8)	
	USG	134 (10.6)	0	
Trauma	**Fall**	593 (48.6)	1 (0.1)	**0.001**
	FFH	393 (31)	8 (0.6)	
	In-VTA	124 (9.8)	5 (0.4)	
	Non-VTA	109 (8.6)	7 (0.6)	
	PI	13 (1)	0	
	GW	12 (0.9)	2 (0.2)	

FFH, Falling from high; GW, Gunshot wound; In-VTA, In-vehicle traffic accident; Non-VTA, Non-vehicle traffic accident; PI, Penetrating injury.

Plain radiographs are extremely important in the initial evaluation of cases with fractures and dislocations as a result of trauma. The high resolution of computed tomography and

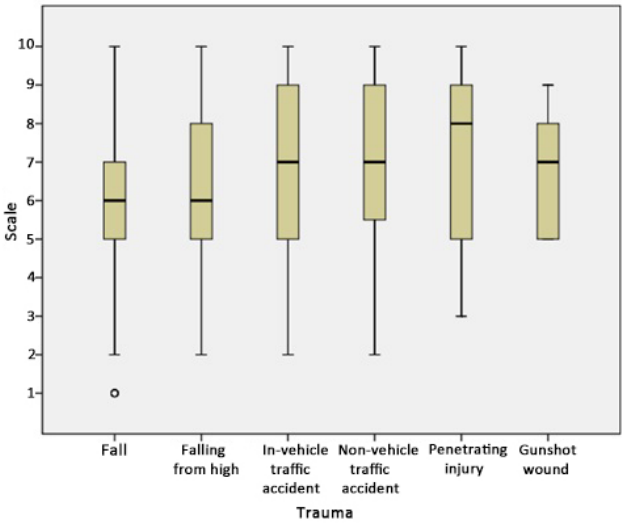

FIGURE 3. Numerical score distribution of pain severity.

TABLE 5. Correlation analysis of pain intensity with variables.

	Pain Severety	
	r	***P*-value**
Radiology	**0.061**	**0.030**
Scale	**0.928**	**0.001**
Age	-0.028	0.327
Gender	0.034	0.221
Consultation	**0.480**	**0.001**
Hospitalization	**0.400**	**0.001**
Analgesic	**0.697**	**0.001**
Trauma	**0.170**	**0.001**

the ability to obtain images in different planes can be used for advanced characterization of fractures [23]. Specificity and sensitivity were, respectively, 98%, 99% for magnetic resonance imaging; 96%, 89% for bone scintigraphy, and 94%, 96% for computed tomography [24]. In our study, radiological examination was not requested for patients who had no symptoms. Radiography was requested for patients with simple fractures and injuries; multiple imaging was requested for patients with multiple trauma, and abdominal and thoracic trauma; blood tests and USG were performed in the emergency follow-up of the patients, and CT was requested for patients with isolated thoracic and lumbar vertebra injuries.

Significant changes have occurred in the approach to pain management in the last decade. Understanding of pain physiology has suggested early, aggressive analgesic intervention for postoperative and trauma patients, in which the goal is not only to reduce pain discomfort, but also to stop the pain cycle triggered by the release of stress hormones. This cycle has been shown to cause a negative physiological response that can lead to significant complications, including infection, thrombosis,

and dysphoria during the recovery period. Therefore, appropriate analgesic intervention enables early mobilization, shorten hospital stay and reduces costs, as well as increasing patient satisfaction [25]. However, many studies have shown that both the dose and frequency of analgesics administered to patients admitted to the ED with pain are insufficient. For major trauma cases, pain management has traditionally not been a priority during the assessment and resuscitation of these patients. In fact, analgesics were discouraged by fear of masking, delaying or concealing, despite the lack of evidence in this regard [26]. Silka *et al*. found a rate of 53% and 38%, respectively, in two studies in which the general analgesic administration and analgesic use in trauma were evaluated. In addition, it was noted that the patient group with a pain scale of 5, patients with increased pain scores and patients with a score of 7-10 points were more likely to receive analgesics [27]. Zohar *et al*. put the trauma pain management protocol into practice in their study. In this study, the ED personnel used a pain estimation questionnaire based on a visual analog scale for pain assessment. They found that the implementation of this pain management protocol resulted in an improvement in patient and staff satisfaction, and a timely administration of analgesics to a greater number of patients [26]. Patients with severe trauma and fractures are more likely to receive analgesics. It showed that patients with such injuries were more likely to have analgesic therapy, even if the pain assessment tool was not traditionally used. Before the standard use of the pain scale, trauma patients received analgesia at a rate of 69% in cases of severe trauma and fractures [27].

In our study, non-steroidal anti-inflammatory drugs were used as analgesics in 43.6% of the patients. Analgesia was firstly applied in the first radiological imaging group, followed by the X-ray and CT groups. Among the types of trauma, analgesics were used most frequently in case of falls, and most frequently in the severe group among pain classifications. Although analgesics were applied, we think that the rate is fairly low compared to similar studies.

Detailed evaluation of the mechanism of injury and imaging findings is essential for accurate diagnosis and effective treatment. Morbidity and mortality rates of patients vary depending on the cause of trauma. Monitoring the cause of trauma and pain intensity is crucial for clinical correlation. Because pain is a subjective experience, clinicians have to take into account the patient's complaints when providing analgesic treatment. To accurately describe the morbidity and mortality of trauma, the severity of the injury must be characterized to allow objective comparisons between patient populations. Use of imaging systems more effectively thanks to the trauma mechanism in these trauma scores and the determination of pain sites will reduce the economic burden.

6. Study limitations

The main limitation of the study was that trauma patients' tolerance to pain is variable and their needs for immediate treatment limit the time frame to question the pain scale during pre-evaluation. In addition, patients tend to report higher pain in numerical scales used for pain grading. Lack of time during acute evaluation in trauma patients limited the application of different pain scale methods.

7. Conclusions

Trauma is the leading cause of undesired mortality and morbidity in the young and productive age group. According to the results we obtained from our study, pain assessment and appropriate use of analgesia in trauma patients in the emergency department direct the correct diagnosis and treatment of trauma. In trauma, accurate first intervention will reduce possible complications and workforce losses during recovery. There is still need for studies on new approaches and factors affecting the application of analgesia to trauma patients in the emergency department.

AUTHOR CONTRIBUTIONS

Figen Tunali Turkdogan and Abuzer Coşkun designed the study. Abuzer Coşkun collected the data. Figen Tunali Turkdogan analyzed the data. Figen Tunali Turkdogan analyzed the results and drafted the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the Local Ethics Committee of Cumhuriyet University Faculty of Medicine (date: 08.05.2012, no: 2012-05/02).

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CONFLICT OF INTEREST

The authors have no conflict of interest.

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