



Pressure Ulcer in Intensive Care Patients

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ABSTRACT

A pressure ulcer is defined as an injury to the skin and/or underlying tissues caused by pressure or friction. Pressure ulcers can cause significant economic losses to society, they can also increase individual morbidity. Since surgery and other approaches become important, especially in advanced stage pressure ulcers, it is important to know the risk factors that cause pressure ulcers as well as the factors that may cause it to progress. In this study, we will try to determine the frequency of pressure ulcers in the internal medicine intensive care unit of a training and research hospital in Turkey. We will also examine the relationship between factors that we think may increase the progression of pressure ulcers and pressure ulcer stages. In this descriptive and cross-sectional study, the files of 1224 patients who were treated in the internal medicine intensive care unit between 01/06/2022-01/06/2023 were retrospectively scanned. In the current study, it was determined that 22.39% of the patients hospitalized in the internal medicine intensive care unit had a pressure ulcer. Additionally, no statistically significant relationship was found between the pressure ulcer stage and the demographic, clinical and laboratory parameters of the patients ($p>0.05$). As a result, pressure ulcers continue to be an important problem for both individuals and society, despite the improvement in patient care. Since reducing pressure ulcers is a team effort, we think it is important for all stakeholders to work multidisciplinary.

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INTRODUCTION

A pressure ulcer is defined as an injury to the skin and/or underlying tissues caused by pressure or friction. Due to pressure ulcers, injuries may occur in various areas, not only the skin, but also the subcutaneous fat tissue, muscles and deeper tissues. Essentially, these ulcers occur as a result of long-term pressure of soft tissues in areas of the body with hard structures such as bones (1).

Pressure ulcers can cause significant economic losses to society, they can also increase individual morbidity. Considering this situation, it is clear that pressure ulcers are a very important problem for both society and individuals (2).

Patients in intensive care units are at risk of pressure ulcer formation for various reasons. Comorbidities of patients, immobilization, sedation, vasopressors, mechanical ventilation,

hemodynamic instability and nutritional status are the main factors that increase the risk. In fact, what causes pressure ulcer formation is the interaction of these factors rather than their individual effects (3,4). Apart from intensive care units, pressure ulcer development may also be common in physical medicine and rehabilitation, neurology and surgery clinics where immobilization is common and long-term hospitalizations are observed. Although pressure ulcer formation is common in other clinics, it is obvious that it is more common in intensive care unit patients. While the frequency of pressure ulcer formation is between 10-23% in other clinics, this rate goes up to 56% in intensive care units (5-8).

Pressure ulcers are difficult to treat. Pressure ulcer treatment can lead to significant losses in terms of both labor loss and cost. Therefore, the main management strategy should aim at

prevention. In terms of prevention, ensuring patient mobility and physiotherapy play an important role. Apart from this, it is important for various departments to approach this issue in a multidisciplinary manner to prevent pressure ulcers from occurring and reoccurring. (9-12). In their study, Paker et al. found that a strict follow-up protocol and cooperation between the plastic surgeon and the physical medicine and rehabilitation department could help prevent recurrence of pressure ulcers after surgery in spinal cord injury patients (13). Therefore, a multidisciplinary approach is important at every stage in the prevention and treatment of pressure ulcers.

There are many studies in the literature about pressure ulcers. In these studies, the incidence and risk factors of pressure ulcers were generally investigated. Studies investigating factors that may be related to the pressure ulcer stage in patients with pressure ulcers are not common (14,15).

For the reasons mentioned, pressure ulcers are very important for both individual and public health. In this study, we will try to determine the frequency of pressure ulcers in the internal medicine intensive care unit of a training and research hospital in Turkey. We will also examine the relationship between factors that we think may increase the progression of pressure ulcers and pressure ulcer stages.

Table 1. Distribution of patients with pressure ulcers according to sex, mortality status, vasoactive drug use, pressure ulcer region and stage.

Variables	n (%)	
Pressure ulcer	Yes	274 (22.39%)
	No	950 (77.61%)
Sex	n (%)	
	Male	146 (53.28%)
	Female	128 (46.72%)
Mortality status	Yes	168 (61.31%)
	No	106 (38.69%)
Pressure ulcer region	Sacrococcygeal region	162 (59.12%)
	Gluteal region	40 (14.60%)
	Malleolar region	27 (9.85%)
	Trochanteric region	19 (6.93%)
	Back region	14 (5.11%)
	Extremities	11 (4.01%)
	Occipital region	1 (0.36%)
Pressure ulcer stage	1	67 (24.45%)
	2	135 (49.27%)
	3	53 (19.34%)
	4	19 (6.93%)
Vasoactive drug use status	Yes	158 (71.82%)
	No	62 (28.18%)

Table 2. Analysis of patients with pressure ulcers according to age, BMI, APACHE II score, duration of mechanical ventilation and intensive care unit stay, and admission blood tests.

Variables	Median (minimum-maximum)
Age	74 (19-98)
BMI (kg/m²)	25.70 (14-64.90)
APACHE II score (mean±standard deviation)	26.49±8.50
INR	1.19 (0.78-9)
WBC (10*9/L)	12.48 (0.34-80.74)
HGB (g/dL)	9.90 (4.70-17.70)
Blood glucose (mg/dL)	137 (27-744)
Albumin (g/L)	25.25 (10.80-45.90)
Duration of stay on mechanical ventilation (day)	2 (0-87)
Duration of stay in intensive care unit (day)	9 (1-90)

Data are expressed as median (minimum-maximum) and mean±standard deviation. BMI: Body mass index, APACHE II: Acute physiology and chronic health evaluation II, INR: International normalized ratio, WBC: White blood cell, HGB: Hemoglobin.

METHODS

In this descriptive and cross-sectional study, the files of 1224 patients who were treated in the internal medicine intensive care unit between 01/06/2022-01/06/2023 were retrospectively scanned. Patients were grouped according to the presence of pressure ulcer. In patients with pressure ulcer, age, body mass index (BMI), gender, mortality status, duration of stay in intensive care unit, duration of stay on mechanical ventilation, pressure ulcer area, pressure ulcer stage, and whether the patients used vasoactive medications were recorded. In addition, international normalized ratio (INR), white blood cell (WBC), hemoglobin (HGB), blood glucose and albumin levels were recorded from the routine blood tests taken at the time of hospitalization.

Apart from this, the acute physiology and chronic health evaluation II (APACHE II) score, which is a scoring system frequently used to predict mortality in intensive care unit patients, was calculated and recorded.

An attempt was made to determine whether there was a relationship between the recorded parameters and the pressure ulcer stage of the patients.

Statistical analysis

Shapiro Wilk test was used for assessing whether the variables follow normal distribution or not. Continuous variables were presented as median (minimum:maximum) and mean±standard deviation values. Categorical variables were reported as n(%).

According to the normality test results, ANOVA test or Kruskal Wallis test was used in comparison between two groups. When the number of groups was more than two, multiple comparison procedures were applied using the Dunn-Bonferroni approach to identify the group or groups that created the difference.

Table 3. Relationship between pressure ulcer stage and patient demographic, clinical and laboratory parameters.

	Pressure Ulcer Stage								p-value
	n	Stage 1	n	Stage 2	n	Stage 3	n	Stage 4	
Age	67	75 (19-96)	135	72 (42-98)	53	73 (53-92)	19	81 (47-94)	0.444 ^a
BMI (kg/m²)	54	25.20 (16.53-64.90)	110	26 (16-41.15)	41	25.70 (17.70-34.90)	15	25.70 (14-36.73)	0.678 ^a
Sex									
	Male	35 (52.24%)		80 (59.26%)		24 (45.28%)		7 (36.84%)	
	67		135		53		19		0.145 ^b
	Female	32 (47.76%)		55 (40.74%)		29 (54.72%)		12 (63.16%)	
Mortality status									
	Yes	41 (61.19%)		83 (61.48%)		31 (58.49%)		13 (68.42%)	
	67		135		53		19		0.900 ^b
	No	26 (38.81%)		52 (38.52%)		22 (41.51%)		6 (31.58%)	
Vasoactive drug use status									
	Yes	33 (71.74%)		86 (75.44%)		28 (65.12%)		11 (64.71%)	
	46		114		43		17		0.548 ^b
	No	13 (28.26%)		28 (24.56%)		15 (34.88%)		6 (35.29%)	
APACHE II score	67	25.70±8.40	135	26.32±8.20	53	28.00±8.77	19	26.26±10.29	0.512 ^c
INR	67	1.21 (0.78-9)	135	1.19 (0.91-3.38)	53	1.19 (0.94-2.22)	19	1.19 (0.94-2.96)	0.937 ^a
WBC (10⁹/L)	67	11.98 (0.51-26.10)	135	12.85 (1.05-80.74)	53	12.48 (0.34-26.85)	19	14.75 (6.81-25.45)	0.108 ^a
HGB (g/dL)	67	9.80 (5.10-15.50)	135	9.80 (5.10-16.90)	53	9.90 (5.60-17.70)	19	10.40 (4.70-12.60)	0.939 ^a
Blood glucose (mg/dL)	67	121 (60-388)	135	146 (42-744)	53	129 (40-734)	19	140 (27-241)	0.076 ^a
Albumin (g/L)	67	25.90 (11.90-45.90)	135	25.50 (11.90-45.90)	53	23.80 (10.80-37.10)	19	25.60 (13.40-29.70)	0.232 ^a
Duration of stay on mechanical ventilation (day)	67	1 (0-50)	135	3 (0-87)	53	2 (0-55)	19	1 (0-28)	0.509 ^a
Duration of stay in intensive care unit (day)	67	7 (1-50)	135	9 (1-90)	53	10 (1-65)	19	5 (2-40)	0.269 ^a

Data are expressed as n(%), mean±standard deviation and median(minimum-maximum). a: Kruskal Wallis Test, b: Pearson Chi-Square Test, c: ANOVA Test

Pearson chi-square test was used for comparing categorical variables. SPSS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0, Armonk, NY: IBM Corp.) was used for statistical analysis and p value <0.05 was considered statistically significant.

RESULTS

In our study, it was found that 22.39% of the patients hospitalized in the internal medicine intensive care unit had pressure ulcer (Table 1).

Demographic characteristics of the patients, admission blood tests, APACHE II score, pressure ulcer stage and localization, vasoactive drug use status, mortality status of the patients, intensive care unit stay and mechanical ventilator stay are given in Table 1 and Table 2.

The relationship between the pressure ulcer stages of the patients and the variables examined is given in Table 3.

DISCUSSION

In our current study, it was determined that 22.39% of the patients treated in the internal medicine intensive care unit developed pressure ulcers. In a study conducted by Kiraner et al., it was found that 113 of 1074 patients treated in the intensive care unit for 1 year developed pressure ulcers (16). In a literature review examining the prevalence and incidence of pressure ulcers in intensive care patients, it was found that the prevalence of pressure ulcers varied widely between countries, ranging from 4% to 49% (17). In a study evaluating the incidence and risk factors of pressure ulcers in patients treated in adult intensive care units in Saudi Arabia, the frequency of pressure ulcers was found to be 39.3% (18). It is observed in the literature that the frequency of pressure ulcers varies greatly depending on countries, the unit where the patient is treated, and many factors. We think that this may be related to the development of the countries' health systems and preventive treatment strategies. We observed that pressure ulcer development was not common in our patients, according to the literature. We think that the early initiation of physiotherapy to patients and the training of nurses, doctors and allied health personnel on early prevention and treatment strategies are the factors that cause this situation.

In our study, it was determined that pressure ulcer formation was most common in the sacrococcygeal and gluteal areas in patients treated in intensive care units. In addition, in the current study, it was determined that stage 1 and stage 2 pressure ulcers were the most common. In a systematic review and meta-analysis evaluating pressure ulcers in hospitalized adult patients, the most common stages of pressure ulcers were determined to be Stage I (43.5%) and Stage II (28.0%). It was also found that the sacrococcygeal area, heels and gluteal area were most frequently affected (14). In a cross-sectional study on pressure ulcer prevalence and risk factors in Turkey, it was found that pressure ulcers were most common in stage 1 (48.3%) and the most affected region was the sacral region (37.3%) (19). There are different results on this subject in the literature. Nowadays, with the development of healthcare systems, pressure ulcers can be detected and treated in the early stages. In addition, it is common to see pressure ulcers, most commonly in the gluteal and sacrum, due to immobilization in patients hospitalized in intensive care units, physical medicine and rehabilitation or neurology clinics. The current results of our study are compatible with the literature.

In our study, no statistically significant relationship was found between the pressure ulcer stage and the parameters that we consider to be risk factors for pressure ulcers. In a study examining pressure injuries due to medical devices, an inverse relationship was found between the stage of pressure injury and

the patients' HGB, albumin and total cholesterol levels. Additionally, it was determined that there was a positive correlation between the duration of hospital stay and mental status. No relationship was found between age and BMI and pressure injury stage (20). In the literature, studies on pressure ulcers generally focus on prevalence, detection of risk factors in pressure ulcer formation, and treatment and prevention strategies. In our study, we examined the relationship between factors that we think may be related to pressure ulcers and the pressure ulcer stage. The number of studies on this subject is limited. We think that the results of the current study will be guiding for future studies.

There were some limitations in our study. First of all, the fact that it was a single center and retrospective study was the most important limitation. Apart from this, our patient population was heterogeneous as it consisted of patients followed in internal medicine intensive care units. However, the advantage of our study is that the factors affecting the pressure ulcer stage have been examined and there are a limited number of studies on this subject.

As a result, pressure ulcers continue to be an important problem for both individuals and society, despite the improvement in patient care. Since surgery and other approaches are gaining importance, especially in advanced stage pressure ulcers, it is important to know the risk factors that cause pressure ulcers as well as to know and eliminate the factors that may cause progression. Since reducing pressure ulcers is a team effort, we think it is important for all stakeholders to work multidisciplinary.

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Conflict of Interest

The authors declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.

Ethics

The study protocol was approved by the University of Health Sciences Bursa Yüksek İhtisas Training and Research Hospital Clinical Research Ethics Committee (Decision number: 2011-KAEK-25 2023/06-10).

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