



Factors Affecting Pressure Sores in Palliative Care Patients

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Abstract

Introduction: Determining the risks in terms of preventing the formation of pressure sores and the progression of existing wounds is very important in reducing mortality. In our study, we aimed to determine the factors affecting the formation of pressure ulcers and the stage of the wound in patients hospitalized in a palliative care center.

Methods: The material of our cross-sectional and retrospective study consisted of patients hospitalized in a palliative care center between January 2017 and February 2018. The age, gender, primary diagnosis, comorbidities, hemoglobin, hematocrit, lymphocyte, neutrophil, C-reactive protein, albumin, and prealbumin values, and NRS 2002 scores of the patients were recorded; and the relationship of these variables with pressure ulcer information was analyzed.

Results: Of the patients participating in our study, 277 (55.1%) were female, and 226 (44.9%) were male. According to the results of our study, the risk of pressure ulcers increases in patients over 65 years of age and in female patients. Having a cerebrovascular accident or dementia/Alzheimer's disease increases the risk of advanced wounds. The presence of hypertension or cardiovascular disease increases the risk of pressure ulcers. Diabetes and chronic kidney disease have not been found to be associated with wounds. Low albumin, hemoglobin, and hematocrit, and high lymphocyte levels are associated with advanced wounds. There was no statistically significant relationship between prealbumin, CRP, neutrophil levels, and the neutrophil/lymphocyte ratio and pressure ulcers.

Discussion and Conclusion: There is a strong relationship between the formation and progression of pressure ulcers and the diagnosis, nutritional status, presence of anemia, and hypertension. Taking precautions by being aware of the risks in elderly patients with chronic diseases and in need of care is of great importance in terms of preventing pressure ulcers, which increase morbidity and mortality.

Keywords: Nutrition; palliative care; pressure sore.

Pressure ulcers are defined by the European Pressure Ulcer Advisory Panel (EPUAP) as "regional damage to the skin and/or subcutaneous tissue, usually over a bony prominence, as a result of pressure"^[1]. Additionally, these wounds can sometimes occur due to pressure exerted on the skin by various materials or clinical instruments^[2]. This situation significantly affects the morbidity, length

of hospital stay, and mortality of patients. Pressure ulcers can cause severe pain, usually heal slowly, limit people's activities of daily living, and can lead to complications such as osteomyelitis and septicemia^[3]. Pressure ulcers play a significant role in the prognosis and quality of life of fragile patients, especially in intensive care and palliative care units^[4-6]. The presence of pressure ulcers increases

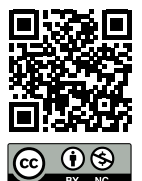
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mortality in patients with long-term hospitalization regardless of the wound's severity^[7].

There are many independent predisposing factors associated with pressure ulcers. Studies indicate that the main risk factor is restricted mobility and activity. Additionally, factors that impair tissue oxygenation or perfusion (e.g., diabetes mellitus, hypotension), poor general health of the patient, decreased sensation, advanced age, nutritional deficiencies, and related hematological and biochemical changes also contribute to the formation of pressure ulcers^[4, 8-11]. When all factors are evaluated together, pressure ulcers are more likely to occur in people whose general condition worsens as a result of advanced disease or whose life expectancy is shorter than 6 months^[12]. Due to restricted mobility, impaired tissue perfusion, dyspnea, edema, malnutrition, and decreased sensory perception due to analgesia, pressure ulcers are frequently encountered in intensive care and palliative care patients^[4,5,11,12].

In this study, we aimed to identify preventable factors in ulcer formation and to increase the awareness of healthcare professionals, patients, and patient relatives on this issue.

Materials and Methods

This cross-sectional and retrospective study was conducted with patients who were hospitalized in a palliative care center between January 1, 2017, and February 28, 2018. All patients over the age of 18, who were hospitalized in the palliative care center during the specified period, and whose data could be accessed in full, were included. The first hospitalizations of patients with more than one visit were taken into account. Patients younger than 18 years of age and whose data could not be reached were excluded.

Following the approval of the retrospective study permit, patients' age, gender, primary diagnoses for hospitalization (i.e., the condition chiefly responsible for the admission to the hospital), and comorbidities were recorded from their archived files. Hemoglobin, hematocrit, lymphocyte, neutrophil, C-reactive protein (CRP), albumin, and prealbumin values were obtained from the electronic medical record system. Information about the presence/stage of pressure ulcers was obtained from the archive of palliative care nursing. NRS 2002 scores of the patients were obtained from the Clinical Nutrition Unit records.

IBM SPSS Statistics 22 (IBM SPSS, Türkiye) program was used for statistical analysis. In the analysis of the data, the

mean±standard deviation (SD) was given if the continuous variables were normally distributed, and the median value was given if they were not normally distributed. Categorical variables were expressed as percentages. The suitability of the parameters to the normal distribution was tested with the Shapiro-Wilk test. In addition to descriptive statistical methods (mean, standard deviation, frequency), the Mann-Whitney U test was used for the comparison of quantitative data and the comparison of non-normally distributed parameters between two groups. In the comparison of qualitative data, the Chi-Square test, Fisher's Exact test, Fisher-Freeman-Halton test, and Continuity (Yates) Correction were applied. Spearman's rho correlation analysis was used to examine the relationships between parameters that did not conform to the normal distribution. Significance was evaluated at the $p < 0.05$ level. There is no conflict of interest in our study.

Results

Of the patients participating in the study, 277 (55.1%) were female and 226 (44.9%) were male. The age range was 21-96, with a mean of 72.85 years (72.85 ± 15.36). The demographic characteristics, primary diagnoses, comorbidities, and purposes of hospitalization in the palliative service of the patients are summarized in Table 1. Pressure sores were detected in 197 (39.2%) of the patients. Stage 2 pressure sores were the most common (13.7%), followed by stage 3 sores (13.6%) (Fig. 1).

Table 1. Distribution of Patient Properties

	n	%
Age Min-Max, Mean±SD	21-96	72.85±15.36
Gender		
Female	277	55.1
Male	226	44.9
Age groups		
<65	135	26.8
65-79	167	33.2
>79	201	40
Principle Diagnosis		
Malignancy	181	36
Cerebrovascular disease	103	20.5
Dementia/Alzheimer's Disease	79	15.7
Other	140	27.8
Hospitaization purpose		
Pain palliation	47	9.3
Nutritional palliation	347	69
Cardiopulmonary palliation	58	11.5
Wound care	51	10.1

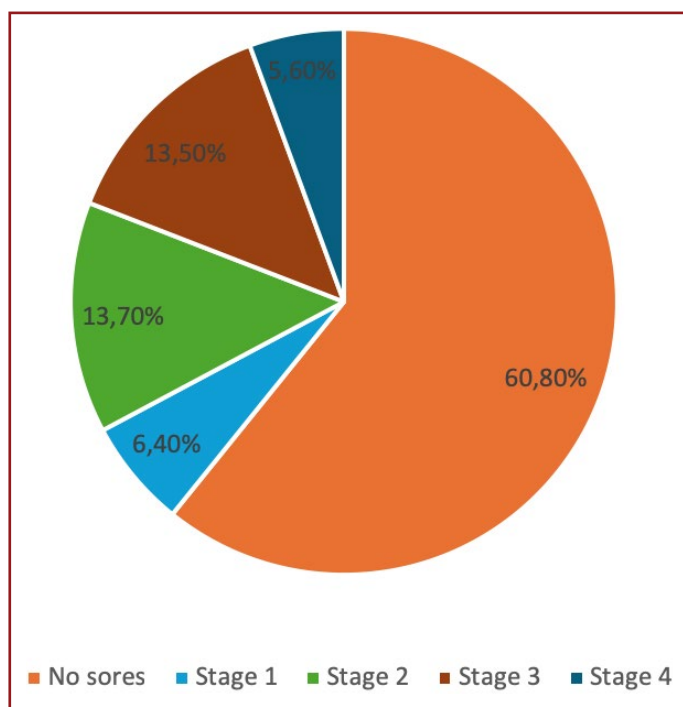


Figure 1. Pressure sore stages of participants.

Pressure sores in women were found to be statistically significantly more common than in men ($p=0.08$; $p<0.05$). In the analysis made according to age groups, pressure ulcers were more frequent in the group above 79 years of age ($p<0.05$). The incidence of wounds in patients with malignancy was found to be significantly lower than those without ($p=0.000$). The incidence of wounds in patients who had cerebrovascular disease, Alzheimer's, or dementia was significantly higher than in those who did not ($p=0.002$ and

$p=0.000$, respectively). There was no statistically significant difference in the incidence of wounds between those with and without other comorbidities ($p>0.05$).

The incidence of wounds in patients with hypertension or cardiac disease was found to be statistically significantly higher than those without ($p=0.001$ and $p=0.029$, respectively). In patients with lung or liver disease, the incidence was found to be statistically significantly lower than those without ($p=0.019$ and $p=0.001$, respectively). There was no statistically significant difference in the incidence of pressure ulcers between those with and without diabetes, thyroid disease, psychiatric disorder, pneumonia, urinary tract infection, and renal disease ($p>0.05$).

Forty-six (9.1%) of the participants in the study were admitted to the palliative care center with a referral from the intensive care unit, and the incidence of wounds in this group was 71.1%.

The wound stages of the patients who were not diagnosed with malignancy, had cerebrovascular disease, or were diagnosed with dementia/Alzheimer's were found to be statistically significantly higher than the other groups ($p=0.000$).

Wound stages of patients with hypertension were found to be statistically significantly higher than those of other patients ($p=0.000$). There was no significant difference in wound stage between patients with and without diabetes, heart disease, psychiatric disorder, pneumonia, urinary tract infection, or renal disease ($p>0.05$). The wound stage of those who were referred from the intensive care unit was found to be statistically significantly higher than the others ($p=0.000$).

Table 2. Relationship Between Nutritional and Inflammatory Markers and Pressure Sore Status

	Pressure sore		p
	Yes Mean±SD (Median)	No Mean±SD (Median)	
Albumin (g/dL)	2.72±0.58 (2.7)	2.58±0.5 (2.6)	¹ 0.022*
Prealbumin (mg/dL)	11.59±6.23 (11.0)	10.83±4.83 (10.0)	10.392
Hemoglobin (g/dL)	10.02±1.79 (9.9)	9.61±1.61 (9.6)	¹ 0.014*
Hematocrit (%)	31.25±5.61 (31.4)	29.79±4.67 (29.4)	¹ 0.002*
Gastrostomy status, n (%)			
No	278.0 (64.8)	151.0 (35.2)	² 0.000*
Yes	28.0 (37.8)	46.0 (62.2)	
Lymphocyte (1×10 ³ /μL)	1.37±0.81 (1.3)	1.48±0.73 (1.4)	0.028*
Neutrophil (1×10 ³ /μL)	8.0±6.28 (6.1)	7.22±3.88 (6.2)	0.965
Neutrophil/lymphocyte ratio	10.19±24.82 (5.2)	6.55±6.04 (4.7)	0.252
CRP (mg/dL)	8.04±1.79 (7.7)	8.13±1.91 (7.7)	0.421

¹Mann whitney U test; ²Chi-square test; * $p<0.05$.

Table 3. Relationship Between Nutritional and Inflammatory Markers and Pressure Sore Stage

Parameter	Pressure Sore Stages (r)	p
Albumin	-0.137	0.002*
Prealbumin	-0.077	0.092
Hemoglobin	-0.142	0.001*
Hematocrit	-0.164	0.000*
Lymphocyte	0.113	0.011*
Neutrophil	0.014	0.756
Neutrophil/Lymphocyte Ratio	-0.054	0.226
CRP	0.01	0.826

Analysis: Spearman rho correlation analysis* $p < 0.05$.

All patients included in our study were found to be at risk of malnutrition according to NRS 2002 screening. The albumin, hemoglobin, and hematocrit values of the patients without pressure ulcers were found to be statistically significantly higher than those with wounds ($p < 0.05$). In addition, the incidence of wounds in patients who did not undergo gastrostomy was found to be statistically significantly lower than those with gastrostomy ($p = 0.000$). While the lymphocyte values of those without wounds were statistically significantly lower than those with wounds ($p = 0.028$), there was no statistically significant difference in terms of neutrophil, neutrophil/lymphocyte ratio, and CRP parameters ($p > 0.05$) (Table 2).

A statistically significant, inverse relationship was found between wound stages and albumin, hemoglobin, and hematocrit levels. The relationship between prealbumin levels and wound stage was not statistically significant. A statistically significant correlation was found only with lymphocyte values among the inflammation markers ($p = 0.011$) (Table 3). But the correlation between parameters is very weak.

Discussion

According to the results of our study, the risk of pressure ulcers increases in patients over 65 years of age and in female patients. The most at-risk group in terms of ulcer formation in palliative care patients is those who have had a cerebrovascular accident and who are hypertensive. On the other hand, we determined that the presence of diabetes mellitus and the elevation of CRP were not significantly associated with wound formation or its stage.

In the literature, different results exist regarding the relationship between the formation of pressure sores and gender in patients. For example, in the study conducted by Efteli and Güneş with 122 patients in the Intensive

Care Unit of Ege University Hospital, pressure sores were more common in women, while in the study of Cremasco et al.^[13] on 160 intensive care patients in São Paulo, scar formation was more common in men^[13,14]. However, there are also studies suggesting that gender is a statistically insignificant factor^[15-17]. In our study, the rate of pressure sores in women was found to be statistically significantly higher than in men. This may be related to the high mean age of the female patients in our study. As in many studies, the risk of wound formation increases with advancing age in our study^[10,15,16,18-23].

Different results were obtained between the primary diagnosis of the patients and wound formation. In a study investigating the predictors of pressure ulcers in palliative care patients, it was found that cancer, dementia, and non-stroke neurological diseases increased pressure ulcer formation, while dementia was associated with less scar formation^[18]. In the study of Lyder et al.^[23], which analyzed pressure sores after hospitalization, it was observed that pressure sores were more common in cancer patients. In another study, it was shown that the most common diagnosis associated with pressure sores in intensive care patients was neurological diseases^[22]. In our study, there was an inverse relationship between cancer diagnosis and pressure sores. This can be explained by the fact that most cancer cases hospitalized in our palliative care service were younger, usually mobile, and without loss of sensation. In addition, according to our data, pressure ulcers were more common in patients with dementia, Alzheimer's, or cerebrovascular disease. We observed that the patients in this group who were hospitalized were generally older and had decreased sense of perception or expression.

According to the results of many studies, the risk of pressure ulcers is higher in patients with diabetes mellitus^[18,21-23,24,25]. However, there are other studies in which the presence of diabetes mellitus is not a significant risk factor, as in our study^[15,26,27]. Since the diabetes rate was relatively low in the patients included in our study, it can be thought that a statistically significant result was not obtained in terms of the wound relationship.

The most common comorbid condition in our patients was hypertension. In previous studies, it has been shown that hypotension increases the risk of pressure ulcers due to the deterioration of tissue perfusion and oxygenation^[26,28]. In our study, pressure ulcers were more common in patients with high blood pressure. The reason for this may be that nearly half of the patients were hypertensive, and hypertension may contribute in addition to the main

pathological condition that causes pressure sores.

In most of the studies, a statistically significant relationship has been established between the history of being hospitalized in the intensive care unit and pressure ulcers, and it has been shown that the risk of wounds increases as the length of stay in the intensive care unit increases^[10,14,24,26-28]. In our study, pressure sores increased significantly in patients hospitalized by referral from the intensive care unit. This situation can be caused by the general deterioration of hemodynamics of patients in need of intensive care, cerebrovascular injury, or immobility due to sedative drugs, infections involved in the process, or the destructive effects of inflammatory substances.

To the best of our knowledge, this is the first study in the literature to compare the stages of pressure ulcers in palliative care patients with the primary diagnoses and comorbidities of the patients. Having cerebrovascular disease and dementia or Alzheimer's disease, and high blood pressure were associated with more advanced pressure ulcers according to our results. Similarly, the wound stages of patients referred from the intensive care unit were more advanced than those of patients from other departments or home/nursing homes. It is also noteworthy that there was no statistically significant relationship between wound stage and diabetes mellitus.

There are many studies in which blood parameters are used to investigate the relationship between nutrition and pressure sores. Apart from albumin and prealbumin, the relationship between hemoglobin value and pressure ulcer has been investigated since it gives an idea about the nutritional status. There are studies showing that anemia increases the risk of wounds in both intensive care and palliative care patients^[28,29]. In our study, we found that low albumin, hemoglobin, and hematocrit levels were statistically significantly correlated with wound formation, which supports the literature. In addition; low levels in these parameters are also associated with the advanced stage of the wound.

There are studies showing an increased risk of pressure ulcers in patients with a high probability of malnutrition as a result of NRS 2002 screening^[30,31]. In our study, this parameter was not taken into consideration, since all of our patients had a high risk of malnutrition.

Another nutrition-related factor is the patient's gastrostomy status. Contrary to the intended purpose of application, studies in nursing patients have concluded that gastrostomization increases the risk of pressure ulcer formation or slows wound healing^[28,32]. In our study,

pressure ulcers were more common in patients who underwent gastrostomy, and it was observed that the wounds were at a more advanced stage in this group.

Patients with pressure sores have symptoms of inflammatory conditions such as high white blood cell count, high CRP, and low albumin^[33,34]. In our study, no statistically significant correlation was found between wound formation and wound stage and CRP elevation. However, to the best of our knowledge, there is no study in the literature examining the formation and stages of pressure ulcers, and the neutrophil, lymphocyte, and neutrophil/lymphocyte ratio in the blood. According to our data, there is a statistically significant relationship between lymphocyte levels and wound formation. In addition, lymphocyte levels were higher in patients with advanced wounds. The neutrophil and neutrophil/lymphocyte ratios did not have a significant relationship with wound formation or its stage.

Our study is conducted on the basis of data previously recorded by different units. Since the categories of "unstageable wound" and "deep tissue wounds" were not used during the classification of wounds, these wounds were considered as stage 4. This is one of the limitations of our study. The lack of precise data on the weight of the patients in the service records is another limitation. From this point of view, it seems necessary to have beds that measure body weight for the evaluation of immobile patients, especially in palliative care centers where critical patients with a high risk of malnutrition are followed.

Conclusion

There is a strong relationship between the formation and progression of pressure ulcers and the general health status of patients. It is observed that the risk of pressure ulcers is higher, especially in patients over 65 years of age, female, with neurological damage, immobile, malnourished, and anemic. Taking the necessary measures to prevent the formation of pressure sores or the progression of the existing wound may help increase the quality of life and reduce morbidity and mortality.

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Conflict of Interest: None declared.

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