RESEARCH ARTICLE

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Retrospective Analysis of Factors Affecting Mortality and Morbidity in Patients with Pressure Ulcers in the Palliative Care Unit

ABSTRACT

Objective: Pressure ulcers are conditions that result from the combination of multiple factors and have an impact on mortality and morbidity. In our study, the demographic data of patients, the majority of whom were elderly, along with the severity, stage, and etiological factors of pressure ulcers, were analyzed to assess their impact on mortality and morbidity.

Method: Our study is a cross-sectional and retrospective analysis. Data from 223 patients with pressure ulcers who were hospitalized in the Palliative Care Unit of Başakşehir Çam and Sakura City Hospital between April 1, 2021, and July 31, 2023, were reviewed. Patients' age, gender, length of stay, source of admission, discharge destination, nutritional status, laboratory values, and details related to pressure ulcers were recorded. The data obtained were analyzed using IBM SPSS version 25.0 (SPSS Inc., Chicago, IL, USA). A p-value of <0.05 was considered statistically significant.

Results: A statistically significant relationship was identified between the stage of the pressure ulcer and the number of pressure ulcers ($p<0.001$), as well as WBC ($p=0.012$), NEU ($p=0.004$), albumin ($p<0.001$), and prealbumin ($p=0.008$) values. Additionally, a statistically significant relationship was observed between the number of pressure ulcers and both the source of admission ($p=0.034$) and the discharge destination of the patients ($p=0.017$). A statistically significant difference was found between the source of admission and vitamin D levels ($F=4.111$, $p=0.018$). The discharge destination was also significantly associated with age (years) ($F=5.786$, $p<0.001$), the number of diseases ($F=5.613$, $p<0.001$), the number of medications used ($F=6.217$, $p<0.001$), and NRS2002 values ($F=3.324$, $p=0.011$).

Conclusions: In patients with pressure ulcers followed in the palliative care unit, advanced age, a higher number of pressure ulcers, the presence of infection, a history of intensive care unit stay, and low levels of albumin, prealbumin, and vitamin D are associated with increased mortality and morbidity.

Keywords: Pressure Ulcer, Holistic Medicine, Morbidity, Palliative Care.

Palyatif Bakım Servisinde Yatan Bası Yarası Mevcut Hastalarda Mortalite ve Morbidite Üzerine Etki Eden Faktörlerin Retrospektif Analizi

ÖZET

Amaç: Bası yaraları, birçok faktörün bir araya gelmesiyle oluşan ve mortalite ile morbidite üzerine etkili bir durumdur. Çalışmamızda, bası yarası olan çoğunluğu ileri yaş hastaların demografik verileri ile bası yarası şiddeti, evresi ve etiyolojide yer alan faktörlerin mortalite ve morbidite üzerine etkileri araştırılmıştır.

Yöntem: Çalışmamız kesitsel ve retrospektif tiptedir. Başakşehir Çam ve Sakura Şehir Hastanesi Palyatif Bakım Servisinde 01.04.2021-31.07.2023 tarihleri arasında yatarak tedavi gören ve bası yarası olan 223 hastanın verileri taranmıştır. Hastaların yaş, cinsiyet, yatış süresi, nakil alındığı yer bilgisi, taburcu edilen yer bilgisi, nutrisyon durumu, laboratuvar değerleri ve bası yarası ile ilgili bilgileri kaydedilmiştir. Elde edilen veriler IBM SPSS sürüm 25.0 (SPSS Inc., Chicago, Illinois, ABD) programı ile analiz edilmiştir. İstatistiksel analizlerde p<0.05 değeri anlamlı kabul edilmiştir.

Bulgular: Hastalarda mevcut olan bası yarası evresi ile bası yarası sayısı arasında($p<0.001$), WBC ($p=0.012$), NEU ($p=0.004$), albümin ($p<0.001$), prealbumin ($p=0.008$) değerleri arasında istatiksel anlamlı ilişki bulunmuştur. Bası yarası sayısı ile hastanın alındığı yer ($p=0.034$) ve hastanın taburcu edildiği yer arasında ($p=0.017$) istatistiksel olarak anlamlı bir ilişki saptanmıştır. Hastanın alındığı yer ile D vitamini düzeyleri arasında istatistiksel olarak anlamlı bir fark saptanmıştır ($F=4.111$, $p=0.018$). Hastaların taburcu edildiği yer ile yaş (yıl) ($F=5.786$, $p<0.001$), hastalık sayısı ($F=5.613$, $p<0.001$), kullanılan ilaç sayısı ($F=6.217$, $p<0.001$) ve NRS2002 değerleri ($F=3.324$, $p=0.011$) arasında arasında istatistiksel olarak anlamlı bir ilişki saptanmıştır.

Sonuç: Palyatif bakım servisinde takip edilen bası yarası mevcut hastalarda, ileri yaş, bası yarası sayısının fazla olması, enfeksiyon, yoğun bakım yatışı öyküsü, albümin, prealbumin ve D vitamini düşüklüğü mortalite ve morbidite ile ilişkilidir.

Anahtar Kelimeler: Bası Yarası, Bütüncül Tıp, Morbidite, Palyatif Bakım.

INTRODUCTION

The European Pressure Ulcer Advisory Panel (EPUAP) defines a pressure ulcer as "localized damage to the skin and/or underlying tissue, usually over a bony prominence, resulting from sustained pressure or pressure in combination with shear forces"(1). Pressure is the most critical factor in the development of pressure ulcers. Conditions that increase pressure on tissues or reduce tissue sensitivity to pressure accelerate the formation of pressure ulcers (2). Particularly in the elderly population, neurological diseases, spinal cord injuries, cerebrovascular events, and prolonged surgical procedures significantly contribute to pressure ulcer development due to their association with immobility (3,4). Infections, inflammation, friction, moisture, shear forces during transfers, poor general health, advanced age, malnutrition, anemia, edema, and diabetes are also recognized as factors that facilitate the development of pressure ulcers (4,5).

Palliative care and pressure ulcer management require a highly specialized team. With the aging population, the demand for palliative care services is increasing, and pressure ulcers remain a significant concern for these patients(3). Identifying risk factors and implementing preventive measures are more cost-effective than treatment. The costs associated with managing severe pressure ulcers are substantially higher than those of preventive strategies (6).

Pressure ulcers are a major cause of mortality and morbidity among elderly patients. However, there are limited studies focusing on palliative care patients, and statistical data on pressure ulcers in our country remain scarce. This study aims to analyze the demographic characteristics of patients with pressure ulcers, investigate the factors influencing the development of pressure ulcers, and evaluate the effects of these factors on mortality and morbidity.

MATERIAL AND METHODS

This study is a retrospective cross-sectional analysis. Data from patients with pressure ulcers who were hospitalized in the Palliative Care Unit of Başakşehir Çam and Sakura City Hospital between April 1, 2021, and July 31, 2023, were reviewed retrospectively. The study included 223 patients with pressure ulcers. Patients' demographic characteristics, primary diagnoses, comorbidities, number and stages of pressure ulcers, length of hospital stay, discharge or transfer destinations, number of medications used, source of admission, nutritional risk score (NRS-2002), and biochemical test results were examined through the hospital system and nursing records. The relationships between these variables were analyzed. For patients with multiple pressure ulcers, the most severe stage of the pressure ulcer was considered for analysis.

Biochemical tests included hemoglobin (HGB), hematocrit (HCT), white blood cell count (WBC), neutrophil count (NEU), neutrophil-to-lymphocyte ratio (NLR), total protein, C-reactive protein (CRP), vitamin D, albumin, and prealbumin levels.

Ethics committee approval for the study was obtained from the Ethics Committee of Başakşehir Çam and Sakura City Hospital on October 2, 2023, with the decision number 225627113.

Statistical Analysis: All analyses were performed using IBM SPSS version 25.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were presented as median (min-max) and mean ± SD, while categorical variables were expressed as number (n) and percentage (%). Pearson correlation test was applied for correlation analysis, and Chi-Square test was used for categorical variables. Independent Samples t-test and One-Way ANOVA were used for comparing means, with Sidak test as the post-hoc test. A p-value of <0.05 was considered statistically significant.

RESULTS

The mean age of the 223 patients included in the study was 68.88 ± 16.25 years (min=18, max=97), with 66.4% (n=148) being 65 years or older and 33.6% (n=75) being under 65 years. Of the patients, 48.0% (n=107) were admitted from the ward, 27.8% (n=62) from the intensive care unit (ICU), and 24.2% (n=54) from home. Among these patients, 61.9% (n=138) were discharged to home, 25.6% (n=57) were transferred back to the ICU, 3.6% (n=8) were transferred to other wards, and 3.6% (n=8) were transferred to the physical therapy and rehabilitation (PTR) unit. Mortality (exitus) occurred in 5.4% (n=12) of the patients.

The frequency distribution of demographic and various variables related to the patients is shown in Table 1.

Table 1. Frequency distribution of demographic and various variables of patients (n=223)

Variables	n or Median (Min-Max)
Gender	
Female	103
Male	120
Primary disease	
Trauma	39
Infection	21
Malignancy	43
Neurological	93
Other	27
NRS2002	2.0 (0.0-6.0)
Number of diseases	2.0 (0.0-8.0)
Number of medications used	4.0 (0.0-10.0)

n=Number, Median=Median, Min=Minimum, Max=Maximum

The most common pressure ulcer stage observed among patients was Stage 2, comprising 26.5% (n=59) of cases, followed by unstageable ulcers at 22% (n=49), Stage 1 at 15.7% (n=35), Stage 3 at 14.3% (n=32), Stage 4 at 13.5% (n=30), and suspected deep tissue injuries at 8.1% (n=18). The average number of pressure ulcers per patient was 2.34 ± 1.81 (min: 1, max: 13).

A statistically significant difference was found between the pressure ulcer stages and the number of pressure ulcers (F=29.478, p<0.001). According to the results of the post-hoc analysis, Stage 1 pressure ulcers had significantly lower mean numbers of pressure ulcers compared to Stage 4, Suspected Deep Tissue Injury, and Unstageable Stage (p<0.001). Similarly, Stage 2 and Stage 3 pressure ulcers also exhibited significantly lower mean numbers compared to Suspected Deep Tissue Injury and Unstageable Stage. The highest average number of pressure ulcers was observed in the Unstageable Stage group (4.10±2.16), while the lowest average was in Stage 1 ulcers (1.03±0.17).

Table 2 shows the relationship between pressure ulcer stages and the number of pressure ulcers in patients.

When the pressure ulcer stages of the patients were compared with laboratory parameters, statistically significant differences were observed between the highest pressure ulcer stage and WBC values (F=2.990, p=0.012), NEU values (F=3.520, p=0.004), albumin levels (F=5.871, p<0.001), and prealbumin levels (F=3.247, p=0.008). Patients with Stage 1 pressure ulcers had higher albumin and prealbumin levels compared to other groups, while their WBC and NEU values were found to be lower than those in the other groups.

Table 2. Relationship between pressure ulcer stages and the number of pressure ulcers in Patients (n=223)

Variables	n	Mean±SD	p
Number of Pressure Ulcers			**<0.001**
Stage 1	35	1.03±0.17	
Stage 2	59	1.54±0.92	
Stage 3	32	1.78±1.10	
Stage 4	30	2.33±1.58	
Suspected Deep Tissue Injury	18	3.78±1.77	
Unstageable	49	4.10±2.16	

t=Independent Samples t-test, p<0.05

Table 3 shows the laboratory parameters that were found to be statistically significant with pressure ulcer stages in patients.

Table 3. Comparison of blood parameters by pressure ulcer stages in participants (n=223)

Variables	Stage 1 (n=35)	Stage 2 (n=59)	Stage 3 (n=32)	Stage 4 (n=30)	Suspected Deep Tissue Injury (n=18)	Unstageable (n=49)	p
WBC (x10³/µL)	7.87 ± 2.85	8.88 ± 3.85	8.63 ± 3.17	8.95 ± 3.3	9.62 ± 2.7	10.82 ± 4.95	0.012
NEU (x10³/µL)	5.68 ± 2.55	6.68 ± 3.76	5.72 ± 2.89	6.10 ± 2.75	6.98 ± 2.53	8.36 ± 4.59	0.004
Albumin (g/L)	3.16 ± 0.53	3.02 ± 0.49	2.99 ± 0.66	2.61 ± 0.42	3.11 ± 0.42	2.72 ± 0.58	<0.001
Prealbumin (mg/dL)	14.80 ± 6.16	12.78 ± 5.9	14.03 ± 6.11	10.57 ± 4.56	13.11 ± 5.70	10.55 ± 6.36	0.008

t = Independent Samples t test, p<0.05

A statistically significant difference was found between the number of pressure ulcers and the source of admission (F=3.424, p=0.034) as well as the discharge destination (F=3.069, p=0.017). Patients admitted from or discharged to the intensive care unit (ICU) had a higher number of pressure ulcers compared to other groups.

A statistically significant difference was found between the source of admission and vitamin D levels (F=4.111, p=0.018). Patients admitted from home had the highest vitamin D levels (14.39±10.38 ng/mL) compared to other groups. According to the Sidak post-hoc analysis, a statistically significant difference was observed between patients admitted from home and those transferred from the ICU (p=0.014). The lowest vitamin D levels were found in patients admitted from the ICU, with an average of 9.79±6.89 ng/mL.

Statistically significant differences were observed between discharge destinations and age (years) (F=5.786, p<0.001), the number of diseases (F=5.613, p<0.001), the number of medications used (F=6.217, p<0.001), and NRS2002 scores (F=3.324, p=0.011) when comparing the discharge destinations of patients with demographic data.

Table 4 shows the comparison of patients' discharge destinations with their demographic data.

Table 4. Comparison of Various Variables by Discharge Destinations of Patients (n=223)

Variables	ICU (n=57)	Exitus (n=12)	Discharged home (n=138)	To anaother war (n=8)	PTR (n=8)	p
Age (years)	70.81 ± 15.76	72.00 ± 10.95	69.78 ± 15.36	58.50 ± 23.42	45.63 ± 15.12	<0.001
Number of Diseases	2.60 ± 1.50	2.42 ± 1.93	2.63 ± 1.41	1.25 ± 1.28	0.50 ± 1.07	<0.001
Number of medications used	3.93 ± 2.24	3.00 ± 2.63	3.92 ± 2.21	1.25 ± 1.28	1.00 ± 1.93	<0.001
NRS2002	2.28 ± 1.53	2.75 ± 1.91	1.75 ± 1.37	1.88 ± 1.96	0.88 ± 1.13	0.011

Of the patients under 65 years old, 87.5% (n=7) were transferred to the physical therapy and rehabilitation (PTR) unit, while 75.4% (n=43) of patients aged 65 and older were transferred to the ICU. Among the patients transferred to the ICU (n=57), 45.6% (n=26) were those who were initially admitted to the palliative care unit from the ICU.

When the relationship between discharge destinations and blood parameters of patients was examined, statistically significant differences were observed in NEU (F=3.875, p=0.005), NLR (F=9.844, p<0.001), total protein (F=7.733, p<0.001), albumin (F=8.316, p<0.001), prealbumin (F=6.039, p<0.001), and vitamin D (F=2.902, p=0.023) levels.

Table 5 presents the blood parameters that showed significant differences based on the discharge destinations of the patients.

Table 5. Comparison of various laboratory variables by discharge destination in patients (n=223)

Variables	ICU (n=57)	Exitus (n=12)	Discharged home (n=138)	To another ward (n=8)	PTR (n=8)	p
NEU (x10³/μL)	7.77 ± 3.73	9.04 ± 5.60	6.13 ± 3.19	5.43 ± 2.26	6.61 ± 4.00	0.005
NLR	7.49 ± 5.86	15.68 ± 19.58	4.58 ± 4.50	4.01 ± 2.21	3.23 ± 1.72	<0.001
Total Protein (g/L)	57.40 ± 9.30	51.50 ± 7.13	61.38 ± 7.34	62.38 ± 7.15	66.63 ± 6.57	<0.001
Albumin (g/L)	2.67 ± 0.53	2.50 ± 0.57	3.04 ± 0.52	2.98 ± 0.50	3.39 ± 0.50	<0.001
Prealbumin (mg/dL)	11.02 ± 6.14	8.17 ± 4.93	13.07 ± 5.65	12.63 ± 6.72	19.75 ± 6.27	<0.001
Vitamin D (ng/mL)	9.32 ± 7.40	8.42 ± 4.23	13.29 ± 9.50	11.38 ± 5.80	14.75 ± 6.04	0.023

t = Independent Samples t-test, p<0.05

When examining the Pearson correlation analysis of the relationships between patients' demographic and blood parameters, a statistically significant positive correlation was found between the number of pressure ulcers and WBC values (r=0.328, p<0.001), NEU values (r=0.331, p<0.001), and CRP values (r=0.239, p<0.001).

DISCUSSION

In our study, the relationships between pressure ulcer stages, the number of pressure ulcers, and various clinical and laboratory parameters were examined. A positive correlation was found between the number of pressure ulcers and WBC, NEU, and CRP values. These values were highest in unstageable pressure ulcers. Patients with low vitamin D levels were found to have higher morbidity and mortality rates. Additionally, hypoalbuminemia and low prealbumin levels showed a negative correlation with the pressure ulcer stage, revealing the significant impact of malnutrition on mortality and morbidity.

The literature lacks sufficient studies on parameters such as CRP, procalcitonin, WBC, NEU, and NLR. Kurtoğlu et al. observed a significant increase in CRP values as the pressure ulcer stage progressed(7). Although our study did not find a correlation between CRP and pressure ulcer stages, an increase in CRP values was observed as the number of pressure ulcers increased. WBC and NEU values were related to the pressure ulcer stage and were highest in unstageable pressure ulcers. Similarly, NEU levels were highest in patients who experienced exitus and those transferred to the ICU. Although not statistically significant, a similar trend was observed for WBC and CRP levels. NLR values were higher in patients who experienced exitus compared to other groups, followed by those transferred to the ICU. These findings suggest that these parameters may influence both mortality and morbidity.

Studies investigating the relationship between vitamin D and pressure ulcers are limited. In a case-control study by Kalava et al., the authors suggested that more robust analyses with sufficient statistical power could demonstrate a relationship between vitamin D and pressure ulcers (8). In our study, vitamin D levels were found to be lowest in patients who experienced exitus, followed by those

transferred to the ICU. Patients admitted from the ICU had lower vitamin D levels compared to those admitted from home or other wards. These findings suggest that vitamin D may affect morbidity and mortality in patients with pressure ulcers, contributing valuable insights to the literature.

The literature indicates that patients with a history of ICU stay are at a higher risk of developing pressure ulcers (9,10). Similarly, in our study, patients admitted from and transferred to the ICU had the highest number of pressure ulcers. Moreover, most patients transferred to the ICU were originally admitted from the ICU. This highlights the significant impact of ICU admission history and the higher number of pressure ulcers on mortality and morbidity.

Advanced age has been identified as a major risk factor for pressure ulcer development in many studies (11,12). In our study, the predominance of patients aged 65 and older, as well as the higher average age of those transferred to the ICU or who experienced exitus, aligns with the existing literature.

As in Kıraner's study, our research also identified Stage 2 pressure ulcers as the most common among patients (13).

When the literature on nutritional parameters is examined, studies have identified hypoalbuminemia as a risk factor for wound development (14,15). In our study, albumin and prealbumin levels decreased as the pressure ulcer stage progressed and were lowest in patients who experienced exitus. These findings support the impact of albumin and prealbumin on both pressure ulcer development and mortality and morbidity. The limited literature on prealbumin makes its detailed evaluation in our study particularly valuable.

Finally, according to the NRS 2002 nutrition score, patients at risk of malnutrition are more likely to develop pressure ulcers (16,17). In our study, patients who experienced exitus had higher NRS 2002 scores, indicating severe malnutrition, followed by those transferred to the ICU. This underscores the role of nutrition and malnutrition in influencing mortality and morbidity in patients with pressure ulcers.

CONCLUSION

Pressure ulcers are largely preventable, making them a significant quality indicator for all healthcare institutions. Various factors contribute to the formation and progression of pressure ulcers, and these factors also affect mortality and morbidity in patients with pressure ulcers. Our study demonstrated that several factors influence mortality and morbidity in patients with pressure ulcers. These factors include advanced age, advanced stage pressure ulcers, the presence of multiple pressure ulcers, the number of comorbidities and medications, a history of ICU stay, vitamin D deficiency, nutritional disorders or malnutrition, and the presence of infection and inflammation.

It is crucial to thoroughly assess all risks and conduct a risk analysis when patients are admitted to palliative care. In addition to taking necessary physical precautions, addressing biochemical deficiencies, managing nutrition to prevent albumin and prealbumin deficiencies, and controlling existing infections are important to prevent the formation or progression of pressure ulcers. Such measures are expected to reduce the mortality and morbidity rates in patients.

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