



# Association Between Pressure Injuries and Nutritional Status in Patients Receiving Home Healthcare Patients

## Evde Sağlık Hizmeti Alan Hastaların Basınç Yaralanmalarının Değerlendirilmesi ve Beslenme Durumları ile İlişkisi

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### Abstract

**Aim:** Pressure injuries are commonly observed in home care patients. This study aimed to evaluate the presence of pressure injuries and the nutritional status of patients receiving home healthcare services, and to reveal the relationship between these two conditions.

**Material and Method:** A total of 81 patients with pressure injuries, followed in September 2023 by the Home Healthcare Unit of Kayseri City Training and Research Hospital, were evaluated in detail. Patients' demographic characteristics, presence of chronic diseases, and nutritional status were assessed. The Barthel Index of Activities of Daily Living and the Mini Nutritional Assessment-Short Form (MNA-SF) were applied. A p-value of <0.05 was considered statistically significant.

**Results:** The median age of patients with pressure injuries was 77 years (range: 15–97), and 45 (55.6%) were female. Pressure injuries were most commonly located in the sacral region (57 patients, 70.4%), with stage 2 being the most frequent (43.9%). Heel injuries were observed in 9 patients (11.1%), also predominantly stage 2 (66.7%). One patient (1.2%) had a pressure injury on the toes, which was stage 2. Sixty-two patients (76.5%) were completely dependent. According to the MNA-SF, 8 patients (9.9%) had normal nutrition, 39 (48.1%) were at risk of malnutrition, and 34 (42%) were malnourished. Malnutrition was significantly more prevalent in patients with sacral pressure injuries (p=0.043). Similarly, the risk of malnutrition was significantly higher in those with trochanteric pressure injuries (p=0.009).

**Conclusion:** The incidence of pressure injuries was higher in patients who were malnourished or at risk of malnutrition. In order to prevent pressure injuries in patients receiving home healthcare, early identification of malnutrition is essential. During this process, individualized diet planning and appropriate vitamin and mineral supplementation should be provided.

**Keywords:** Pressure injury, home health service, malnutrition, activities of daily living

### Öz

**Amaç:** Basınç yaralanmaları evde bakım hastalarında yaygın olarak görülmektedir. Bu çalışmada evde sağlık hizmeti alan hastaların basınç yaralanması varlığını ve beslenme durumlarını değerlendirmek; bu iki durum arasındaki ilişkiyi ortaya koymak amaçlanmıştır.

**Gereç ve Yöntem:** Kayseri Şehir Eğitim ve Araştırma Hastanesi Evde Sağlık Hizmetleri Biriminde 2023 yılı Eylül ayında takip edilen hastalardan basınç yaralanması olan 81 hasta ayrıntılı değerlendirildi. Hastaların demografik özellikleri, kronik hastalık varlığı, beslenme şekli sorgulandı ve Barthel Günlük Yaşam aktiviteleri indeksi, Mini Nutrisyonel Değerlendirme-Kısa Form (MNA-SF) ölçekleri uygulandı. p<0,05 istatistiksel olarak anlamlı kabul edildi.

**Bulgular:** Basınç yaralanması olan hastaların yaş ortancası 77 (15-97) idi. Hastaların 45'i (%55,6) kadındı. Sakrumda 57 (%70,4) hastada basınç yaralanması vardı ve en çok görülen evre 2 (%43,9) idi. Topukta 9 (%11,1) hastada basınç yaralanması vardı ve en çok görülen evre 2 (%66,7) idi. Ayak parmaklarında 1 (%1,2) hastada basınç yaralanması vardı ve evre 2 (%100) idi. Hastaların 62 (%76,5) tam bağımlıydı. MNA-SF tarama durumuna göre normal nutrisyon 8 (%9,9), malnütrisyon riski altında 39 (%48,1), malnütrisyonlu 34 (%42) hasta bulunmaktaydı. Özellikle sakrum bölgesinde basınç yaralanması olanlarda malnütrisyon anlamlı yüksekti (p:0,043). Trokanter bölgesinde basınç yaralanması olan hastalarda da malnütrisyon riski anlamlı yüksekti (p:0,009).

**Sonuç:** Sonuç olarak malnütrisyon ya da malnütrisyon riski olan hastalarda basınç yaralanması görülme oranı artmıştır. Evde sağlık hizmeti alan hastalarda basınç yaralanmalarının önlenmesi için malnütrisyonun erken dönemde tespit edilmesi gereklidir. Bu süreçte, hastaların bireysel ihtiyaçlarına uygun özel diyet planlamaları yapılmalı ve gerekli vitamin-mineral takviyeleriyle desteklenmelidir.

**Anahtar Kelimeler:** Basınç yaralanması, evde sağlık hizmeti, malnütrisyon, günlük yaşam aktivitesi



## INTRODUCTION

The term pressure injury (PI) was formerly referred to as “decubitus ulcer” or “bed sore.” In 2016, the National Pressure Ulcer Advisory Panel (NPUAP) in the United States replaced this terminology with pressure injury to better define skin and underlying tissue damage in immobile patients. The term ulcer only referred to open wounds, whereas injury includes both open and intact skin damage and emphasizes preventability. With appropriate care, up to 95% of pressure injuries are considered preventable.

<sup>[1,2]</sup> Despite this high preventability, pressure injuries continue to occur at significant rates globally and in Turkey. A Turkish study reported a PI incidence of 33.5%.

<sup>[3]</sup> PIs are defined as “localized damage to the skin and/or underlying tissue, typically over a bony prominence, as a result of pressure or pressure in combination with shear”.

<sup>[4]</sup> These injuries compromise skin integrity, increase the risk of infection, prolong hospitalization, reduce quality of life, and raise healthcare costs. The quality of care is critical in PI prevention. These injuries are frequently observed among home care patients. Factors such as poor oral intake, malnutrition, low body weight, and muscle wasting significantly increase the risk. Immobility, incontinence, and reduced muscle mass are also contributing factors.

<sup>[5]</sup> Approximately 95% of PIs occur in the lower half of the body. Around 65% affect the pelvic area and 30% the lower extremities. In supine patients, the most common sites are the sacrum (53.4%), heels (14.8%), and trochanters (12.5%). These injuries are prevalent in home care settings, especially among elderly patients. Malnutrition is frequent in this group and is defined by insufficient intake of energy and protein, weight loss, and low body mass index. It impairs wound healing and increases PI risk. Anorexia, dysphagia, and reduced appetite further contribute to nutritional deficits. Studies have shown that malnourished elderly individuals are nearly twice as likely to develop pressure injuries compared to well-nourished peers.<sup>[6]</sup> Preventing and managing PIs is an important healthcare quality indicator. The U.S. Agency for Healthcare Research and Quality notes that one in eight deaths is linked to pressure injuries resulting from malnutrition. Malnutrition, worsened by chronic illness and age-related factors like tooth loss, is a major contributor to morbidity and mortality. This study aims to assess the presence of pressure injuries and nutritional status in patients receiving home healthcare and to examine the relationship between these two factors.<sup>[7]</sup>

## MATERIAL AND METHOD

The institutional consent to perform the study was obtained from Kayseri Provincial Directorate of Health and the study was approved by the Ethics committee of Nuh Naci Yazgan University (Decision number: 2024/002-07 and Date: 12.02.2024). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

This descriptive, cross-sectional study included all patients with a documented pressure injury who were registered with the Home Healthcare Services Unit of Kayseri City Training and Research Hospital and received care in September 2023. A total of eighty-one eligible patients were enrolled. Demographic characteristics, chronic disease history, and nutritional patterns were recorded. Pressure injuries were evaluated according to the classification system of the National Pressure Ulcer Advisory Panel (NPUAP).<sup>[8]</sup> In addition, the researchers developed a patient information form based on a review of the relevant literature. This form was supplemented with the Barthel Index of Activities of Daily Living (ADL) and the Mini Nutritional Assessment–Short Form (MNA-SF) to assess functional and nutritional status, respectively.

Barthel Index of ADL. Originally developed by Barthel et al. and later revised by Shah et al.<sup>[9]</sup>, the Turkish validation was conducted by Küçükdeveci et al.<sup>[10]</sup> The scale assesses independence in ten basic daily activities (e.g., feeding, transfers, continence, mobility). Scores range from 0 (total dependence) to 100 (complete independence), categorized as total (0–20), severe (21–61), moderate (62–90), or slight (91–99) dependence, and full independence (100). MNA-SF. Revised by Kaiser et al., this six-item screening tool reliably classifies older adults as malnourished (0–7), at risk of malnutrition (8–11), or well-nourished (12–14), based on appetite, recent weight loss, mobility, acute illness or stress, neurocognitive status, and body mass index (BMI).<sup>[11,12]</sup>

## Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 21.0. Continuous variables were summarized as means±SD, medians, and ranges; categorical variables as counts and percentages. Normality was tested with Kolmogorov–Smirnov. Between-group comparisons used the Independent-Samples t-test for normally distributed data and the Mann–Whitney U test otherwise. In the comparison of three or more groups, One-Way ANOVA was applied for normally distributed data, while the Kruskal–Wallis test was used for data that did not follow a normal distribution. Categorical variables were compared with  $\chi^2$  tests. Pearson or Spearman correlation coefficients assessed associations between continuous variables, depending on distribution. A two-tailed  $p < 0.05$  indicated statistical significance.

## RESULTS

In September 2023, data from 573 patients under the care of the Home Healthcare Services Unit of Kayseri City Training and Research Hospital were reviewed. Among them, 81 (14%) were diagnosed with decubitus ulcers (DUs). The median age of these patients was 77 years (range: 15–97), and 55.6% ( $n=45$ ) were female. All patients had at least one chronic illness. The most common ulcer site was the sacral region

(70.4%), with Stage 2 being the most frequent stage (43.9%). Heel ulcers were observed in 11.1%, mostly Stage 2. Other locations included the trochanteric (13.6%), scapular (3.7%), and toe (1.2%) areas. The average number of ulcers per patient was  $1.39 \pm 0.58$ . No significant gender difference was observed in DU count ( $p=0.643$ ). Most patients (76.5%) were classified as totally dependent according to the Barthel Index, with a median score of 0 (range: 0–75). Nutritional assessment using the Mini Nutritional Assessment–Short Form (MNA-SF) showed that 9.9% had normal nutrition, 48.1% were at risk of malnutrition, and 42% were malnourished (median MNA-SF: 9). Malnutrition was significantly more prevalent among patients with sacral ulcers ( $p=0.043$ ) and those with trochanteric ulcers were significantly more likely to be at risk of malnutrition ( $p=0.009$ ). Among malnourished patients with sacral ulcers, most had Stage 2 injuries ( $p=0.020$ ). A positive correlation was found between Barthel score and MNA-SF score ( $p=0.007$ ,  $r=0.298$ ). While there was a weak negative correlation between Barthel score and number of DUs ( $p=0.102$ ), a statistically significant negative correlation was observed between MNA-SF score and number of DUs ( $p=0.002$ ,  $r=-0.343$ ). Age was positively correlated with the number of DUs ( $p=0.042$ ,  $r=0.226$ ).

**Table 1. General Data of Patients and Frequency of Pressure Injury**

	Number (n)	Percentile (%)	Mean $\pm$ SD/Median (min–max)
Age			77 (15–97)
Gender (F/M)	45/36	55.6/44.4	
Chronic Diseases			
Hypertension	40	49.4	
Cerebrovascular disease	32	39.5	
Diabetes	23	28.4	
Coronary artery disease	22	27.2	
PI			
PI Prevalence	81/573	14	
Number of PI per patient			$1.39 \pm 0.58$
PI Localization			
Sacrum	57	70.4	
Trochanter	11	13.6	
Heel	9	11.1	
Scapula	3	3.7	
Toes	1	1.2	
MNA Screening			
MNA Score			9 (1–13)
At risk of malnutrition	39	48.1	
Malnourished	34	42	
Normal	8	9.9	
Feeding Type			
Normal	39	48.1	
Oral Nutrition	31	38.3	
PEG	11	13.6	

SD: Standard Deviation; Min: minimum; Max: maximum; MNA: Mini Nutritional Assessment; PI: Pressure Injury; PEG: Percutaneous Endoscopic Gastrostomy

**Table 2: Mini Nutritional Assessment Screening Scores by Pressure Injury Location**

Region	Mean Score	Standard Deviation	p-value
Sacrum			
Yes (n=57)	9.25	2.382	0.001
No (n=24)	6.98	3.583	
Trochanter			
Yes (n=11)	9.36	1.286	0.074
No (n=70)	7.39	3.576	

**Table 3: Pressure Injury Status in Sacral and Trochanteric Regions Based on Mini Nutritional Assessment Screening**

Region	Nutritional Status	Normal Nutrition	At Risk of Malnutrition	Malnourished	p-value
Sacrum	Yes (n=57)	4 (7%)	24 (42.1%)	29 (50.9%)	0.035
	No (n=24)	4 (16.7%)	15 (62.5%)	5 (20.8%)	
Trochanter	Yes (n=11)	0 (0%)	10 (90.9%)	1 (9.1%)	0.009
	No (n=70)	8 (11.4%)	29 (41.4%)	33 (47.1%)	

**Table 4: Correlation Matrix between Age, Number of Pressure Injuries, Barthel Score, and Mini Nutritional Assessment Screening Score**

	Age	Number of Ulcers	Barthel Score	MNA Screening Score
Age	1	0.226 ( $p=0.042$ )	0.031 ( $p=0.786$ )	–0.091 ( $p=0.417$ )
Number of Ulcers		1	–0.183 ( $p=0.102$ )	–0.343 ( $p=0.002$ )
Barthel Score			1	0.298 ( $p=0.007$ )
MNA Screening Score				1

MNA: Mini Nutritional Assessment

## DISCUSSION

Pressure injuries are associated with factors such as immobility, aging, malnutrition, and chronic diseases.<sup>[13]</sup> These injuries significantly reduce quality of life, increase healthcare costs, and elevate mortality. Their prevalence is particularly high among elderly individuals who are hospitalized, live in nursing homes, or receive home healthcare services.<sup>[14]</sup> Therefore, identifying the contributing factors is essential for effective preventive strategies.

In this study, the dependency level, nutritional status, and clinical characteristics of pressure injuries in individuals receiving home healthcare services were examined. Literature indicates that among those receiving home care, the total dependency rate is 37%, the rate of nutritional product use is 32%, and the pressure injury prevalence is 12%.<sup>[15]</sup> In our study, all participants had pressure injuries, and total dependency was 76.5%, which is considerably higher. This can be attributed to the specific characteristics of the study population.

Regarding ulcer characteristics, our findings are consistent with previous studies. In the study by Bergquist et al.<sup>[16]</sup>, most ulcers were at Stage 1 or 2, commonly localized to the sacral and heel regions. Similarly, Özgenel et al.<sup>[17]</sup> reported sacral (43%), trochanteric (29%), and heel (8%) as the most common sites. In our study, 70.4% were sacral ulcers, and Stage 2 was the most frequent stage, confirming that the sacral region is the most vulnerable.

Nutritional status is a key factor in pressure injury development. The Pan Pacific Guideline recommends the use of the Mini Nutritional Assessment–Short Form (MNA-SF) for elderly individuals.<sup>[18]</sup> European data shows that 40% of hospitalized patients and 60% of those in nursing homes are at risk of malnutrition.<sup>[19]</sup> In a multinational study, malnutrition prevalence was 5.8% among community-dwelling elderly, 13.8% in nursing homes, and 38.7% in hospitals.<sup>[20]</sup> Similar results have been reported in Turkey.<sup>[21]</sup> Malnutrition prevalence is also notably high among patients receiving home healthcare services, largely due to advanced age, multiple comorbidities, and severe dependency. For instance, a 2023 study found that 49.7% of elderly patients under home healthcare were either malnourished or at risk of malnutrition.<sup>[22]</sup> Similarly, another 2023 study reported that 38.13% of home care patients were malnourished, while 37.81% were at risk.<sup>[23]</sup> In our study, malnutrition prevalence was 42%, and 48% were at risk, likely due to older age, high comorbidity, and severe dependency. These findings are consistent with previous studies in the literature, which have also reported high rates of malnutrition and nutritional risk among elderly patients receiving home healthcare services.

Aging is associated with an increased risk of pressure injuries, likely due to age-related skin changes, immobility, and the burden of chronic diseases.<sup>[24]</sup> In our study, all patients had at least one chronic illness, the median age was 77 years, and 76.5% were totally dependent, which may contribute to the observed frequency of pressure injuries.

While gender has not consistently shown a relationship with pressure injury development in the literature<sup>[25]</sup>, our findings were in line with this, showing no statistically significant difference between male and female patients.

The relationship between functional dependency and malnutrition is well-established. Cereda et al. demonstrated that malnutrition leads to decreased activities of daily living.<sup>[26]</sup> Our study found a significant positive correlation between MNA-SF and Barthel Index scores, suggesting that better nutrition supports independence. Conversely, malnutrition causes muscle loss and functional decline, leading to increased care needs and decreased quality of life.<sup>[20,27]</sup> This bidirectional relationship underscores the need for early, combined evaluation of functional and nutritional status.<sup>[28]</sup>

Immobility is a major pressure injury risk factor. Aydın and Mucuk noted a higher risk among individuals with dependency in daily living.<sup>[29]</sup> In our study, a weak negative but non-significant correlation was found between functional status and the number of pressure injuries.

Malnutrition has been reported as an independent risk factor for pressure injuries. Alhaug et al. found that individuals with malnutrition had a 2.5-fold increased risk.<sup>[30]</sup> Similarly, Bergquist-Berenger et al. reported a strong association between malnutrition, hypoalbuminemia, and the incidence of pressure ulcers.<sup>[31]</sup> Although our findings are consistent with those in the literature, causality cannot be confirmed due to the study design.

In our study, patients with pressure injuries located in the sacral region were more frequently malnourished, while those with injuries in the trochanteric region were more often at risk of malnutrition. These findings suggest that nutritional impairment may compromise tissue integrity and predispose certain anatomical areas to ulcer development. Cereda et al. reported that inadequate nutritional status delays wound healing and increases the risk of pressure injury formation.<sup>[32]</sup> In particular, protein-energy malnutrition reduces the resistance of the skin and soft tissues to pressure, thereby facilitating ulcer formation in high-risk regions such as the sacrum and trochanter.<sup>[33]</sup> Therefore, nutritional assessment plays a critical role in establishing clinical priorities based on the location of pressure injuries in affected individuals.

This study is subject to several limitations. First, as it was conducted exclusively among patients receiving home healthcare services from a single hospital, the generalizability of the findings is inherently restricted. Second, nutritional status was assessed solely using the MNA-SF, which relies on self-reported data and may therefore introduce measurement bias. Finally, the relatively small sample size further limits the external validity and applicability of the results to broader populations.

## CONCLUSION

Most patients were totally dependent, and 42% were malnourished, underscoring the importance of nutritional status as a significant risk factor for pressure injuries. Based on these findings, systematic nutritional assessment should be integrated into the routine care of home healthcare patients. Early identification of nutritional risk and timely, individualized nutritional interventions may contribute to the prevention and more effective management of pressure injuries. In this context, a multidisciplinary approach that addresses both functional and nutritional status is essential to improve patient outcomes and support quality of life.

## ETHICAL DECLARATIONS

**Ethics Committee Approval:** The study was carried out with the permission of Nuh Naci Yazgan University Ethics Committee (Date: 12.02.2024, Decision No: 2024/002-07).

**Informed Consent:** Because the study was designed retrospectively, no written informed consent form was obtained from patients.

**Referee Evaluation Process:** Externally peer-reviewed.

**Conflict of Interest Statement:** The authors have no conflicts of interest to declare.

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**Author Contributions:** All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.



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