ISSN 2458-8865 E-ISSN 2459-1505
www.fppc.com.tr
Family Practice & Palliative Care

Research Article

Comparison of the incidence of pressure ulcers among patients admitted to the palliative care service from different providers

Farklı sağlık hizmeti sağlayıcıları tarafından palyatif bakım hizmetine kabul edilen hastalarda bası yarası görülme sıklığının karşılaştırılması

Feridun Gürlek[a], Eyyüp Taşdemir[b], Ali Erol[b], Fatih Coşkun[b],

[a] Department of Allergy and Immunology, Bursa Yüksek İhtisas Training and Research Hospital, University of Health Science, Bursa, Türkiye

[b] Department of Internal Medicine, Bursa Yüksek İhtisas Training and Research Hospital, University of Health Science, Bursa, Türkiye

Abstract

Introduction: The aim was to evaluate the prevalence of pressure ulcers among centers providing palliative care.

Methods: This study was conducted among patients admitted to the palliative care center of the Health Sciences University Bursa High Specialization Training and Research Hospital between 2019 and 2020. Medical data of 217 patients who met the definition of palliative care patients admitted from intensive care, home, and wards were retrospectively scanned. Demographic data, diagnoses, chronic diseases, and characteristics of pressure sores of the patients were recorded.

Results: The incidence of pressure ulcers in palliative care patients admitted from intensive care is significantly higher than in patients admitted from home and wards.

Conclusions: In intensive care units, it is more difficult to monitor and care for patients who meet the definition of palliative care patients in terms of pressure ulcers compared to homes and wards. Providing this service to patients who meet the definition of palliative care, especially at home, is important for the prevention and treatment of pressure ulcers.

Keywords: Palliative care, pressure ulcers, healthcare providers

Öz

Giriş: Palyatif bakım veren merkezler arasındaki bası yarası görülme sıklığının değerlendirilmesi amaçlandı.

Yöntem: Bu çalışma Sağlık Bilimleri Üniversitesi Bursa Yüksek İhtisas Eğitim ve Araştırma Hastanesi palyatif bakım merkezine 2019-2020 yılları arasında kabul edilen hastalar arasında yapıldı. Yoğun bakım, ev ve servislerden kabul edilen palyatif bakım hastası tanımına uyan 217 hastanın tıbbi verileri geriye dönük olarak tarandı. Hastaların demografik verileri, tanıları, kronik hastalıkları ve bası yaralarının özellikleri kaydedildi.

Bulgular: Yoğun bakımdan kabul edilen palyatif bakım hastalarında bası yarası görülme sıklığı evden ve servislerden kabul edilen hastalardan anlamlı düzeyde yüksektir.

Sonuç: Yoğun bakımlarda palyatif bakım hastası tanımına uyan hastaların bası yarası açısından takip ve bakımları ev ve servislerle karşılaştırıldığında daha zordur. Palyatif bakım tanımına uyan hastalara bu hizmetin özellikle evlerde verilmesi bası yaralanmasının önlenmesi ve tedavisi açısından önemlidir.

Anahtar Kelimeler: Palyatif bakım, bası yaraları, sağlık hizmeti sağlayıcıları

Received	Accepted	Published Online	Corresponding Author	E-mail
August 6, 2024	November 18, 2024	March 20, 2025	Ali Erol	alierol625@gmail.com
Correspondence	Ali Erol. Mimarsinan Mah.Emniyet Cad. 16310 Yıldırım/Bursa, Türkiye			
	https://doi.org/10.22391/fppc.1528838			

Key Points

1. The incidence of pressure ulcers is increased in intensive care patients compared to other medical providers.
2. Stage 2 pressure ulcers are the most common stage seen by all medical providers.

Introduction

Pressure ulcers are a common health problem worldwide in hospitalized patients and elderly people with physical-motor limitations. It is essential to identify the factors affecting them in order to provide nursing care and prevent the development of pressure ulcers [1]. Pressure ulcers constitute a significant burden on the economy and society, affecting the global health system. In addition, the reported low healing rates suggest the severity of this condition. Skin wounds are generally classified as acute and chronic. The immune response plays an important role in acute wound healing. The activation of immune cells and factors initiates the inflammatory process, facilitates wound cleansing and contributes to tissue healing. However, dysregulation of the immune system during the wound healing process leads to chronic inflammation, chronic wounds and delayed healing. The microenvironment of a chronic wound is characterized by overexpression of inflammatory mediators such as TNF-α and IL-1β, increased activity of matrix metalloproteinases, high amounts of proinflammatory macrophages, and increased reactive oxygen species. In addition, chronic wounds are often complicated by bacterial biofilms that maintain the inflammatory phase. Continuous inflammation and microbial biofilms make healing of chronic wounds very difficult [2]. As is known, the general common feature of palliative care patients is that they are bedridden due to an advanced disease. Pressure sores (PS) are ulcerated wounds that are usually observed in patients who remain immobile and lying down for a long time, especially in areas of the body exposed to pressure [3,4]. However, it is known that they can develop in a short time in some cases, as is observed in non-ulcerated PS [5]. The National Pressure Ulcer Advisory Panel (NPUAP) defines a pressure sore as "a localized damage to the skin and underlying soft tissue, usually over bony prominences or in the area associated with a medical or other device, as a result of intense and/or prolonged pressure or pressure combined with friction". In addition to chronic pressure exposure, various reasons such as lack of care, nutritional deficiency, and the presence of chronic disease may also be predisposing factors for the formation of PS. Our aim is to compare the frequency of PS in places where this service is provided to patients receiving palliative care services, to reveal the possible differences between service providers and to discuss the importance of the service delivery factor in PS.

Today, after cardiovascular diseases and cancers, the third most costly disease is pressure ulcers. The mortality rate due to pressure ulcers is 2 to 6 times higher than other diseases, and 60,000 deaths occur annually due to complications [6]. In the United States, approximately 2.5 million hospitalizations are due to pressure ulcers [7]. In order to understand the prophylactic methods and disease process in pressure ulcers, counseling systems have been established for healthcare personnel in the USA and Europe [8]. Pressure ulcers cause increased palliative care costs due to decreased patient autonomy, increased risk of infection, pain, prolonged hospitalization, and additional surgical procedures [9]. In addition to the costs of treating pressure ulcers, the workload of nurses and staff increases by 50% compared to other patients after hospitalization [10].

In order to provide better healthcare services and reduce the incidence of pressure ulcers, it is important to examine the factors affecting the incidence in different service providers and also to combat early diagnosis and complications [11]. Systemic circulation disorders, lack of mobility, inotrope use in intensive care patients, and patients with high APACHE II scores are considered to be factors affecting the incidence of ulcers in different service providers. In addition, due to sepsis, prolonged hospitalization, intubated patients, and limited mobility, they have to stay in the same position for a long time, making them more prone to pressure ulcers in intensive care units [12]. Intensive care patients are also more likely to develop pressure ulcers due to lack of mobility and long-term hospitalization, so there is a direct relationship between the duration of hospital stay and the incidence of pressure ulcers [13]. Studies conducted to investigate the incidence of pressure ulcers worldwide are also the first stage of the plan to reduce the incidence of pressure ulcers and control the problem. Therefore, the aim of this article is to focus on the reasons that increase the risk of pressure ulcers in different services in a hospital environment, to try to reduce the incidence and indirectly the cost, and to determine strategies that can increase the quality of service delivery.

Methods

Our study is an observational retrospective study. A total of 217 patients hospitalized in the Bursa Health Sciences University Hospital Palliative Care Center between May 2019 and September 2020 were screened. The localization and stages of decubitus ulcers were recorded. The demographic data and chronic disease characteristics of the patients were also recorded. The staging of decubitus ulcers was performed according to the NPUAP and the European Pressure Ulcer Advisory Panel (EPUAP), while risk analysis was performed using the Braden Risk Scale.

The European Pressure Ulcer Advisory Panel (EPUAP) defined a pressure ulcer as "an area of localized damage to the skin and underlying tissue caused by pressure, friction, or a combination of these". The classification systems are summarized below: Stage I: erythema on intact skin. Stage II: partial thickness skin loss involving the epidermis, dermis, or both; the ulcer is superficial and clinically seen as an abrasion or blister. Stage III: full thickness skin loss including subcutaneous tissue damage or necrosis that may extend through the underlying fascia but does not extend beyond it. Stage IV: full thickness skin loss or tissue necrosis or damage to muscle, bone, or supporting structures [14]. According to the National Pressure Ulcer Advisory Panel (NPUAP), pressure ulcers are divided into four categories. Stage 1: Erythema of intact skin. Stage 2: Partial thickness skin loss with dermis exposed. Stage 3: Fat tissue seen in the ulcer and granulation tissue. Stage 4: Full thickness skin and tissue loss [15].

General informed consent was obtained from patients or relatives at the time of admission to the palliative care unit. Patients over the age of 18 with pressure ulcers were included in the study. As an exclusion criterion, patients with multiple hospitalizations due to pressure sores and patients with extensive skin tissue integrity such as extensive skin burns were not included. The definition of palliative care patient in our study defines patients who are in the last period of life or who have encountered a life-threatening condition and have reduced hope of recovery, are completely bedridden and are completely dependent on a caregiver for all daily needs. As a service provider, personal homes, public or private nursing homes and public or private care centers where patients are accommodated are grouped under the title of “home”, inpatient services in public or private hospitals are grouped under the title of “service” and intensive care units in public or private hospitals are grouped under the title of “intensive care unit

During the analysis process; descriptive statistics of the data of the participants were compared with other data of the service providers and patients. In this context; the mean, minimum, maximum, standard deviation and median values of the age variable defined as a continuous variable were examined, and the frequencies and rates of the variables of gender, diagnosis and pressure sore stage defined as categorical were examined.

Within the scope of relational analyses; One-Way Anova Test, which is a parametric difference test, was used in comparisons of three or more groups showing normal distribution, and appropriate Post Hoc Tests were performed to determine the source of the difference in cases where there was statistical significance. In other comparisons; Since the variables compared were categorical, the Chi-Square Test was used. In all analyses, the significance value (p) was accepted as 0.05, and if the p value was less than 0.05, the findings were considered statistically significant, and if the p value was greater than 0.05, the findings were considered statistically insignificant.

Within the scope of relational analyses; the relationships between the ages of the participants according to the service providers were examined with the One-Way Anova Test, and the relationships between the service providers and gender, diagnosis and pressure sore stages were examined with the Chi-Square Test. In this context, the findings obtained with the descriptive statistics

Ethical Approval

The study included patients hospitalized in the Bursa Health Sciences University Hospital Palliative Care Center between May 2019 and September 2020. Ethics committee approval was obtained with the protocol number 2011-KAEK-25 2021/09-04.

Results

Within the scope of this study, the demographic variables of gender and age of 217 participants followed up in the palliative care unit of Bursa Yüksek İhtisas Education and Research Hospital, and the types of diagnoses given to the participants, service providers and pressure sore stage variables were analyzed. Within the scope of descriptive statistics; 44.7% (n=97) of the participants were female, 55.3% (n=120) were male, the ages of the participants ranged from 18 to 98, the mean was 70.50, and the standard deviation value was 15.72. When the diagnoses given to the participants were examined; 17.1% (n=37) were Alzheimer's/Dementia, 36.9% (n=80) were Cerebrovascular Diease (CVD), 35.0% (n=76) were malignancy, 1.8% (n=4) were trauma, 6.0% (n=13) were chronic diseases, and 3.2% (n=7) were other diseases. The stages of pressure ulcers are as follows; It was observed that 45.2% (n=98) did not have PS, 11.5% (n=25) had stage 1, 24.4% (n=53) had stage 2, 17.1% (n=37) had stage 3 and 1.8% (n=4) had stage 4 PS. Finally, 47.9% (n=104) of the participants followed up in the palliative care unit were admitted to our clinic from home, 14.3% (n=31) from the ward and 37.8% (n=82) from the intensive care unit. The findings are given in Table 1.

Table1. Distribution of descriptive characteristics of patients by place of origin

		Place of Origin				
		Total (n=217)	**Home (n=104; 47.9%)**	**Service (n=31; 14.3%)**	**Intensive Care (n=82; 37.8%)**	
		n (%)	**n (%)**	**n (%)**	**n (%)**	**p**
Age (year)	Mean ± SD	70.5 ± 15.72	72.3 ± 13.7	70.5 ± 13.6	68.1 ± 18.4	**[a]0.213**
	Median (Min-Max)	74 (18-98)	75 (24-93)	74 (33-90)	72 (18-98)	
Sex	**Woman**	97 (44.7)	52 (50.0)	11 (35.5)	34 (41.5)	**[b]0.273**
	Man	120 (55.3)	52 (50.0)	20 (64.5)	48 (58.5)	
Diagnosis	**Alzheimir/ Dementia**	37 (17.1)	18 (17.3)	8 (25.8)	11 (13.4)	**[c]0.001**
	CVD*	80 (36.9)	25 (24)	5 (16.1)	50 (61)	
	Malignite	76 (35)	52 (50)	17 (54.8)	7 (8.5)	
	Trauma	4 (1.8)	1 (1)	0 (0)	3 (3.7)	
	Chronic Disease	13 (6)	6 (5.8)	0 (0)	7 (8.5)	
	Other	7 (3.2)	2 (1.9)	1 (3.2)	4 (4.9)	
Decubitus Stage	**of Absent**	98 (45.2)	68 (65.4)	14 (45.2)	16 (19.5)	**[c]0.001**
	Stage 1	25 (11.5)	13 (12.5)	3 (9.7)	9 (11)	
	Stage 2	53 (24.4)	14 (13.5)	8 (25.8)	31 (37.8)	
	Stage 3	37 (17.1)	8 (7.7)	4 (12.9)	25 (30.5)	
	Stage 4	4 (1.8)	1 (1)	2 (6.5)	1 (1.2)	

*** CVD**: Cerebrovascular Event. **Mean**: Mean, **SD**: Standard deviation

[a]Oneway ANOVA Test [b]Pearson Ki-Kare Test [c]Fisher Freeman Halton Exact Test **p<0,01

According to the correlational analysis findings; there was a statistically significant relationship between the diagnoses given to the service providers and the stages of the pressure sores ($p<0.05$), and there was no statistically significant relationship between the service providers and age and gender ($p>0.05$). When the relationships with the diagnoses given to the participants were examined; It was seen that the most malignancy diagnoses were made in the participants coming from home (52 (50%), while the least trauma diagnosis was made (1 (1.0%); the most malignancy diagnoses were made in the participants coming from the ward (17 (54.8%); none of the participants were diagnosed with trauma or chronic disease; the most CVD diagnoses were made in the participants coming from the intensive care unit (50 (61%); the least trauma diagnoses were made in 3 (3.7%). When the relationships with the stage of pressure sores were examined; it was seen that 68 (65.4%) of the participants coming from home, 14 (45.2%) of the participants coming from the ward and 16 (19.5%) of the participants coming from the intensive care unit did not have pressure sores; the most common pressure sores were stage 2 pressure sores in all service providers, and the least common pressure sores were stage 4 pressure sores in all three service providers. The fact that there is no statistically significant relationship between the other variables and the service providers means that there is no difference according to where the participants come from, the age and gender of the participants. Since there is no statistically significant relationship between the service providers and the age variable, which is considered as a continuous variable, there is no need to conduct an additional Post Hoc Test.

Discussion

In our study, we found decubitus ulcers in 54.2% of patients hospitalized in our palliative care unit. However, the incidence of decubitus ulcers is quite variable in the literature [16,8]

The incidence of PS can be seen as 0.4- 38% in acute care units, 2.3- 23.9% in long-term care units, up to 17% in home care centers, and up to 6% in rehabilitation centers [17]. In our study, the rate of stage 1 and above PS in palliative care patients admitted from intensive care is 80.5%. This rate is significantly higher when compared to the rate of PS in admissions from home and wards. The main reason for this may be the tendency of patients with advanced organ failure, mechanical ventilation, nutritional, circulatory disorders, and respiratory failure to PS. It is also known that patients admitted are mostly treated in intensive care with the diagnosis of CVD. CVD is a debilitating condition that causes long-term bedriddenness. Dinçer and colleagues reported that 61% of patients discharged from the palliative care service had PS [18].

In our study, PS was seen in 34.6% of patients admitted from home. It can be considered that these rates are relatively low because patients admitted from home had a diagnosis of malignancy. Because malignant patients do not spend a long period of bedridden. In our study, the rate of patients admitted from intensive care receiving a diagnosis of CVD was higher, while the rate of those admitted from home and from the service was higher. A statistically significant difference was found in the comparison made between the service providers in terms of PS stages ($p=0.001$; $p<0.01$). While the rate of stage 2 and stage 3 PS was higher in patients admitted from intensive care, the rate of not having PS was higher in those admitted from home and from the service. In a systematic study conducted by Çınar and colleagues in which they reviewed the studies published between 2005 and 2015 in order to determine the situation in our country; it was stated that the frequency of pressure ulcers varies between 15-65% [19].

Given that lack of mobility is one of the risk factors for the development of pressure ulcers in previous studies, patients in orthopedic wards are more likely to develop pressure ulcers. A study on orthopedic patients showed that 16% of patients with hip fractures also developed pressure ulcers [12]. The incidence of pressure ulcers in diabetic patients was found to be approximately twice as high as in non-diabetic patients [13].

Despite the increasing interest in PS over the past 20 years, the prevalence of PS has remained largely unchanged [20]. Xianghong Zhang and colleagues calculated the prevalence of PS from 1990 to 2019. Globally, the number of prevalent PS cases was 0.42 million in 1990 and the age-standardized prevalence rate was 12.6 per 100,000, while in 2019, 0.85 million prevalent PS cases were detected and the age-standardized prevalence estimate (per 100,000 population) was 11.3. The same study reported that the prevalence of PS in developed countries is higher than in underdeveloped countries [21]. A study from Spain reported that the prevalence of decubitus ulcers was 35% in elderly patients [22]. However, patients receiving palliative care are at a very high risk of developing additional cutaneous pathologies due to malnutrition, anorexia, cachexia, immobility, incontinence, anemia, metabolic changes, immunosuppression, anti-cancer treatments, and primary malignancies [23]. Bergstrom showed that more than 70% of high-risk patients develop pressure-related injuries [24].

As a result; Pressure ulcers are one of the leading medical problems in bedridden patients in our country and around the world. Pressure ulcers are an important palliative care component that has high treatment costs and also troubles caregivers. They are also the condition that most impairs patients' quality of life. They are difficult to treat and are often prone to complications. Preventing pressure ulcers is a much more appropriate approach than treating them once they have formed. Because even the treatment of stage 1 pressure ulcers can take months. Pressure ulcers can form quickly and can last for a long time. Intensive care units are palliative care service providers that should be especially careful in this regard. Using intensive care centers as palliative care service providers is riskier than other palliative care service providers in terms of pressure ulcers. It is important for the provision of palliative care services to be provided at home rather than in intensive care units and hospitals in terms of preventing and treating pressure ulcers.

Limitations

The single-center nature of the study is not suitable for generalizability. If it were a multicenter study, it could be a reference for prevalence studies with more data. In addition, if the relevant healthcare personnel did not have sufficient experience, they may have assessed and recorded the stage of patients' pressure sores differently, and a prospective study design could eliminate such a possibility. If patients were not assessed for pressure sores during visits, the incidence may be lower than expected, so palliative care patients should be routinely assessed for pressure sores.

Conclusion

In conclusion; pressure ulcers are one of the leading medical problems in our country and in the world. Pressure ulcer treatment is an important palliative care component that is costly and also disturbs caregivers. Preventing pressure ulcers is a much more appropriate approach than treating them after they occur. Pressure ulcers are more frequently seen in intensive care units, oncology and orthopedic services due to long-term hospitalizations. Different healthcare providers should pay attention to the fact that the risk of pressure ulcers may be high in patients who will remain immobile for a long time after hip surgery, patients with high inotropic needs and patients whose hospitalization period will be extended due to circulatory disorders. Patients should be evaluated for pressure ulcers in daily check-ups, frequent position changes should be made, the most appropriate operation method should be selected in order not to prolong the hospital stay of patients, more attention should be paid to antiseptics to prevent hospital-acquired infections and the blood sugar levels of diabetic patients should be strictly controlled. In addition, it is important to provide palliative care services at home instead of intensive care units and hospitals in terms of preventing and treating pressure ulcers.

Conflict of interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author Contributions		Author Initials
SCD	Study Conception and Design	FG,ET
AD	Acquisition of Data	FG,AE,ET
AID	Analysis and Interpretation of Data	FG,ET,AE,FC
DM	Drafting of Manuscript	FG,ET,AE,FC
CR	Critical Revision	FG,FC

Financial Support: No financial support was received for this article.
Acknowledgements: We would like to thank all authors and palliative service staff who contributed to the creation of this publication.
Prior Publication: The research article has not been presented at any congress or published in any journal before.

References

1. Afzali Borojeny L, Albatineh AN, Hasanpour Dehkordi A, Ghanei Gheshlagh R. The incidence of pressure ulcers and its associations in different wards of the hospital: a systematic review and meta-analysis. Int J Prev Med. 2020;5(11):171. https://doi.org/10.4103/ijpvm.ijpvm_182_19
2. Raziyeva K, Kim Y, Zharkinbekov Z, Kassymbek K, Jimi S, Saparov A. Immunology of acute and chronic wound healing. Biomolecules. 2021;11(5):700. https://doi.org/10.3390/biom11050700
3. Sibbald RG, Krasner DL, Woo KY. Pressure ulcer staging revisited: superficial skin changes & deep pressure ulcer framework. Adv Skin Wound Care. 2011; 24:571-80. https://doi.org/10.1097/01.ASW.0000408467.26999.6d
4. Thomas DR. The new F-tag 314: prevention and management of pressure ulcers. J Am Med Dir Assoc. 2007; 8:117-25. https://doi.org/10.1016/j.jamda.2006.12.013
5. Gefen A. How much time does it take to get a pressure ulcer? Integrated evidence from human, animal, and in vitro studies. Ostomy Wound Manage. 2008; 54:26-30. https://pubmed.ncbi.nlm.nih.gov/18927481/
6. Schindler CA, Mikhailov TA, Kuhn EM, Christopher J, Conway P, Ridling D, Scott AM, Simpson VS. Protecting fragile skin: nursing interventions to decrease development of pressure ulcers in pediatric intensive care. Am J Crit Care. 2011;20(1):26-34. https://doi.org/10.4037/ajcc2011754
7. Kottner J, Dassen T. Pressure ulcer risk assessment in critical care: interrater reliability and validity studies of the Braden and Waterlow scales and subjective ratings in two intensive care units. Int J Nurs Stud. 2010;47(6):671-7. https://doi.org/10.1016/j.ijnurstu.2009.11.005
8. Reddy M, Gill SS, Rochon PA. Preventing pressure ulcers: a systematic review. JAMA. 2006;296(8):974-84. https://doi.org/10.1001/jama.296.8.974
9. Claudia G, Diane M, Daphney SG, Danièle D. Prevention and treatment of pressure ulcers in a university hospital centre: a correlational study examining nurses' knowledge and best practice. Int J Nurs Pract. 2010;16(2):183-7. https://doi.org/10.1111/j.1440-172X.2010.01828.x
10. James J, Evans JA, Young T, Clark M. Pressure ulcer prevalence across Welsh orthopaedic units and community hospitals: surveys based on the European Pressure Ulcer Advisory Panel minimum data set. Int Wound J. 2010;7(3):147-52. https://doi.org/10.1111/j.1742-481X.2010.00665.x
11. Agrawal K, Chauhan N. Pressure ulcers: back to the basics. Indian J Plast Surg. 2012;45(2):244-54. https://doi.org/10.4103/0970-0358.101287
12. Keller BP, Wille J, van Ramshorst B, van der Werken C. Pressure ulcers in intensive care patients: a review of risks and prevention. Intensive Care Med. 2002;28(10):1379-88. https://doi.org/10.1007/s00134-002-1487-z
13. Cremasco MF, Wenzel F, Zanei SS, Whitaker IY. Pressure ulcers in the intensive care unit: the relationship between nursing workload, illness severity and pressure ulcer risk. J Clin Nurs. 2013; 22:2183-91. https://doi.org/10.1111/j.1365-2702.2012.04216.x
14. European Pressure Ulcer Advisory Panel. Guidelines on treatment of pressure ulcers. EPUAP Rev. 1999; 1:31-3.
15. Edsberg LE, Black JM, Goldberg M, McNichol L, Moore L, Sieggreen M. Revised National Pressure Ulcer Advisory Panel pressure injury staging system. J Wound Ostomy Continence Nurs. 2016;43(6):585-97. https://doi.org/10.1097/won.0000000000000281
16. Lyder CH. Pressure ulcer prevention and management. JAMA. 2003; 289:223-6. https://doi.org/10.1001/jama.289.2.223
17. Dorner B, Posthauer ME, Thomas D. The role of nutrition in pressure ulcer prevention and treatment: National Pressure Ulcer Advisory Panel white paper. Adv Skin Wound Care. 2009; 22:212-21. https://doi.org/10.1097/01.ASW.0000350838.11854.0a
18. Dincer M, Doger C, Tas SS, Karakaya D. An analysis of patients in palliative care with pressure injuries. Niger J Clin Pract. 2018;21(4):484-91. https://doi.org/10.4103/njcp.njcp_51_17

19. Çınar F, Kula Şahin S, Eti Aslan F. Evaluation of studies in Turkey on the prevention of pressure sores in the intensive care unit: a systematic review. Balıkesir Univ Saglik Bilim Derg. 2018;7(1):42-50.
20. Campbell KE, Woodbury MG, Houghton PE. Heel pressure ulcers in orthopedic patients: a prospective study of incidence and risk factors in an acute care hospital. Ostomy Wound Manage. 2010;56(2):44-54. https://pubmed.ncbi.nlm.nih.gov/20200445/
21. Pokorny ME, Koldjeski D, Swanson M. Skin care intervention for patients having cardiac surgery. Am J Crit Care. 2003;12(6):535-44. https://pubmed.ncbi.nlm.nih.gov/14619359/
22. Mervis JS, Phillips TJ. Pressure ulcers: pathophysiology, epidemiology, risk factors, and presentation. J Am Acad Dermatol. 2019;81(4):881-90. https://doi.org/10.1016/j.jaad.2018.12.069
23. Zhang X, Zhu N, Li Z, Xie X, Liu T, Ouyang G. The global burden of decubitus ulcers from 1990 to 2019. Sci Rep. 2021; 11:217-50. https://doi.org/10.1038/s41598-021-01188-4
24. Casimiro C, García-de-Lorenzo A, Usan L. Prevalence of decubitus ulcer and associated risk factors in an institutionalized Spanish elderly population. Nutrition. 2002; 18:408-14. https://doi.org/10.1016/s0899-9007(01)00805-x