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RESEARCH ARTICLE

Pressure Ulcers Prevalence and Potential Risk Factors Among Intensive Care Unit Patients in Governmental Hospitals in Palestine: A Cross-sectional Study

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Abstract:

Aim:

To determine the prevalence rate and the potential risk factors of pressure ulcers (PUs) among patients in the intensive care unit (ICU) departments of the government hospitals in Palestine.

Methods:

A quantitative, cross-sectional, descriptive analytical study was carried out in five government hospital intensive care units in four different Palestinian cities between September 27, 2017, and October 27, 2017. The data of 109 out of 115 (94.78%) inpatients were analyzed. The Minimum Data Set (MDS) recommended by the European Pressure Ulcer Advisory Panel (EPUAP) was used to collect inpatients' information.

Results:

The result of the analysis showed that the prevalence of pressure ulcers in the ICU departments was 33%, and the prevalence of PUs when excluding stage one was 7.3%. The common stage for pressure ulcers was stage one. It was also determined that the most common risk factors for the development of pressure ulcers were the number of days in the hospital, moisture, and friction.

Conclusion:

According to the recent studies in the Asian States, the prevalence of pressure ulcers in Palestine is considerably higher than in China and Jordan. However, it is still lower than the prevalence reported in comparable published studies in Western Europe. Increasing the staff's knowledge about PUs screening and preventive measures is highly recommended in order to decrease the burden of PUs.

Keywords: Pressure Ulcers, Risk Factors, Prevalence, ICU, MDS, EPUAP.

Article History

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1. INTRODUCTION

Pressure Ulcers (PUs) are a significant problem in healthcare. They do not only affect the quality of life, morbidity and mortality of patients, but they also have an impact on healthcare costs [1].

A pressure ulcer is described as a localized injury to the skin and/or underlying tissue, usually over a bony prominence, as a result of pressure or pressure in combination with shear and/or friction. PUs vary in size and severity of the affected tissue layer, ranging from skin erythema to damaged muscle and underlying bone [2 - 4].

A study conducted by Jiang in China shows that the prevalence rate of pressure ulcers was 1.58% (0.94-2.97%) [5], while the prevalence rate of PUs ranges from 8.8 - 53.2% in Europe in which the incidence rate ranges from 7- 71.6% [6].

There are different risk factors related to PUs development among ICU patients. Immobility and friction are important risk factors for PUs [2, 7, 8]. Malnutrition and Body Mass Index (BMI) are associated with pressure injury prevalence. Therefore, routine and formal assessment of both BMI and nutritional status are important to enable the identification of patients with high risk of developing PUs [8 - 10].

The days in hospital, skin moisture, and other neurological factors are significant risk factors for PUs development [11 - 13].

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On the other hand, protective methods can prevent PUs development. One method can be the use of dynamic surfaces which are found to be protective against PUs [14].

Although the studies on the prevalence of PUs in ICU departments are very limited, ICU patients' acquired PUs prevalence is significantly greater than that found in other patient groups. ICU patients are nearly four times more likely to develop PUs than non-ICU patients [15]. In Palestine, there is no study found on assessing the prevalence and risk factors of PUs, despite the importance of studies on the prevalence of PUs among hospitals' patients, especially in ICU. Thus, information about PUs prevalence and risk factors is very limited and cannot be obtained retrospectively in Palestine.

2. METHODS AND MATERIALS

2.1. Study Design

A cross-sectional study was used to identify the prevalence rate of PUs and potential risk factors associated with PUs development among ICU patients in Palestinian government hospitals.

2.2. Study Setting

The study was conducted in the Intensive Care Units (ICUs) of five governmental hospitals (Rafedia hospital, Al - Watani hospital, Darwish Nazal hospital, PMC hospital, and Alia hospital) in four different Palestinian cities.

2.3. Population and Sample

All patients were admitted to the ICUs departments between September 27, 2017, and October 27, 2017. The total population derived from five hospitals in four cities included 109 patients. The number of patients in Rafedia hospital was 29 (26.6%) patients, Al-Watani hospital was 9 (8.2%) patients, Darwish Nazal hospital was 14 (12.8%) patients, Palestinian Medical Complex (PMC) hospital was 45 (41.3%) patients and, finally, Alia hospital was 12 (11.0%) patients. All patients, 18 years or older, admitted to ICU departments were included, while patients who aged equal or less than 18 years, patients who did not accept participation, or patients who refused to sign informed consent, were excluded.

2.4. Data Collection

The researchers used data collection sheets that contained two sections. Section one contained the patient's characteristics such as age, gender, weight, height and BMI. The second section, based on the European Pressure Ulcer Advisory Panel (EUPAP) guidelines, contained the Risk assessment using the Braden Scale. The Braden Scale consists of six sub-scales: sensory perception, moisture, activity, mobility, nutrition, friction and shear. The classification system made by National Pressure Ulcer Advisory Panel (NPUAP) and EPUAP in 2009 is used in the recognition of pressure ulcers, including Stage I to Stage IV, the category of "unstageable", and "Suspected Deep Tissue Injury" (SDTI) [4, 16]. Each data collection member received training on data collection and PUs detection with the main aim of standardizing practices. Since the study focuses on PUs prevalence in ICU patients, if several PUs were

found on the same patient, only the most severe was considered. Unstageable pressure ulcers or suspected deep tissue injuries were included as a separate category.

Approval of Institutional Review Board (IRB) at An-Najah National University and Ministry of Health was obtained. Data collection from selected hospitals was conducted daily for one month. Before the assessment began, researchers explained the purpose of the study and received a consent form from each participant. Initially, all patients who were admitted to ICU were assessed to determine any abnormalities such as abnormal heat, redness, and erythema. The assessment was focused on bony prominence areas.

2.5. Statistical Analysis

All analyses were done with the software package SPSS 18.0. Descriptive analysis, mean, median, standard deviation, maximum, minimum, percentage and frequency were used. The Chi-Square test was used to present the relationship between risk factors and PUs development, in which the significance is 0.05 or less.

2.6. Ethical Considerations

Ethical approval by IRB (Institutional Review Board) at An-Najah National University and the Ministry of Health was obtained. The patient's caregiver/relative signed the consent form before the assessment began and a code number was used rather than the participant's name in order to maintain privacy.

Table1. Characteristics of the participants (N=109).

Variables		Frequency	Percent		
Gender	Female	60	55.0		
	Male	49	45.0		
Residency	Nablus	35	32.1		
	Qalqilia	14	12.8		
	Ramallah	43	39.4		
	Hebron	12	11.0		
	Tulkarem	4	3.7		
	Jenin	1	0.9		
Hospital	Rafedia	29	26.6		
	Al Watani	9	8.2		
	DarwishNazal	14	12.8		
	PMC	45	41.3		
	Alia	12	11.0		
Weight categories	Underweight	2	1.83		
	Normal	31	28.44		
	Overweight	46	42.20		
	Obese	30	27.5		
	Mean	SD	Median	MIN	MAX
Age (years)	54.7	21.0	55.0	19.0	105
Weight (Kg)	78.2	16.4	80.0	40.0	125
Height (cm)	169.0	8.4	170.0	145	188
BMI	27.3	5.2	27.1	13.0	42.9

BMI: Body Mass Index **SD:** Standard Deviation **MIN:** Minimum **MAX:** Maximum

PMC: Palestinian Medical Complex

3. RESULTS

3.1. General Data of Patients

Table 1 shows the characteristics of participants. Fifty-five percent of the participants were female, and most of the participants were from Ramallah (39.4%). In addition, most participants were from PMC hospital (41.3%). The mean age of participants was 54.7 years old and ranged from 19-105 years. The mean weight of participants was 78.2 kg, with a mean height of 169 cm and ranged from 145 – 188 cm. The mean BMI of participants was 27.3 and ranged from 13.0 – 42.9 for all participants. Most participants (42.2%) were overweight, whereas 28.44% had normal BMI. Furthermore, 27.5% of participants were obese and 1.83% of participants were underweight.

3.2. Medical Records of Participants

According to Table 2, most participants (66.1%) were medical cases, 17.4% of participants were surgical cases, 6.4% of participants were traumatic cases and 10.1% were gynecological cases. Also, 35.8% of participants had a medical history, 33% of participants had a surgical history, and all participants were on medication.

Table 2. Medical records of participants among ICU departments (N=109).

Variables	–	Frequency	Percent
Diagnosis	Medical	72	66.1
	Surgical	19	17.4
	Traumatic	7	6.4
	Gyna	11	10.1
Medical History	Yes	70	35.8
	No	39	64.2
Surgical History	Yes	36	33
	No	73	67
Medication	Yes	109	100

ICU: Intensive Care Unit.

3.3. The Prevalence of Pressure Ulcers

The results in Table 3 exhibit that out of the 109 patients, 36 patients have pressure ulcers.

The prevalence of PUs in the ICU department was 33%, and the prevalence of PUs when excluding Stage 1 was 7.3%.

Table 3. Prevalence of PUs of participants among ICU departments (N=109).

Variables	–	Frequency	Percentage
PUs	Yes	36	33
	No	73	77
PUs excluding stage 1	Yes	8	7.3
	No	101	92.6

PUs: pressure ulcers ICU: intensive care unit

3.4. Risk Factors for PUs

The results in Table 4 exhibit that most cases in the PU were male. The Chi-Square test exhibited no relation between PU and gender (p value=0.371).

The results also show that most participants who had PU exhibit normal or overweight BMI category, and the Chi-Square test exhibited no signs of BMI on the development of PU (p-value=0.157).

Most participants who had PUs were in dependent mobility category (80.6%), and the Chi-Square test on the relation between mobility category and PUs revealed no significant relation between PUs and mobility category (p-value =0.157).

Of patients with PUs, 44.4% were NPO, whereas 55.6% were on a diet, and the Chi-Square test showed no significant relation between PUs with nutritional status (p-value = 0.239).

Table 4 also shows that longer the stay of patients in the ICU department increased the risk of PUs development. The result of the Chi-square test revealed a significant relationship between increased days in hospital and PUs (p value=0.001).

The results also exhibit that 22 (55.6%) participants who had PUs had dry skin; Chi-square test results exhibited no significant relation between the moisture and PUs development (p-value = 0.071).

The results in Table 4 exhibit that 50% of patients who developed PUs were exposed to friction, while 85% of patients who did not develop PUs, were not exposed to friction. The results showed that there is a significant relation between PUs development and friction (p-value= 0.001).

Table 4. Risk factors for PUs of participants in ICU departments (N=109).

Variable	–	PUs		χ^2	P value
		Yes n (%)	No n (%)		
Gender	Male Female	22 (61.1) 14 (38.9)	38 (52.1) 35 (47.9)	0.79 ^a	0.37
BMI Categories	Underweight Normal Overweight Obese	1 (2.8) 13 (36.1) 13 (36.1) 9 (25.0)	1 (1.4) 18 (24.7) 33 (45.2) 21 (28.8)	1.96	0.57
Mobility*	Independent Dependent Paralysis	5 (13.9) 29 (80.6) 2 (5.6)	22 (30.1) 49 (67.1) 2 (2.7)	3.69	0.15
Nutritional Status*	NPO Diet	16 (44.4) 20 (55.6)	24 (32.9) 49 (67.1)	1.38	0.23
Day Inpatient	1-3 days 4-6 days 7-9 days 10-12 days >12 days	7 (19.5) 10 (27.8) 8 (22.3) 5 (13.9) 6 (16.8)	45 (68.4) 17 (23.2) 4 (5.5) 2 (2.7) 0 (0.0)	40.88	0.001
Moisture*	Normal Dry Wet	12 (33.3) 20 (55.6) 4 (11.1)	39 (53.4) 24 (32.9) 10 (13.7)	5.278	0.07
Friction*	No Yes	18 (50.0) 18 (50.0)	62 (84.9) 11 (15.1)	15.066	0.001
Ventilator	No Yes	21 (58.3) 15 (41.7)	65 (91.6) 8 (8.4)	14.854	0.001

P: Significance, χ^2 : Chi square, (*) these are Braden Scale variables

4. DISCUSSION

This study is aimed at identifying the prevalence rate and the potential risk factors of pressure ulcers among patients in the ICU departments of government hospitals in Palestine.

Although detection, assessment, and management of possible risks before an injury occurs are keystones of PUs prevention [17], identification of potential risks is also important. However, results from this study and others reviewed suggest that PUs development is aggravated by the sum of multiple, rather than single, risk factors in the one critically ill individual [18]. This study assessed the prevalence of PUs among ICU adult patients in Palestine. The prevalence of PUs was 33% and the prevalence of PUs higher than stage 1 was 7.34%. It also shows that days in the hospital, Mechanical Ventilators (MV), and friction were significant risk factors for PUs development. On the other hand, BMI, moisture and immobility did not have any statistically significant relation with PUs development.

A study applied in Jordan found that the prevalence of PU was lower (16%) than the prevalence of the present study (33%) among which a total sample of 295 participants had similar participants' characteristics such as gender and age; 58% of their samples were male and 42% were female. The mean age in their study was 49.1 years [19]. In the present study, the sample was 109 participants, of which 55% were female and 45% were male, the mean of age was 54.7 years. Another study done by Fiona Coyer found the prevalence of PUs to be 11.5% and prevalence of PUs > stage 1 to be 11.2% [20].

The prevalence of PUs in ICU of government hospitals in Palestine was higher than North America (22%) [21] and Jordan (16-29%) [19], and lower than Western Europe (49%) [1], and Australia (50%) [22].

Studies stated that malnutrition and BMI are associated with PUs prevalence [8 - 10]. Therefore, routine and formal assessment of both BMI and nutritional status are important to enable the identification of patients at high risk of PUs. The present study supports that the BMI was not associated with PUs development, whereas malnutrition could be the factor associated with skin injury prevalence [23]. It also demonstrated the limitations of BMI as a nutritional assessment measure. Morbid obesity is a significant and independent risk factor for PUs development. However, the clustering of nutritional risk factors (morbid obesity and malnutrition) substantially increases this risk. Therefore, routine and formal assessment of both BMI and malnutrition status are important to enable the identification of patients at high risk of PUs. The study conducted by Ness *et al.* (2017) revealed a significant relationship between BMI category and PUs development (p -value = 0.001), and exhibited that the underweight and morbidly obese have a higher risk of developing PUs [9], in contrast with results of the present study which show no relation between the BMI category and PUs developments (p -value = 0.579). The difference between results can be explained because only 1.83% of the samples were underweight and few cases were morbidly obese, which are insufficient to exhibit the effect of low weight and morbid obesity on PUs development.

The present study exhibits that 24.56% of patients had friction caused by the rank of the sheet, and friction had a significant effect on PUs development (p value= 0.001). In comparison, other studies revealed a significant relationship between friction and PUs category [2, 7, 8]. This may be

because friction between skin and other surfaces, such as bed sheets, causes loss of stratum corneum that leads to the loss of blood flow to the skin and cause ulceration.

PUs are likely to occur early in the hospital days as shown in Table 4 and may develop within the first week of hospitalization in ICU. Thus, there was a significant relationship between the increase in the number of days in the hospital with the development of PUs (p -value = 0.001). In comparison, a study conducted in Korea (2017) showed a relation between increase in the number of inpatient days and PUs developments [24], and a study conducted in the United States showed a relation between increase in the number of inpatient days and PUs developments (p -value < 0.05) [25]. These studies' results were consistent with the present study results that revealed that inpatient days are a risk factor for PUs development. These results can also be explained by suggesting that most critical cases stay for long periods in hospital and little attention is given to their nutrition and mobility, increasing pressure on the small points and decreasing perfusion of blood in these sites, resulting in an increased risk for ulceration.

While immobility is found to be an important risk factor for PU [2, 7, 8], the results of the present study exhibit that there is no significant relation between immobility and development of PUs (p -value = 0.157). This difference in the results can be explained by the fact that 75.2% of samples were conscious and 71.6% of the samples were independent of mobility. This means that most participants were able to change their position from time to time, leading to pressure relief on bony prominences, and improvement in the circulation of these sites, preventing PUs. Further results of the present study show that moisture has no relationship with PUs development (p -value = 0.071) in contrast with results of the study conducted in Germany, which exhibit a significant relation between PUs and moisture (p -value = 0.010) [12]. These differences may be due to the small sample size of the study which might be seen from the marginal level of p -value (p -value = 0.071).

The present study also demonstrated a significant relation between PUs development and mechanical ventilators (p -value = 0.001) in comparison to a study conducted in Spain, which found a significant relationship between MV and PUs development (p -value = 0.037) [26]. These results can be explained by noting that mechanically ventilated patients were immobile, suffered from malnutrition, and were exposed to friction. These factors increased pressure on the small points and decreased perfusion of blood in these sites, resulting in an increased risk for ulceration. There may be a gap between theory and practice regarding the care of ICU patients who are at high risk for PUs. Furthermore, in addition to the small sample size of the study, a meaningful comparison cannot be made between the various studies because of the different grading systems for PUs, different methods of data collection and population characteristics. Finally, the absence of standardized protocols in screening and managing PUs in the governmental hospitals in Palestine could be one of the main reasons for these inconsistent results.

CONCLUSION

The prevalence of PUs was 33% and most of them were in Stage I. When excluding Stage 1 PUs, the prevalence was 7.34%. Many factors affected PUs prevalence, including the number of days in the hospital, friction, and medical devices such as ventilators. Moisture, immobility, nutritional status, and BMI were not associated with PUs prevalence. In this study, change of position had little effect on PUs development which could be explained by the staff's lack of knowledge [27] and a lack of PUs risk screening led to changing positions for those who had already developed PUs, and missed those who were at risk. The study findings confirmed that the assessment and the prevention efforts and screening, in addition to increasing the staff's knowledge about PUs preventive measures in Palestine hospitals, must be improved in order to decrease the burden of PUs.

LIMITATIONS

Local studies led to small sample size. In addition, there was a difficulty controlling all hospitals which were selected, in which results were dependent on other nurses to collect data. Increase in budget related to long distances between hospitals and difficulty in observing patients several times a day were observed.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Potential participants were approached by the researchers after ethical approval had been granted by Institutional Review Board (IRB) at An-Najah National University and Ministry of Health.

HUMAN AND ANIMAL RIGHTS

No animals/ humans were used for the studies that are the basis of this research.

CONSENT FOR PUBLICATION

Before the assessment began, researchers explained the purpose of the study and received a consent form from each participant.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest, financial or otherwise.

AVAILABILITY OF DATA AND MATERIAL

These data represent doctors working in hospitals and are based on the ethical approval from An-Najah National University, IRB ethical committee. Data will be kept confidential and only findings will be submitted.

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REFERENCES

- [1] Hoogendoorn I, Reenalda J, Koopman BFJM, Rietman JS. The effect of pressure and shear on tissue viability of human skin in relation to the development of pressure ulcers: A systematic review. *J Tissue Viability* 2017; 26(3): 157-71. [http://dx.doi.org/10.1016/j.jtv.2017.04.003] [PMID: 28457615]
- [2] Coleman S, Gorecki C, Nelson EA, *et al.* Patient risk factors for pressure ulcer development: Systematic review. *Int J Nurs Stud* 2013; 50(7): 974-1003. [http://dx.doi.org/10.1016/j.ijnurstu.2012.11.019] [PMID: 23375662]
- [3] Haesler E. Prevention and treatment of pressure ulcers: Clinical practice guideline: Cambridge Media. 2014.
- [4] National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. 2014. <https://www.npuap.org/wp-content/uploads/2014/08/Updated-10-16-14-Quick-Reference-Guide-DIGITAL-NPUAP-EPUAP-PPPIA-16Oct2014.pdf>
- [5] Jiang Q, Li X, Qu X, *et al.* The incidence, risk factors and characteristics of pressure ulcers in hospitalized patients in China. *Int J Clin Exp Pathol* 2014; 7(5): 2587-94. [PMID: 24966973]
- [6] Moore Z, Johanssen E, van Etten M. A review of PU prevalence and incidence across Scandinavia, Iceland and Ireland (Part I). *J Wound Care* 2013; 22(7): 361-362, 364-368. [http://dx.doi.org/10.12968/jowc.2013.22.7.361] [PMID: 24159658]
- [7] Alderden J, Rondinelli J, Pepper G, Cummins M, Whitney J. Risk factors for pressure injuries among critical care patients: A systematic review. *Int J Nurs Stud* 2017; 71: 97-114. [http://dx.doi.org/10.1016/j.ijnurstu.2017.03.012] [PMID: 28384533]
- [8] Kottner J, Gefen A, Lahmann N. Weight and pressure ulcer occurrence: A secondary data analysis. *Int J Nurs Stud* 2011; 48(11): 1339-48. [http://dx.doi.org/10.1016/j.ijnurstu.2011.04.011] [PMID: 21601854]
- [9] Ness SJ, Hickling DF, Bell JJ, Collins PF. The pressures of obesity: The relationship between obesity, malnutrition and pressure injuries in hospital inpatients. *Clin Nutr* 2018; 37(5): 1569-74. [http://dx.doi.org/10.1016/j.clnu.2017.08.014] [PMID: 28890276]
- [10] Hyun S, Li X, Vermillion B, *et al.* Body mass index and pressure ulcers: Improved predictability of pressure ulcers in intensive care patients. *Am J Crit Care* 2014; 23(6): 494-500. [http://dx.doi.org/10.4037/ajcc2014535] [PMID: 25362673]
- [11] Brienza D, Krishnan S, Karg P, Sowa G, Allegretti AL. Predictors of pressure ulcer incidence following traumatic spinal cord injury: A secondary analysis of a prospective longitudinal study. *Spinal Cord* 2018; 56(1): 28-34. [http://dx.doi.org/10.1038/sc.2017.96] [PMID: 28895575]
- [12] Lechner A, Lahmann N, Neumann K, Blume-Peytavi U, Kottner J. Dry skin and pressure ulcer risk: A multi-center cross-sectional prevalence study in German hospitals and nursing homes. *Int J Nurs Stud* 2017; 73: 63-9. [http://dx.doi.org/10.1016/j.ijnurstu.2017.05.011] [PMID: 28535399]
- [13] van der Wielen H, Post MW, Lay V, Gläsche K, Scheel-Sailer A. Hospital-acquired pressure ulcers in spinal cord injured patients: Time to occur, time until closure and risk factors. *Spinal Cord* 2016; 54(9): 726-31. [http://dx.doi.org/10.1038/sc.2015.239] [PMID: 26782839]
- [14] Lima Serrano M, González Méndez MI, Carrasco Cebollero FM, Lima Rodríguez JS. Risk factors for pressure ulcer development in Intensive Care Units: A systematic review. *Med Intensiva* 2017; 41(6): 339-46. [http://dx.doi.org/10.1016/j.medin.2016.09.003] [PMID: 27780589]
- [15] Coyer F, Miles S, Gosley S, *et al.* Pressure injury prevalence in intensive care versus non-intensive care patients: A state-wide comparison. *Aust Crit Care* 2017; 30(5): 244-50. [http://dx.doi.org/10.1016/j.aucc.2016.12.003] [PMID: 28063724]
- [16] National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel. Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline. Washington, DC: National Pressure Ulcer Advisory Panel 2009.
- [17] Schoonhoven L, Bousema MT, Buskens E. The prevalence and incidence of pressure ulcers in hospitalised patients in the Netherlands: a prospective inception cohort study. *Int J Nurs Stud* 2007; 44(6):

- 927-35.
[http://dx.doi.org/10.1016/j.ijnurstu.2006.02.011] [PMID: 16620820]
- [18] Theaker C, Mannan M, Ives N, Soni N. Risk factors for pressure sores in the critically ill. *Anaesthesia* 2000; 55(3): 221-4.
[http://dx.doi.org/10.1046/j.1365-2044.2000.01216.x] [PMID: 10671839]
- [19] Tubaishat A, Anthony D, Saleh M. Pressure ulcers in Jordan: A point prevalence study. *J Tissue Viability* 2011; 20(1): 14-9.
[http://dx.doi.org/10.1016/j.jtv.2010.08.001] [PMID: 20880710]
- [20] Coyer F, Miles S, Gosley S, *et al.* Pressure injury prevalence in intensive care versus non-intensive care patients: A state-wide comparison. *Aust Crit Care* 2017; 30(5): 244-50.
[http://dx.doi.org/10.1016/j.aucc.2016.12.003] [PMID: 28063724]
- [21] Shahin ES, Dassen T, Halfens RJ. Pressure ulcer prevalence in intensive care patients: A cross-sectional study. *J Eval Clin Pract* 2008; 14(4): 563-8.
[http://dx.doi.org/10.1111/j.1365-2753.2007.00918.x] [PMID: 18462282]
- [22] Ballard N, McCombs A, Deboor S, *et al.* How our ICU decreased the rate of hospital-acquired pressure ulcers. *J Nurs Care Qual* 2008; 23(1): 92-6.
[http://dx.doi.org/10.1097/01.NCQ.0000303811.39737.b4] [PMID: 18281882]
- [23] Munro EL, Hickling DF, Williams DM, Bell JJ. Malnutrition is independently associated with skin tears in hospital inpatient setting- Findings of a 6-year point prevalence audit. *Int Wound J* 2018; 15(4): 527-33.
[http://dx.doi.org/10.1111/iwj.12893] [PMID: 29797534]
- [24] Moon M, Lee SK. Applying of decision tree analysis to risk factors associated with pressure ulcers in long-term care facilities. *Healthc Inform Res* 2017; 23(1): 43-52.
[http://dx.doi.org/10.4258/hir.2017.23.1.43] [PMID: 28261530]
- [25] Raju D, Su X, Patrician PA, Loan LA, McCarthy MS. Exploring factors associated with pressure ulcers: A data mining approach. *Int J Nurs Stud* 2015; 52(1): 102-11.
[http://dx.doi.org/10.1016/j.ijnurstu.2014.08.002] [PMID: 25192963]
- [26] Manzano F, Navarro MJ, Roldán D, *et al.* Pressure ulcer incidence and risk factors in ventilated intensive care patients. *J Crit Care* 2010; 25(3): 469-76.
[http://dx.doi.org/10.1016/j.jcrrc.2009.09.002] [PMID: 19879730]
- [27] Qaddumi J, Khawaldeh A. Pressure ulcer prevention knowledge among Jordanian nurses: A cross-sectional study. *BMC Nurs* 2014; 13(1): 6.
[http://dx.doi.org/10.1186/1472-6955-13-6] [PMID: 24565372]

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