

Incidence of pressure ulcers and its related variables among critically ill adult patients in Palestine

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ABSTRACT

The aim of this study is to measure the pressure ulcers (PUs) incidence and its related variables among adult intensive care patients. A prospective descriptive study was conducted among 140 patients admitted to an Intensive Care Unit (ICU) of governmental hospitals in Palestine to determine the incidence of PUs and to evaluate PU risk factors. Results were analyzed using SPSS program, the incidence of PUs among ICU patients was 30%. Crude and adjusted Odds Ratios (OR) with the 95% confidence interval (95% CI) were used, the related factors that significantly associated with PUs development were day in patient; OR was at 1.7 with 95% IC= (0.79-3.68), abnormal skin temperature; OR was at 9.09 with 95% IC= (2.38-34.70), skin moisture (wet); OR was at 4.85 with 95% IC= (1.02-23.06). The risk factors that were not significant but predicted (PUs) occurrence were age; OR was at 1.7 with 95% IC= (0.79-3.68), medical history; OR was at 2.2 with 95% IC= (0.25-20.12), level of consciousness; OR was at 6.2 with 95% IC= (0.50-77.56), ventilator; OR was at 18 with 95% IC= (0.03-95.99), defecation dependant; OR was at 53 with 95% IC= (0.76-37.08), diaper use; OR was at 12 with 95% IC= (0.02-4.16), edema; OR was at 5 with 95% IC= (0.42-58.81), change position; OR was at 2 with 95% IC= (0.00-38.18), matrix; OR was at 1.2 with 95% IC= (0.03-47.75). On the other hand, folly's catheter and change position number of nurses were not significant but can be considered as protective factors; OR was at 0.09 and 0.75, with 95% IC= (0.04-2.36) and (0.00-38.18) respectively. PUs occur highly in Palestinian ICU adult patients who have greater risk for developing PUs, thus would have its effect on varying the practice of Palestinian nurses in order to stop or decrease its development. The PUs related variables are regarded as strong factors for pressure ulceration. This study advances nursing knowledge in that it investigates additional risk factors for the development of PUs, and it identifies a set of factors that best predict PUs occurrence, which may contribute to the nurses' diagnostic reasoning in the ICU.

KEYWORDS: Pressure ulcers; incidence; intensive care; Palestine.

INTRODUCTION

Critically ill patients are at increasing risk of developing PUs, as; the most critical medical and surgical cases in the hospital setting were admitted or transferred to ICU. Most of ICU patients are sedated, ventilated, and/or bedridden for long periods [1].

That population in ICU requires care by highly trained nurses to minimize complications and improve outcomes [2]. As a consequence of the complexity of their care and the high burden of illness, it is logical to find the highest incidence of PU's were in critical care units. In fact, PUs occurrence in

the ICU population is cited as the highest among hospitalized patients, ranging from 13% to 45.5% [3] Critical care patients had a higher rate of severe PUs (Stage 3, Stage 4, or unstageable) as compared to the general hospital population [4].

Determining PU or pressure injury risk becomes challenging in this population, which can be considered as a significant problem in healthcare, because it affects the all; the patient and family in terms of suffering and burden, morbidity and mortality, and health care costs [5].

The incidence rate range from 7- 71.6% in Europe and the prevalence rate of PUs range from 8.8 - 53.2% in Europe [6].

There are lots of risk factors for PUs development among critical patients that are found in many international studies. Age, length of stay in the ICU, history of cardiovascular disease and kidney disease, infrequent repositioning, time of operation, emergency admission, mechanical ventilation and lower Braden Scale scores independently predicted the development of PUs [7]. Another study showed that besides smoking, age, length of stay, fecal incontinency, diabetes mellitus, anemia and trauma were significantly associated with PUs development [8].

Also, scores on the Braden Scale at admission, low body mass index, number of vasopressors, multiple surgeries during the admission, total surgery time, and risk for mortality were significant predictors of PUs [9].

Clinical variables associated with PUs occurrence were as following: fecal management systems, incontinence, acidosis, support surfaces, steroids, and additional equipment. Hypotension was one of the strongest predictors of PUs. Nursing interventions may address risk factors and improve patient outcomes [10]; but, unfortunately, a lot of nurses had poor level of PUs knowledge [11].

Multivariate logistic regression showed a model with risk factors associated with PUs development: sex, length of ICU stay, illness severity and nursing workload [12]. Respectively, multivariate analysis showed that 'emergency ICU patients' and 'infrequent turning' were related to PUs development [13].

However, PUs development remains a multifactorial phenomenon in critically ill persons[14], and despite the importance of identifying the incidence and risk factors of PUs development, information about PUs incidence and risk factors is very limited and cannot be obtained retrospectively in Palestine as searching through literature revealed very few studies mostly on prevalence, risk factors, and features of

pressure ulcers [15, 16]. The objective of the current study is to assess the pressure ulcers incidence and its related variables among adult intensive care patients.

METHODS

Study design and sample. This prospective, descriptive study was conducted in the ICU of governmental hospitals in North, Middle and East West Bank, Palestine. All patients admitted to this unit between February, 2018 and March, 2018 and who met the study criteria were eligible to participate. The inclusion criteria for the study were 18 years of age or older, an expected hospital stay of at least 7 days, absence of a PU on admission to the unit (patients with existing PUs at admission were excluded for the incidence measure), and a Braden score of <12, which indicates high risk.

Instruments. Data were collected using a two-part instrument: 1. Patient demographic data, including information on age, gender, body mass index, and time between admission and PU development, was recorded to determine PUs incidence, defined as the number of persons who develop a new PU within a particular time period in a particular population; 2. Braden risk assessment scale score.

Braden Risk Assessment Scale. The Braden Scale is one of the best known and widely used tools for evaluating PU risk in adults; its psychometric properties in assessing risk have been validated. The scale consists of six subscales: mobility, activity, sensory perception, skin moisture, nutrition state, and friction/shear. Each subscale is rated from 1 to 3 or 4, and the summative scores range between 6 and 23. A lower score indicates a lower level of functioning and, therefore, a higher level of risk for PU development. A cutoff score of <12 was used to designate patients as being at high risk for PU development [3].

Data collection. All information relating to the patient was recorded once daily from the day of admission to the unit until the development of a PU or until being discharged from the unit. Data about Braden scale were calculated and recorded by the research nurse. If a PU developed, it was assessed and

recorded. Data were de-identified for patient privacy.

Data analysis. The daily values for all variables were recorded and then their means were determined. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 18.0. The data were expressed as frequencies and percentages. Descriptive statistics were utilized in order to examine the distributions of demographic and clinic data of patients. The relationship between the risk factors and PU development was evaluated using univariate analysis. Risk was expressed as odds ratio with 95% confidence interval. $P < 0.05$ was considered statistically significant.

Ethical considerations. Study approval was obtained from IRB (Institutional Review

Board) at An-Najah National University. Informed written consent was obtained from all participants or their families.

RESULTS

During a period of two months, 140 patients were admitted to selected critical care units. Male patients were nearly dominant (58.4%). Most of the participants aged more than 54 years, and were either overweight or obese (37.9% and 22.1%, respectively). Moreover, the majority of patients (59%) were from North West Bank hospitals' ICU, and 60% of the patient admitted as medical cases. Furthermore, 62% of patients had medical past history and all of them (100%) were on medication. For more details see Table 1.

Table (1): Demographic data of the participants (N=140).

Variables		Frequency	Percent
Age	19-39 years	32	22.9
	40-54 years	32	22.9
	55-64 years	27	19.3
	65-74 years	22	15.6
	More than 74 years	27	19.3
Gender	Female	61	43.6
	Male	79	58.4
BMI	Underweight	3	2.1
	Normal	49	35.0
	Overweight	53	37.9
	Obese	31	22.1
	Morbid obesity	4	2.9
Hospitals region	NWB	83	59
	MWB	42	30
	EWB	15	11
Diagnosis	Medical	84	60
	Other	56	40
Past history	Medical	87	62
	Other	53	38
Medication	Yes	140	100

BMI: body mass index **NWB:** North West Bank **MWB:** Middle West Bank **EWB:** East West Bank.

The overall incidence of PUs among critically ill patients was 30%. Risk factors by using logistic regression revealed that day in patient, abnormal skin temperature, and skin moisture were significant ($p = 0.013$,

0.001, & 0.047, respectively) predictors (OR= 1.7, 9, & 4.8, respectively) of PUs development among ICUs patients. Moreover, although age, medical history, level of consciousness, ventilator, defecation dependent,

diaper use, edema, change position, matrix were not significant ($p > 0.05$) risk factors for PUs development but they can predict PUs occurrence among ICU patients (OR = 1.7, 2.2, 6.2, 18.53, 12, 5, 2, & 1.2, respectively).

On the other hand, Foley's catheter and change position number of nurses were not significant but protective factors (OR= 0.09 and 0.75, respectively) for PUs development among ICU patients.

Table (2): Risk factors of PUs among critically ill patients in ICU departments (N=140).

Variable	PUs		95% C.I. for OR	
	Sig.	OR	Lower	Upper
Age	0.167	1.71	0.79	3.68
Medical history	0.470	2.24	0.25	20.12
LOC	0.155	6.23	0.50	77.56
Ventilator	0.365	18.09	0.03	95.99
Foley's catheter	0.153	0.09	0.04	2.36
Defecation dependent	0.067	53.45	0.76	37.08
Diaper Use	0.211	12.34	0.02	4.16
Day in patient	0.013	1.71	1.12	2.61
Abnormal skin temperature	0.001	9.09	2.38	34.70
Skin Moisture (wet)	0.047	4.85	1.02	23.06
Edema	0.199	5.02	0.42	58.81
Change Position	0.890	2.00	0.00	38.18
Change Position Nurses No	0.913	0.75	0.05	11.05
Matrix	0.901	1.26	0.03	47.75

LOC: level of consciousness **PUs:** pressure ulcers.

DISCUSSION

Our findings reveal consistent results among some international studies, as well as marked variability or mixed results with another studies. The incidence of PUs among critically ill patients in intensive care units is more crucial than in the other units. This can be explained by the fact that these patients have several risk factors, namely immobility, sedation, ventilator dependency, and so on. The incidence of PUs among ICU patients in our study was 30% and was consistent with the results reported in literature where "Among all hospitalized patients, incidence rates of PUs are the highest among critically ill patients in the intensive care unit (ICU), ranged between 14% to 42%" [17-19]. This could be explained by the relative similar characteristics of population in these studies, firstly, older age of our population where 35% of the participants aged more than 65 years old which is consistent with the other surveys where the middle age ranges between 65 and 80 years. It is in fact probably for the same reason that the age has not been identified as a statistically significant risk factor for the development of PUs in our survey

($p=0>0.05$) in contrast to what was found in a study of Allman et al. [20] where age is found to be a significant risk factor for hospitalized limited activity patients, although, age can predict PUs occurrence among ICU patients (OR=1.7) in current study.

Secondly, male patients were the majority of the sample selected (58.4%), although the men seem more dominant than women in our survey (59% men against 44% women), this variable has not been identified as a significant risk factor. Actually gender is rarely reported in literature as a factor likely to have an effect on the forming of PUs but in some works we can find that females are more likely to develop PUs [21] or else male gender was independently predictive of PUs [12]. Therefore, the role of gender as a risk factor for PUs development requires further investigation.

In current study, the risk factors that significantly predicted PUs were day in patient (OR = 1.7), abnormal skin temperature (OR = 9.09), skin moisture (wet) (OR = 4.85). A prospective descriptive study [12] done to identify risk factors associated with PUs shows that length of ICU stay (LOS) inde-

pendently predicted risk factor for PUs development which is consistent with our findings, and similar results were found in a study done by Cox [22] as one of the predictors of PUs in adult critical care patients. A study done in Spain 2014 by Manzano et al. [23], take into consideration the duration of MV and length of MV before PUs as significant independent predictors of PU development (OR, 1.042; 95% CI, 1.005-1.080; $P = .024$). However, differentiated LOS prior to pressure injury development, is important, because development of a pressure injury increases the length of a hospital stay [20], so the authors recommended to specify the time of day in patient whether, it is before or after PUs occurrence in future studies that concern about PU's risk factors.

Body skin temperature was discussed in different studies, a high-quality study [24] found that fever was an independent risk factor for pressure injury development, which agree with our findings in the current study.

Moisture is included in skin/ pressure injury status due to its close relationship with skin condition. Studies [25, 26] revealed that moisture was emerged as an independent risk factor for PUs which is consistent with our findings that skin moisture (wet) (OR = 4.85) is a risk factors that significantly predicted PUs among ICU patients.

Protein-energy malnutrition, just as immobilization represents a favorable ground for the forming of PUs, it actually causes a loss in the fat layers and thus a loss of the role of pressure shock absorber, hypoalbuminemia with occurrence of edema and nutritional anemia and therefore a tissue anorexia at lower pressures. According to a literature review published in 2008 [27], these factors are the two strong elements predictive of the risk to develop PUs. Since some data were not available in our study, notably albumin levels, the nutritional assessment could not be done properly; which may hide edema as a significant risk factor for PUs but it can predict PUs occurrence among ICU patients (OR= 5).

Manzano et al. and Compton et al. [23, 25] identified length of mechanical ventilation as an independently predictive of PUs risk. Furthermore, mechanical ventilation

may be more indicative of severity of illness than oxygenation status because a patient could be stable from a respiratory standpoint but still require mechanical ventilation support due to other disease processes.

External skin factors were discussed by a study of Compton et al. [25]. The variables included external conditions (incontinence), assessment of the skin's appearance, and edema. Edema emerged from this study as risk factor, but was not independently predictive of PUs risk in another study [28]. A study recorded detailed examination of the skin's condition, found that centralized circulation, mottled skin, and reddened skin were independent predictors of PUs development, whereas livid skin and hyperemic skin did not emerge from the multivariate analysis [25]. These mixed results highlighted the importance of skin assessment in discovering PUs among ICU's patients.

On the other hand, our study results shows that Foley's catheter and change position number of nurses were not significant but protective factors (OR=0.09 and 0.75, respectively) which could be explained by the result of study conducted by Cremasco et al. [12] that increased nursing workload was a slightly protective factor.

LIMITATIONS

A major limitation of current study was a small sample size. In addition, difficulty controlling all hospitals which were selected, in which results were dependent on other nurses to collect data and increase in budget related to long distances between hospitals.

CONCLUSION

Patients admitted to the ICU have greater risk of developing PUs. The incidence of PUs does exist in Palestinian ICUs adult patients, thus would have its effect on varying the practice of Palestinian nurses to stop or decrease its development. These risk factors are regarded as strong predictors for pressure ulceration. This study advances nursing knowledge in that it investigates additional risk factors for the development of PUs and it identifies a set of factors that best predict their occurrence, which may contribute to the nurses' diagnostic reasoning in the ICU.

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