

# Prevalence and Risk Factors of Pressure Ulcers in Hospitalized Patients in Beni Suf Governorate of Egypt

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## ABSTRACT

**Background:** pressure ulcers are a leading cause of serious complications among bed-ridden population with an incidence rate of 10.0 to 25.9%. Thus, it was crucial to examine the relation between the prevalence and risk factors of pressure ulcers among hospitalized patients in Beni Suf Governorate of Egypt. **Purpose:** To examine the relation between the prevalence and risk factors of pressure ulcers among Hospitalized patients in Beni-Suef governorate of Egypt. **Subjects and Methods:** A cross sectional study was conducted on 400 patients of both genders, aged between 25 and 65 years and selected from the intensive care unit of Beni Suf's governmental hospitals that covered all municipal divisions of the governorate. Risk of pressure ulcers were assessed by sociodemographic variables, Braden risk assessment scale, clinical characteristics of patient illness and physical examination to assess the grade of pressure ulcer. **Results:** there was a statistically significant negative relation between prevalence and risk factors of pressure ulcers among hospitalized patients in Beni Suf governorate of Egypt. **Conclusion:** There is no single risk factor for developing pressure ulcers; it is a consequence of multiple risk factors including age, body mass index, the presence of chronic conditions, and the length of hospital stay. The Barden scale is a useful tool for assessing and predicting pressure ulcers.

**Keywords:** braden scale; hospitalized patients; pressure ulcer; prevalence.

## INTRODUCTION

Pressure ulcers (PUs), also known as pressure injuries in the United States, Canada, and Australia, occur due to prolonged bed recumbency or sitting. PUs have been shown to be a source of morbidity, death, suffering, and lowered health-related quality of life in numerous studies [1]. The skin is our largest organ in terms of volume; it serves as the first line of defense against the outer world. It acts as a protector, a regulator, a sensor, a metabolic regulator, and a communicator. When tissue injury, ischemia, and tissue necrosis develop, the most common complication is a pressure ulcer which is more noticeable in patients who are confined to bed [2] The onset of pressure ulcers negatively affects both the patient and the healthcare professional leading to consequences such as a low quality of life, extended length of stay in the hospital (LoS), infection risk and a higher mortality rate.[3] Although pressure ulcers are originally a result of immobility, they result in more impairment in patients' mobility/activity, as they do not move because they are uncomfortable, and nociceptive pain develops as damage forms in cells and tissues.[4] The incidence of pressure ulcers was reported to be 10-25.9% among critically ill patients confined to ICU beds. [5], which is a higher incidence than that reported in general hospital population.[6] Days spent in the hospital, skin wetness, and other neurological variables all play a role in the formation of PUs. [7,8]

## Material and Methods:

### *Study design:*

Cross-sectional study

### *Participants:*

The current study was conducted on four hundred (n=400) patients of both sexes, with their ages between 25 and 65 years. Patients were selected from ICU and CCU in seven governmental hospitals

distributed all over Beni Suef governorate of Egypt. Sample Size Calculation was carried out by Using a single population proportion formula, size of the studied sample was calculated using Epiinfo statcalc, the sample size for the population survey was calculated at 95% confidence level, 5% acceptable margin of error, 1 design effect, 50% expected frequency (of ICU admitted), the minimum sample size was 384 patients [9].

### *Measurement procedures:*

presence and severity of pressure ulcer were assessed in patients by noting sociodemographic variables, Braden risk assessment scale, clinical characteristics of the patient illness and physical examination to assess the grade of pressure ulcer.

### *Treatment Procedures:*

1) Before the evaluation began, researchers described the study's goal and obtained each participant's participation via the consent form. All patients brought to the ICU were first evaluated for any anomalies, such as abnormal heat, redness, or erythema. Bony prominence areas were the focus of the examination.

2) The prevalence of pressure ulcers acquired on the day of the survey was determined first. Because the occurrence of pressure ulcers is not always noted in the medical record, a patient interview or maybe a third-party interview was required. In addition, a conversation with the responsible nurse and a skin examination were routinely performed on immobilized patients.

3) When a pressure ulcer was discovered, it was evaluated to determine its stage, location, and treatment options. The National Pressure Ulcer Advisory Panel (NPUAP) classification has been

used to classify the phases of pressure ulcers.[10]

4) All independent variables were assessed as stated in **Table (1)** these obtained data were used to assess the risk factors associated with the presence of the pressure ulcer.

**Table 1:** Variables assessed as indicators for the risk of developing pressure ulcers

5) The Braden Scale score

perception subscale assesses a patient’s ability to detect and relieve discomfort. The activity and mobility subscales are derived from separate but related concepts. Impairment of mobility, the ability to relieve pressure through movement, can occur in bedfast patients and is a separate concept from activity. The moisture subscale evaluates the degree of exposure of the skin to moisture. Nutrition

Independent Variable	Source of the obtained data	Evaluated Aspects
Sociodemographic variables [11,12]	Medical file Interview	age, sex, height, weight and BMI
Clinical Characteristics of the Patient Illness [12]	Medical file Interview	presence of chronic illness, types of chronic illness, presence of pressure ulcer, stage of pressure ulcer, and anatomical site of ulcer
Characteristics of pressure ulcer [13]	Physical examination	Ulcer history including aetiology, duration and previous treatment, Anatomic location, Stage, Size (length – width and depth in cm)
Risk of developing a pressure ulcer	Braden risk assessment scale [14,15]	Sensory perception, Moisture, Mobility, Nutrition, activity, Friction and

(BS): is a commonly used indication for predicting the occurrence of pressure ulcers. However, because it analyses numerous characteristics linked with frailty (e.g., function, nutrition, and cognition) it can be used as a bed-side instrument to assess frailty. [14,15] Previous researches that studied different populations of hospitalized patients have reported that BS is linked to short-term mortality in critically ill patients, particularly when the BS ≤ 15. [16-19]. The Braden Scale (BS) includes six different categories (i.e., sensory perception, moisture, activity, mobility, nutrition, and friction or shear). The sensory

reflects the usual food intake of the patient and offers a range from very poor to excellent. Friction and shear subscale looks at the individual’s ability to move independently or be moved and the degree of slippage. [20,21] The sum of the points attributed to each factor determines the risk of pressure ulcers, which is inversely related to the total score

6) BS score ranges between 9 and 23 with lower scored indicating a higher risk for developing an acquired ulcer or injury.

7) all independent variables were evaluated in binary logistic regression with the dependent variable. In binary logistic

regression, Length of hospital stay (LHS), presence of chronic illness affecting blood flow, Body mass index, malnutrition and hydration, incontinence, sensory perception, moisture, activity, mobility, and friction/shear were shown to be significant and were then taken into multivariate analysis by using our practical chart for risk factors of pressure ulcer.

**Data Analysis:**

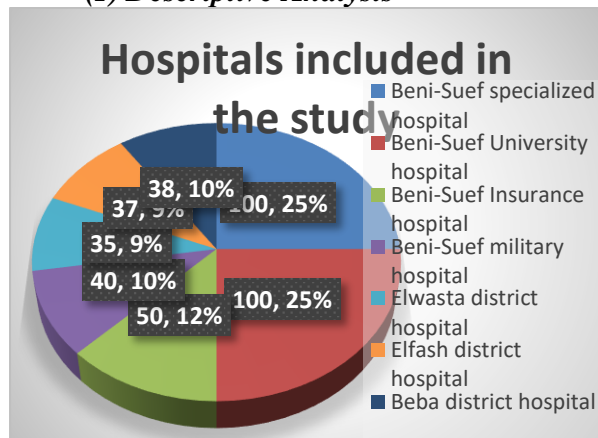
Data analysis was carried out using the SPSS version 26 (IBM SPSS statistics for Windows, Armonk, NY: IBM Corp). Data were summarized using mean± SD or frequency (%).

A normal distribution of quantitative data was assured using the Kolmogorov-Smirnov test.

Independent samples t-test was used for comparing patients with and without bed sores regarding numerical variables and X2 test was conducted to compare categorical variables. Pearson coefficient (r) was used to assess the correlation between numeric variables. P- value < 0.05 (two-tailed) was considered statistically significant.

**Results**

**(I) Descriptive Analysis**



**Figure (1) Distribution of participants according to the site of recruitment**

**Table (2) Baseline characteristics among the studies participants**

characteristics	values (no=400)	
<b>Age</b>		
Mean±SD	47.7±9.8	
Range (Min-Max)	(25-65)	
Median	48	
<b>Sex</b>		
Females	209 (52.3%)	
Males	191 (47.8%)	
<b>BMI</b>		
Mean±SD	30.3±6.4	
Range (Min-Max)	(15.97-45.70)	
Median	29.5	
<b>BMI categories</b>		
Normal	51 (12.8%)	
Obese	160 (40.0%)	
Overweight	159 (39.8%)	
Underweight	30 (7.5%)	
<b>Presence of co-morbidities (chronic diseases)</b>		
No	290 (72.5%)	
Yes	110 (27.5%)	
<b>Type of chronic disease</b>		
Bladder or Bowel disorder	10	(2.5%)
CVD	27	(6.8%)
Dm	41	(10.3%)
HTN	22	(5.5%)
Lower motor neuron lesion	1	(0.3%)
past history of pressure ulcer	2	(0.5%)
respiratory disease	5	(1.3%)
upper motor neuron lesion	2	(0.5%)

This table shows that the mean age of the studied cases was 47.7±9.8, females represented 52.3% of cases while 47.8% were males. The mean body mass index was 30.3±6.4. most of the studied participants had no chronic diseases (72.5%). In addition, 27.5% of the studied participants had chronic diseases; the majority were diabetic (41/110) followed by cardiac diseases (27/110).

**Table (3) Distribution of Braden scale parameters for prediction of risk of bed sores among the studies participants and characteristics of bed sores among the studies participants**

<b>Braden items</b>	<b>values (no=400)</b>	
<b>1-Sensory perception:</b>		
Completely Limited	104	(26.0%)
Very Limited	91	(22.8%)
Slightly Limited	43	(10.8%)
No Impairment	162	(40.5%)
<b>2-Moisture</b>		
Constantly Moist	88	(22.0%)
Very Moist	75	(18.8%)
Occasionally Moist	76	(19.0%)
Rarely Moist	161	(40.3%)
<b>3-Activity</b>		
Bedfast	80	(20.0%)
Chairfast	65	(16.3%)
Walks Occasionally	107	(26.8%)
Walks Frequently	148	(37.0%)
<b>4-Mobility:</b>		
Completely Immobile	76	(19.0%)
Very Limited	67	(16.8%)
Slightly Limited	116	(29.0%)
No Limitations	141	(35.3%)
<b>5-Nutrition:</b>		
Very Poor	69	(17.3%)
Probably Inadequate	121	(30.3%)
Adequate	157	(39.3%)
Excellent	53	(13.3%)
<b>6-Friction and Shear:</b>		
Problem	111	(27.8%)
Potential Problem	68	(17.0%)
No Apparent Problem	221	(55.3%)
<b>Braden score :</b>		
Mean±SD	15.8±6.2	
Range (Min-Max)	(6-23)	
Median	17	
<b>Bed sores</b>		
No	280	(70.0%)
Yes	120	(30.0%)
<b>Stage of bed sores (no=120)</b>		
I	62	(51.7%)
II	30	(25.0%)
III	18	(15.0%)
IV	10	(8.3%)
<b>Causes of bed sores (no=120)</b>		
friction and shear	34	(28.3%)
high BMI	19	(15.8%)
lack of sensory perception	15	(12.5%)
long stay in hospital	38	(31.7%)

malnutrition	14 (11.7%)
<b>Sites of sores:</b>	
buttocks	16 (13.3%)
ear	15 (12.5%)
elbow	10 (8.3%)
heel	20 (16.7%)
occiput	7 (5.8%)
sacral	50 (41.7%)
shoulder	2 (1.7%)
<b>LOS:</b>	values (no=400)
Mean±SD	13±13.7
Range (Min-Max)	(1-90)
Median	10

This table shows the frequency distribution of Sensory perception, Moisture, Activity, Mobility, Nutrition, and Friction and Shear that were used to calculate the Braden score. the mean Braden score was 15.8±6.2, ranged from 6 to 23 with median 17. Most of participants had no risk according to Braden score 4.3% and 23.8% had severe risk according

to Braden score. Bed sores were detected in 30% of cases, most of them were in stage I (51.7%) and the most common cause was friction and shear (28.3%). The comments site of affection with bed sores was the sacrum (41.7%) followed by heels (16.7%). the mean length of stay in the ICU was 13±13.7 days ranged from one day to 90 days with median 10 days.

**II- Analytical Statistics**

**Table (4) Association of bed sores with different risk factors:**

items	Patients without sores (no=280)	Patients with sores (no=120)	P-value
<b>Age (mean±SD)</b>	47.5±9.9	48±9.7	0.624
<b>Sex</b>			0.948
Females	146(69.9%)	63(30.1%)	
Males	134(70.2%)	57(29.8%)	
<b>BMI (mean±SD)</b>	30.7±6.4	29.2±6.5	0.031*
<b>Weight (mean±SD)</b>	88.68 19.755	86.03 19.944	0.222
<b>D Presence of chronic</b>			<0.001*
No	280(96.6%)	10(3.4%)	
Yes	0(0.0%)	110(100.0%)	
<b>Braden score</b>			<0.001*
Severe risk (9 and less)	42(44.2%)	<b>53(55.8%)</b>	
High risk (10-12)	17(45.9%)	<b>20(54.1%)</b>	
Moderate risk (13-14)	11(31.4%)	<b>24(68.6%)</b>	
Mild risk (15-18)	61(89.7%)	7(10.3%)	
No risk (19-23)	149(90.3%)	16(9.7%)	
<b>1-Sensory perception:</b>			<0.001*
Completely Limited	59(56.7%)	45(43.3%)	
Very Limited	50(54.9%)	41(45.1%)	
	25(58.1%)	18(41.9%)	

Slightly Limited No Impairment	146(90.1%)	<b>16(9.9%)</b>	
<b>2-Moisture</b>			<0.001*
Constantly Moist	35(39.8%)	<b>53(60.2%)</b>	
Very Moist	31(41.3%)	<b>44(58.7%)</b>	
Occasionally Moist	<b>65(85.5%)</b>	11(14.5%)	
Rarely Moist	<b>149(92.5%)</b>	12(7.5%)	
<b>3-Activity</b>			<0.001*
Bedfast	24(30.0%)	<b>56(70.0%)</b>	
Chairfast	22(33.8%)	<b>43(66.2%)</b>	
Walks Occasionally	<b>93(86.9%)</b>	14(13.1%)	
Walks Frequently	<b>141(95.3%)</b>	7(4.7%)	
<b>4-Mobility:</b>			<0.001*
Completely Immobile	42(55.3%)	34(44.7%)	
Very Limited	28(41.8%)	39(58.2%)	
Slightly Limited	<b>87(75.0%)</b>	29(25.0%)	
No Limitations	<b>123(87.2%)</b>	18(12.8%)	
<b>5-Nutrition:</b>			<0.001*
Very Poor	18(26.1%)	<b>51(73.9%)</b>	
Probably Inadequate	<b>73(60.3%)</b>	48(39.7%)	
Adequate	<b>143(91.1%)</b>	14(8.9%)	
Excellent	<b>46(86.8%)</b>	7(13.2%)	
<b>Length of stay/days (mean±SD)</b>	10.4±11.5 (median=10)	19.3±16.3 (median=20)	<0.001*

\*P-value is significant

This table showed that there was a significant association between the occurrence of bed sores and presence of chronic disease in addition to the higher Braden score either severe, high or moderate risk. there was a statistically significant association of poor sensory perception, increased moisture, low mobility, bad nutrition and problems in friction and shear with occurrence of bed sores. And there was a statistically significant correlation between presence of bed sores and higher length of stay in the ICU

**Table (5) Correlation between the Braden score and different parameters:**

independent variables		Braden score
Age	Pearson Correlation (r)	0.322**
	P-value	<0.001
Duration of ulcer (days)	Pearson Correlation (r)	0.770**
	P-value	<0.001
length of stay (Days)	Pearson Correlation (r)	0.349**
	P-value	<0.001
BMI	Pearson Correlation (r)	0.065
	P-value	0.198

\*P-value is significant

This table showed that there was a significant positive linear correlation between the Braden score and patients' age, duration of ulcer and length of stay in ICU.

## Discussion

Our findings corroborate those of **Chung and colleagues [11]** who conducted a meta-analysis on the risk variables for pressure ulcers in adult patients. They found that Individuals with was found significant after in comparison with scores of other patients with no pressure ulcers. In another study on the predictive value of the BS in surgical ICUs, only four subscales (moisture, mobility, friction and shear, and sensory perception) showed a significant association with the development of pressure ulcers in ICU patients. [23] Patients with good mobility can change the positions of their bodies and extremities independently, the change in position redistributes blood flow to various body parts, especially to the pressurized areas, lowering the risk of pressure ulcers. [24] In elder stroke patients, skin wetness was associated with pressure ulcers development. Moisture irritates and destroys the skin, causing pressure ulcers to form. [25] Friction is the force caused when two surfaces rub against each other. It frequently results in epidermal peeling and other superficial damage. Tissue injury is likely to occur as a result of the friction created by a patient lying on wrinkled sheets. In terms of the friction and shear subscale, the overall effect implies that those with low scores on this subscale are more likely to acquire pressure ulcers. Low scores are linked to increased friction and shear rates [26]

During position changes, the shear and friction between epidermis and bed linens or patient clothes lead to damage of the dermal–epidermal junction, peeling of the stratum corneum, laceration of the subcutaneous capillaries, and compromised blood flow to the skin, which then result in pressure ulcers. [27]

The study of **Weheida et al., [28]** which assessed the clinical risk factors linked to the development of pressure

a low total Braden score are more prone to developing pressure ulcers. In addition, **Osis and Diccini [22]** reported a lower BS score in individuals with moderate to severe traumatic head injury who developed pressure ulcers. This correlation

ulcers agrees with our findings. They found that the presence of diabetes, heart disease and hypertension were the most dominant risk factors linked to the development of pressure ulcers.

In their investigation of the risk factors for pressure ulcers in hospitalized elderly Egyptians, **Mohamed Tawfik [29]**, concur with these findings. They discovered that individuals with bed sores were more likely to have diabetes, cardiovascular illness, hypertension, cerebrovascular stroke, dementia, fractures, and urine incontinence.

**Wei and colleagues** included papers from seven countries in their meta-analysis on that investigated the validity of the BS as a method to assess risk factors predisposing to pressure ulcers in critical care. These countries included: Korea, Japan, Germany, the United States, France, China, and Spain. In their research, the prevalence of pressure ulcers in ICU patients ranged from 5.9% to 33.3%. [30]

In their study about the Barden scale in pressure ulcer risk assessment, **Jansen et. al.,** agreed with these findings. [31] They discovered that 24 people developed 36 pressure ulcers in total (some had more than one). Ulcers in the heel region accounted for 55.6 percent (20/36); stage I sacral ulcers accounted for 33.3 percent (12/36); and stage II sacral ulcers accounted for 11.1 percent (4/36). [31]

**Ibrahim and Mokhtar [25]** concur with the findings of this study, stating that the buttocks and low back were the most common sites of pressure ulcers in the individuals investigated. The location of a pressure ulcer varies depending on the position. It frequently occurs as a result of



body prominence. The back of the head, scapulae, elbows, spine, and heels are all vulnerable due to a lack of subcutaneous tissue cushioning. [28]

Also, these findings are consistent with the results of **Weheida and colleagues** [28] who studied the efficiency of BS in pressure ulcer risk assessment, which found that the average length of stay for those who developed PU was eight days (ranging from four to 33 days), with a positive influence of the length of stay in the ICU on the development of pressure ulcer.

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