

PRESSURE ULCERS IN MEDICAL AND SURGICAL WARDS: THE PREVALENCE AND CONTRIBUTING FACTORS OF A SINGLE-CENTRE STUDY

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Abstract: *Pressure ulcer (PU) is characterised by localised damage to the skin and underlying tissue caused by a combination of pressure and shear forces. Its consequences are severe, frequently resulting in sepsis and death. Despite its importance, extensive investigations on PU prevalence and contributing factors among inpatients in Malaysia are lacking, emphasising intensive care units and the elderly. This study aims to determine the prevalence and contributing factors of PU among inpatients of medical and surgical wards. A cross-sectional design with convenience sampling was utilised, which included 100 patients from medical and surgical wards at a university hospital in Malaysia's peninsular state. A set of questionnaires was adopted from a previous study that comprised sociodemographic background, PU contributing factors, and the Braden Scale pressure ulcer risk assessment, which was then translated to Malay with back translation to English for consistency and pretested before data collection. SPSS version 21.0 was employed for data analysis. The prevalence rate of PU was 31%. The following PU stages were represented in the sample: stage 1, 10%; stage 2, 11%; stage 3, 7%; and stage 4, 3%. Following analysis, a significant relationship was found between PU stages and various factors, including age, BMI, length of hospitalisation, frequency of repositioning, educational attainment, marital status, sensory perception, moisture and activity levels, mobility and nutritional status, and friction or shear exposure, with all p-values less than 0.05. This study clarifies the critical issue of PU among inpatients of medical and surgical wards. The prevalence of PU was notably high, indicating a substantial burden on healthcare providers. The study also highlighted the key determinants of PU, which require further extensive research with a larger sample to enhance the representativeness of results.*

Keywords: *Pressure Ulcer, Medical-Surgical Nursing, Adult*

Introduction

Pressure ulcer (PU), also known as a pressure sore, a pressure injury, or bedsore, is an area of localised damage to the skin and underlying tissue caused by pressure, shear, or a combination of these factors shear (1–4). The main groups at risk of developing PU are patients with spinal cord injuries, elderly patients, hospitalised patients, especially those undergoing orthopaedic surgeries, and patients admitted to intensive care units (ICUs) (1). According to Bereded et al. (2018), for every 1,000,000 individuals who get PU, 65,000 die due to complications, posing a severe health threat worldwide. In addition, from 1993 to 2006, the number of patients admitted to hospitals increased by 80%, resulting in an increased incidence of PU (2). According to Shiferaw (2017), the overall global prevalence of PU was 14.8% and varied widely around the world, with 14.9 percent in Sweden, 18.2 percent in Norway, 10.1 percent in So Paulo, Brazil, 1.58 percent in China, 3.3 percent in Turkmenistan, 18.7 percent in Brazil, 17.23 percent in a sub-Saharan tertiary care centre, 3.22 percent in Southwest Nigeria, and 19.3 percent in Tunisia.

A PU can affect anyone, but mostly in individuals confined to bed or who spend much time in a chair or wheelchair. In a meta-analysis involving 28 studies and 570,162 patients, the results suggest that older age and a low total Braden scale score are associated with an increased risk of developing PU (6). The use of the Braden Scale is a proven and valuable method for identifying the risk of PU among patients who are admitted to hospitals (7). The typical location where a PU can develop is the sacrum, heels, and hips (8). In another study by Lopes et al., they also found similar findings where the most frequent anatomical locations of PU were the sacrum (28.7%), trochanteric region (18.3%) and heels (17.4%) (9). Between 2006 and 2019, the overall prevalence of pressure ulcers and hospital-acquired pressure ulcers declined, but a plateau occurred in 2015-2019; specifically, data from 2018 to 2019 revealed that 8.97% of 296,014 patients had at least one PU, and 2.58% had at least one hospital-acquired PU (10). In another study by Wung Buh et al, the findings showed that the incidence of PU in hospitalised patients ranges from 9% to 18%, with the elderly population appearing to be the most likely group to acquire ulcers (11).

However, very few studies have comprehensively assessed the prevalence and associated factors among inpatients in Malaysia. Furthermore, most of the data on the development of PU was limited to patients in intensive care units and elderly adults. Therefore, this study is conducted to explore the prevalence of PU and identify the associated factors among patients, such as sociodemographic characteristics, physical activity, nutrient intake, and others among patients in Malaysian hospital settings to prevent complications and decrease the incidence of PU among patients in future.

Methodology

Research Design

A cross-sectional study design was used in this study.

Setting and Samples

This study was conducted at a university hospital in Malaysia's peninsular state. The sampling method that was used in this study was convenience sampling. The population for this study were the inpatients. The patients were selected based on these inclusion criteria:

1. Admitted to the medical or surgical ward.
2. Length of hospitalisation was more than 24 hours.
3. Consented.

4. Relative is available if the patient is unable to cooperate.

On the other hand, the participant was excluded from the study, based on the following criteria:

1. Age of 18 years old and below.
2. Admitted in the isolation room.

Measurements and data collection

A set of questionnaires in Malay language were distributed to the participants. Assistance was offered whenever needed. The questionnaire has three parts: sociodemographic data, associated factors and Braden Scale pressure ulcer risk management. The questionnaire was adapted and obtained permission from the author of the previous study. The questionnaire was translated, and a pilot test was conducted. Cronbach's Alpha was used to determine the internal consistency and scored 0.902.

Data Analysis

Various statistical methods, including One-way ANOVA, Independent T-test and Pearson correlation tests, were used to answer the hypotheses of this study.

Ethical Considerations

This study has been approved by the Institutional Review Board (IREC 2022-KON/64). A written informed consent indicates that the participants agreed to be part of the study. The researcher's information, the research study's aims, the patient's confidentiality, and the right to refuse or withdraw from the study were included in the consent form.

Results

This study's total number of patients was 100: 48 from the medical ward and 52 from the surgical ward. The mean age (standard deviation, sd) of the patients is 58.22 (18.18) years old, and the mean (sd) of the body mass index (BMI) is 24 (4.64 kg/m²). Of the 100 patients, 56 were male, while the rest were female. In this study, the majority of patients were Malay, Muslim and married, with the percentages of 84%, 86% and 60%, respectively. Most education status patients were from the primary school (UPSR) level, which was 22% and did not receive any formal education with 21% (see Table 1).

Table 1: Sociodemographic Background among Patients in Medical and Surgical Wards (N=100)

Variable	Percentage (%)	Mean	Standard deviation (SD)
Age (Years)		58.22	18.18
BMI (kg/m ²)		24.00	4.64
Gender	Male	56	
	Female	44	
Ward	Medical	48	
	Surgical	52	
Race	Malay	84	
	Chinese	11	
	Indian	4	
	Foreigners	1	

Religion	Muslim	86
	Buddhist	5
	Christian	5
	Hindu	4
Education status	UPSR	22
	SPM	12
	STPM/ Matriculation	18
	Diploma	8
	Degree/ Master/ PHD	19
	Not received any formal education	21
Marital status	Single	16
	Married	60
	Divorce	1
	Widower	23

The data in Table 2 showed that 69% of the patients have no PU, and the remaining 31% have. 10% of the patients have stage 1 PU, 11% have stage 2 PU, 7% have stage 3 PU, and 3% have stage 4 PU.

Table 2: The Prevalence of Pressure Ulcers among Patients in Medical and Surgical Wards (N=100)

Variable	Percentage (%)	
Stages of pressure ulcer	None	69
	Stage 1	10
	Stage 2	11
	Stage 3	7
	Stage 4	3

Table 3 shows the distribution of PU-associated factors among the medical and surgical ward patients. Eight variables include length of hospital stays (days), positioning frequency (times per day), sensory perception, moisture, activity, mobility, nutrition and friction or shear. The findings indicate that the mean (sd) of the length of hospitalisation was 7.69 (9.33) days, and the mean frequency of positioning (sd) was 2.79 (1.13) times per day. Out of 100 patients, most of the patients have no deterioration in sensory perception (58%), the skin is rarely moist (45%), can occasionally walk (3%), has no limitation in mobility (38%), get adequate nutrition (35%) and has no problem with friction or shear (51%).

Table 3: Distribution of Factors Associated with Pressure Ulcers among Patients in Medical and Surgical Wards (N= 100)

Variable	Percentage (%)	Mean	Standard deviation (SD)
Length of stay in the hospital (days)		7.69	9.33
Frequency of positioning (times per day)		2.79	1.13
Sensory perception	Completely limited	7	
	Very limited	14	
	Slightly limited	21	
	No deterioration	58	

Moisture	Always moist	5
	Very moist	16
	Occasionally moist	34
	Rarely moist	45
Activity	Bedfast	32
	Chairfast	12
	Walk occasionally	33
	Walk frequently	23
Mobility	Completely immobile	14
	Very limited	17
	Slightly limited	31
	No limitation	38
Nutrition	Very poor	13
	Probably inadequate	31
	Adequate	35
	Excellent	21
Friction or shear	Problem	28
	Potential problem	21
	No apparent problem	51

Table 4 revealed the relationships between stages of PU and the associated factors (age, BMI, days of hospitalisation and frequency of positioning) among patients in medical and surgical wards. The findings showed significant relationships between all the factors and the stages of PU. Specifically, a moderate strength and positive relationship exists between PU stages and patients' age ($r=0.43$, $p<0.001$). There is also a positive weak relationship between the stages of PU and length of hospitalisation ($r=0.30$, $p<0.001$). Besides, the findings also suggest a moderate strength negative relationship between the stages of PU and frequency of positioning ($r=-0.53$, $p<0.001$). BMI score was also negatively associated with the stages of PU among the patients in the medical and surgical ward ($r=-0.22$, $p=0.03$).

Table 4: The Relationship Between Stages of Pressure Ulcer and The Associated Factors among Patients in Medical and Surgical Wards (N=100)

Variable (Numerical)	Stages of PU	
	r-value	p-value
Age (years)	0.43	0.00
BMI (kg/m²)	-0.22	0.03
Length of hospitalisation (days)	0.30	0.00
Number of positioning (times per day)	-0.53	0.00

Note: Pearson correlation ($p\text{-value} < 0.05$)

Table 5 shows the relationship between the stages of PU and factors including gender, classification of wards, race, religion, education and marital status, sensory perception, moisture, activity, mobility and friction or shear. The result suggests that female has a higher stage of PU (mean stage = 0.68) than male (mean stage = 0.63). In addition, the finding suggests that patients admitted to the medical ward have a higher stage of PU (mean stage = 0.83) than the surgical ward (mean stage = 0.48). Other than that, the findings indicate a significant relationship between the stages of PU and education and marital status. Besides, the findings also revealed that PU stages are significantly associated with sensory perception, moisture,

activity, mobility, nutrition and friction or shear (all $p < 0.001$). The findings showed that the mean stage of PU increases in line with the risk factors, including complete limitation in sensory perception (mean stage = 2.15), always moist (mean stage = 1.8), confined to bed (mean stage = 1.84), completely immobile (mean stage = 2.21), very poor nutrition (mean stage = 2.21), have problem with friction or shear (mean stage = 2.00).

Table 5: The Relationship Between Stages of Pressure Ulcer and The Associated Factors among Patients in Medical and Surgical Wards (N=100)

Variable (categorical)	Stages of PU		
	Mean (SD)	p-value	
Gender ^b	Male	0.63 (1.18)	0.80
	Female	0.68 (1.03)	
Ward ^b	Medical	0.83 (1.26)	0.11
	Surgical	0.48 (0.94)	
Race ^a	Malay	0.61 (1.08)	0.33
	Chinese	1.18 (1.47)	
	Indian	0.25 (0.50)	
	Foreigners	0.00 (.)	
Religion ^a	Muslim	0.59 (1.07)	0.18
	Buddhist	1.00 (1.41)	
	Christian	1.60 (1.67)	
	Hindu	0.25 (0.50)	
Education status ^a	UPSR	0.32 (0.65)	0.00
	SPM	0.33 (0.89)	
	STPM/Matriculation	0.78 (1.31)	
	Diploma	0.13 (0.35)	
	Degree/Master/PhD	0.26 (0.65)	
Marital status ^a	Not receiving formal education	1.62 (1.40)	0.00
	Single	0.13 (0.50)	
	Married	0.50 (1.03)	
	Divorce	0.00 (.)	
Sensory perception ^a	Widower	1.43 (1.27)	0.00
	Completely limited	2.14 (0.51)	
	Very limited	1.86 (1.17)	
	Slightly limited	1.14 (1.20)	
	No deterioration	0.00 (0.00)	
Moisture ^a	Always moist	1.80 (1.64)	0.00
	Very moist	1.31 (1.35)	
	Occasionally moist	0.91 (1.19)	
	Rarely moist	0.09 (0.42)	
Activity ^a	Bedfast	1.84 (1.25)	0.00
	Chairfast	0.50 (0.67)	
	Walk occasionally	0.00 (0.00)	
	Walk frequently	0.00 (0.00)	
Mobility ^a	Completely immobile	2.21 (1.25)	0.00
	Very limited	1.65 (1.17)	
	Slightly limited	0.19 (0.48)	

	No limitation	0.00 (0.00)	
	Very poor	2.15 (1.21)	
Nutrition ^a	Probably inadequate	0.94 (1.21)	0.00
	Adequate	0.23 (0.65)	
	Excellent	0.00 (0.00)	
	Problem	2.00 (1.19)	
Friction or shear ^a	Potential problem	0.43 (0.75)	0.00
	No apparent problem	0.00 (0.00)	

Note: ^a One-way ANOVA, ^b Independent T-test, p-value < 0.05

Discussion

This study focused on the participants among patients at a university hospital in Malaysia's peninsular state. This study observed that patients admitted to medical wards had a higher mean stage of PU than those admitted to surgical wards. There could be several factors contributing to this difference. Firstly, patients in medical wards often have underlying health conditions or comorbidities (12). For example, chronic diseases such as diabetes or cardiovascular conditions can hinder the body's ability to heal and protect the skin, thus compromising their ability to maintain healthy skin, thus making them more susceptible to developing PU.

Additionally, cognitive impairments among some medical ward patients may affect their repositioning ability, which is crucial for PU prevention. Furthermore, medications that affect skin integrity or reduce mobility might also play a role in the higher PU stage seen in medical ward patients. For instance, using muscle relaxants was shown to experience a higher risk of PU on the heel due to sensory blockage (13). On the other hand, patients admitted to surgical wards generally had a lower mean stage of PU. This outcome could be attributed to several factors, including the shorter length of hospitalisation typical for surgical patients. Prolonged immobility is a well-known risk factor for PU, and shorter stays in surgical wards may translate to reduced exposure to immobility-related PU risks. Additionally, surgical patients are often encouraged to mobilise early in their recovery process, which can help prevent PU development.

This study also examines the factors contributing to the prevalence of PU. The results show that the risk of developing PU significantly increases with age. This finding is consistent with the research conducted by Liu et al. (2019), who found that advancing age is significantly associated with an increased prevalence of PU. Skin breakdown and the progression to PU development are frequently caused by reduced skin integrity (O'brien et al., 2022). Additionally, Akhkand et al. (2020) and Ebrahim et al., (2018) found that the majority of PU cases occur in patients aged 54 and above (45%) compared to those aged between 45 and 54 (20%). Older people are more prone to PU due to changes in their skin. As they age, their skin becomes thinner and loses elasticity and moisture-retaining capacity, making it more fragile and susceptible to damage from pressure and friction, increasing the risk of PU (17,18).

Other than that, the findings of this study showed that the prevalence of PU increases in days of hospitalisation. Bereded et al. (2018) found that extended hospital stay is significantly associated with stages of PU. Patients between 7 and 20 days had an 8.44 times higher risk of developing PU than those who stayed for less than six days. The potential cause of the association between the length of hospital stays (days) and the development of PU is that patients may not receive proper nursing care and nutrition, which causes them to worsen with

coexisting diseases (19). The number of positions (times per day) is also significantly associated with stages of PUs. This is because being static in one position without moving will cause pressure and decreased blood flow to the affected area, leading to the development of PU. Bereded et al. (2018) noted that individuals whose positions were changed every 2-3 hours had a 10.42 times lower risk of developing PU than those altered less often. Similarly, Gedamu et al. (2014) mentioned that patients may not be aware of the discomfort associated with prolonged pressure on the skin and, therefore, may not change their position to relieve the pressure. As a result, the prolonged pressure impedes blood flow, reducing the nourishment of the skin and underlying tissues and leading to the development of PU.

Besides, this study shows that education status is associated with stages of PUs among patients in medical and surgical wards. According to this finding, not receiving formal education is significantly associated with higher stages of PUs. This might be because the patients with lower education have a limited understanding of the prevention strategies related to PU, such as using two hourly positioning methods and a ripple mattress to reduce the pressure that can cause PUs. Other than that, low education could be associated with low economic and limited access to effective wound management skin products (20)

According to this study, being completely immobile was significantly associated with PU stages. Completely immobile patients will need assistance from nurses or relatives to do positioning. (14) found that PU prevalence is much higher for patients remaining immobile for ten or more days, which suggests that more rigorous monitoring and management are needed to prevent PU when patients remain in bed for ten or more days or are expected to be immobile for a long time. This result is consistent with those of Bereded et al. (2018), who claimed that patients who were limited in their activities (to a chair or bed) were 11 times and 7.58 times, respectively, more likely to acquire PU than those who often walked. In addition, very poor nutrition is also significantly associated with stages of PUs. Nutrition is crucial in PU care as wounds require both macronutrients and micronutrients for healing (21). During wound healing, the body will need balanced nutrients such as more protein, calories (energy), vitamins, minerals, and fluid. Lastly, having problems with friction and shear or having problems keeping the skin free from contact with the wrinkle area were significantly associated with stages of PUs. This is might because the friction and shearing problem forcefully lacerate the patient's skin. Besides, dry skin conditions increase friction and cause shearing, damaging the skin and subcutaneous tissues (17). According to Gedamu et al. (2014), when shear and friction occur, blood vessels stretch and twist, and skin and subcutaneous tissue microcirculation is disrupted, leading to the development of PU.

This study reveals the complex web of factors influencing PU prevalence and severity among patients in a Malaysian university hospital. Patients in medical wards, often burdened with comorbidities and medication-related risks, exhibit higher PU stages than surgical ward counterparts benefiting from shorter stays and early mobilisation. Age, length of hospitalisation, frequency of position changes, and education level play significant roles, with advancing age, prolonged immobility, and lower education correlating with increased PU severity. Additionally, complete immobility, poor nutrition, and issues related to friction and shear emerge as critical determinants in PU development.

Implications and Limitations

This study emphasises the importance of preventing PUs (PUs) in nursing care. One way to prevent PUs is through regular repositioning, typically every two hours. Utilising appropriate

nursing care standards and pressure-relieving devices in hospital wards can also help reduce the risk of developing PUs and related complications. However, it is essential to note that this study only focused on one centre, so the findings may not apply to other locations. Nonetheless, these findings provide valuable insight into the specific population studied.

Conclusion

This study of 100 patients in a Malaysian university hospital found that PU is slightly more common in medical wards. Factors associated with PU development include age, BMI, length of hospital stay, infrequent patient repositioning, sensory perception, skin moisture, immobility, nutrition, and friction/shear. Healthcare professionals, particularly nurses, play a crucial role in PU prevention through regular repositioning and proper hygiene. Future research can focus on targeted interventions to reduce PU rates and explore innovative technologies to enhance PU management in these healthcare settings.

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