Original Article

JHSMR Journal of Health Science and Medical Research

Assessing the Disparities in Pressure Injury Prevention Knowledge and Practices Among Critical Care Unit Nurses in Government and Private Hospitals in Madinah City, Saudi Arabia

Nour Omar Messaykeh, R.N., B.Sc.[1], Najwa El-Gerges, R.N. , Ph.D.[1], Noorsuzana Mohd Shariff, R.N., Ph.D.[2]

[1]Faculty of Nursing and Health Sciences, Notre Dame University Lebanon, XJ28+73C Zouk Mosbeh, Lebanon.

[2]Department of Community Health, Advanced Medical and Dental Institute, Universiti Sains Malaysia, 13200, Kepala Batas, Pulau Pinang, Malaysia.

Received 4 June 2025 ● Revised 9 September 2025 ● Accepted 6 October 2025 ● Published online 1 April 2026

Abstract:

Objective: To examine the level of knowledge and practice regarding pressure injury prevention in the critical care units of nurses working in Medina City, Saudi Arabia.

Material and Methods: A cross-sectional quantitative study design was applied. A total of 598 staff nurses working in King Fahad Hospital and the Saudi German Hospital, Madina, completed the questionnaires. Data were collected using the pressure injury prevention knowledge questionnaire and the pressure injury prevention practices questionnaire. Statistical analysis was conducted using descriptive statistics, Chi-square, independent sample *t*-test, and multiple linear regression inferential analysis of IBM SPSS version 27.

Results: Nurses' total knowledge of pressure ulcer prevention was moderate (17.31±2.86), within the possible score of 22 points. The mean practices of pressure injury prevention among the nurses were reported at 56.64 (S.D.=3.095). The study was found to be clinically significant, but there were no statistically significant differences in the mean pressure injury knowledge scores between those working in private hospitals and those in the public hospitals (17.41±2.82 and 17.26±2.88, respectively, t=0.631, df=596, p-value=0.528). However, the pressure injury practices among nurses in private hospitals were significantly better (p-value=0.004) than those from governmental hospitals (57.17±2.718 vs 56.39±3.234, respectively). Knowledge and practices of pressure injury prevention in government and private hospitals varied according to many factors, including age, duration of employment, formal training, marital status, and level of education (p-value<0.05).

Contact: Noorsuzana Mohd Shariff, R.N., Ph.D.
Department of Community Health, Advanced Medical and Dental Institute,
Universiti Sains Malaysia, 13200, Kepala Batas, Pulau Pinang, Malaysia.
E-mail: suzanashariff@usm.my

J Health Sci Med Res
doi: 10.31584/jhsmr.20261350
www.jhsmr.org

Conclusion: Nurses in private hospitals showed clinically significantly better preventive practices, spotlighting quality of care differences.

Keywords: knowledge, knowledge, nursing, practices, pressure injury

Introduction

The National Institute for Health and Care Excellence (NICE)[1] defines pressure ulcers as "damage to the skin and the deeper layer of tissue under the skin… when pressure is applied to the same area of skin for a period of time and cuts off its blood supply." The injuries often arise when persistent pressure is applied to the skin's surface over a long period. Pressure injuries are common among people who are confined to bed or those who sit for long periods.

Pressure injury is a critical concern in healthcare, with incidences that significantly vary across time depending on many patient factors, including demographics[2]. According to the World Health Organization[3], about 1 in 10 hospitalized patients develop pressure injuries globally, and this translates to a range of 5% to 15%, with some figures rising up to 38% in the critical care unit. Additional global studies, such as a systematic review of nursing homes, found a pooled prevalence of 11.6% and an incidence of 14.3%, with heels and sacrum common sites,[4] and others expressing worries about the rising prevalence and disability worldwide[5]. In Saudi Arabia, incidence rates of pressure injury over 30% have been reported in the last few years[6], with the most recent data indicating a wide range, between 11.4%[7] and 39.3%[8].

Many patient-specific risk factors of pressure injuries have been identified in the literature. For instance, a study in Saudi Arabia identified factors like "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" (p. 912)[6]. Patients in ICUs and critical care units are more prone to pressure injuries because their immobility, severe illness, impaired perfusion, and prolonged stays all compromise skin integrity and increase tissue vulnerability. Another study reported three risk factors for the development of pressure injuries among patients in Saudi Arabia, including age, Body Mass Index (BMI), and length of stay[9]. Studies conducted outside Saudi Arabia have also reported related risk factors, including age, mobility/activity, lower Braden scores, perfusion, skin oedema, and vasopressor infusion[10]. Even though a pressure injury can affect any patient within the inpatient unit, patients in the critical care and intensive care units are more predisposed to the risks[11,12].

Pressure injury presents diverse consequences that spread across patients' clinical and social outcomes, as well as their economic welfare. A study conducted in Iran reported that the average cost of pressure injury treatment varied from United State Dollar (USD) 12 for grade I pressure injury (PI) to USD 66,834 for grade IV PIs[14]. Regarding the extreme consequences, patients who do not receive adequate care and treatment for their pressure wounds can end up dying from pressure injuries and sepsis. Due to the severe potential adverse outcomes of pressure injuries, there has been a focus on preventive measures and care delivery to ensure adequate management and optimal patient outcomes[14]. Diverse approaches for preventing and managing pressure injuries have been developed; however, the success of prevention practices primarily relies on the caregivers' adherence to pressure injury prevention protocols.

Nurses are among the important frontline healthcare professionals who are involved most with patient care, and their competency in the delivery of quality care can significantly influence outcomes. The level of the nurses' competence has a positive influence on the patients' outcomes. Some studies have noted that nurses' knowledge and overall competence are critical to the successful management of pressure injuries[16,17]. Unfortunately, many researchers have reported insufficient knowledge and practices regarding the prevention of pressure injury among nurses in different facilities and countries[18–19].

Various factors have also been noted to affect nurses' practices and knowledge, including heavy clinical workload and higher education level[19,20]. Despite the global emphasis on pressure injury prevention as a vital component of patient safety and nursing care quality, limited research has been undertaken in Saudi Arabia to evaluate nurses' knowledge and practice competencies in this population. Hence, this study aimed to determine the level of knowledge and practices in pressure injury prevention, and the factors influencing them, among nurses working in private and government hospitals in Madinah City, Saudi Arabia.

Material and Methods

This study applied a cross-sectional quantitative research design (Figure 1). Before the study, the researcher sought and obtained ethical approval (IRB: 24-059) from the research and ethics committee of the university (JEPEM USM) and hospital centres (King Abdullah International Medical Research Centre and JePEM, USM) where the study was conducted.

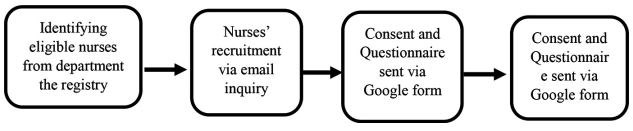

Figure 1 Data collection framework

Subsequently, self-administered electronic questionnaires were sent to 633 stratified, randomly sampled prospective participants, including staff nurses working in different departments in two selected hospitals between January and February 2024. The first was King Fahad Hospital, the government hospital. The second was the Saudi German Hospital Madinah Branch, representing private hospitals; these hospitals have a large number of inpatients. However, only 598 participants completed the questionnaires. King Fahad Hospital is a 500-bed facility consisting of five floors and located in the centre of Al-Madinah City, Kingdom of Saudi Arabia. The Saudi German Hospital is a 300-bed private hospital with more than 350 nurses and 250 physicians, located in Al Azizia District, Medina. Subject to consent, the participants were selected based on two inclusion features:(1) registered nurses and (2) nurses who had been working in the named hospital for at least one year, and the rest were excluded based on four criteria:(1) nursing students, such as those in internships or placements, (2) nurses who were off-session, such as those on leave or holidays, (3) nurse managers and those in various management positions, and (4) travel nurses who worked only on a short-term basis.

Apart from the sociodemographic elements, data were collected using two principal questionnaire scales – pressure injury prevention knowledge and pressure injury prevention practices. The knowledge questionnaire was originally developed by Maylor and Torrance[21] from the Pressure Injury Prevention Guidelines (PUPG). The scale uses 22 items to assess the participants' knowledge on the prevention of pressure injuries in different domains, including risks, nutritional needs, mechanical causes of the wounds, skin care, and the educational or informational needs of patients and their families. Each item has three options to choose from, and the minimum and maximum possible scores are 0 and 22, respectively: high knowledge (≥18/22), moderate knowledge (11–17/22), and low

knowledge (≤10⁄22). This scale is preferred since it has already been piloted and validated by Maylor and Torrance (1999) (Cronbach's alpha values of 0.73). The practice scale was developed by Islam[22] to assess the nurses' practices of pressure injury prevention in Bangladesh. This scale consists of 22 items rated on a 3-point Likert scale with response options of 'always' (score=2), 'sometimes' (score=1), and 'never' (score=0). The score ranges from 22 to 66, with higher scores indicating better prevention practices. The practice scales were already piloted and have Cronbach's alpha values of 0.74[22]. Therefore, these scales were adopted and used in the original English language.

Analysis of the data was performed using the IBM Statistical Package for the Social Sciences (SPSS) version 27. Five principal statistical techniques were applied: descriptive statistics, Chi-square test, independent sample t-test, post-hoc pairwise comparisons, and bivariate multiple linear regression models.

Results

Participant characteristics

Out of the 633 nurses approached, only 598 (94.5%) completed responses, showing various sociodemographic features (Table 1). The mean age of the nurses was 35.5±8.0 years, and the majority were female (65.7%) and married (63.5%). Regarding education, most participants held a Bachelor of Nursing degree (72.4%), followed by master's (15.9%) and diploma (11.7%). Two-thirds of the nurses (67.4%) reported receiving formal training on pressure injury prevention. Nurses were distributed across various clinical areas, with the highest proportions working in the Intensive Care Unit (ICU) (15.7%), orthopedic (15.6%), and Cardiac Care Unit CCU (14.7%) units. The mean duration of employment was 4.1±3.0 years (Table 1).

Knowledge of pressure injury prevention

Overall, the nurses showed an average level of knowledge of pressure ulcer prevention, with a mean score of 17.31 (S.D.=2.86) out of the maximum possible score of 22 points (Table 2). Best knowledge scores were demonstrated in areas like the cause of pressure injury (88.1%), the measurement scale (89.6%), and the need to schedule the patient (86%).

Table 1 Participant characteristics

Variables	Frequency (n)	Percentage (%)
Age (years)[a]	35.48±8.04	
Gender		
Male	205	34.3
Female	393	65.7
Marital status		
Single	148	24.7
Married	380	63.5
Divorced	52	8.7
Widowed	18	3.0
Level of education		
Diploma in nursing	70	11.7
Bachelor of nursing	433	72.4
Master of nursing	95	15.9
Received formal training		
Yes	403	67.4
No	195	32.6
Area of practice		
Medical	42	7.0
ICU	94	15.7
Orthopedic	93	15.6
CCU	88	14.7
Surgical	75	12.5
Neuro-medicine	74	12.4
NICU	65	10.9
PICU	36	6.0
Neuro-surgery	31	5.2
Duration of employment (years of service)[a]	4.13±3.01	

a data was presented as mean±standard deviation
ICU=intensive care unit, CCU=Cardiac care unit, NICU=Neonatal intensive care unit, PICU=Pediatric intensive care unit

This study found no significant difference in mean pressure injury knowledge scores between those working in the private hospital and those in the public hospital (17.41±2.82 and 17.26±2.88, respectively, t=0.631, df=596, p-value=0.528). Although some areas of knowledge

Table 2 Nurses' knowledge of pressure injury prevention in private and public hospitals

Nurses' Knowledge	Private		Public		Overall		Chi-square	
	Correct (1)		Correct (1)		Correct(1)			
Items	(n)	%	(n)	%	(n)	%	χ^2	p-value
1. Contributing factor for pressure injury formation	175	90.7	352	86.9	527	88.1	1.766	0.224
2. The most crucial factor for pressure injury formation in an 80-year-old man with a fractured hip and bedridden	152	78.8	348	85.9	500	83.6	4.903	0.033
3. Favorable environment for bacterial growth in the form of maceration for a young man having head injury with unconsciousness	67	34.7	280	69.1	347	58.0	63.589	<0.001
4. The critical determinant for pressure injury formation	136	70.5	287	70.9	423	70.7	0.010	0.924
5. Assessment procedure for a patient with spinal cord injury who is at high risk for pressure injury development	182	94.3	375	92.6	557	93.1	0.597	0.493
6. Risk assessment scale for pressure injury development	189	97.9	347	85.7	536	89.6	21.102	<0.001
7. Appropriate method for assessing an individual who is at risk for pressure injury development	159	82.4	321	79.3	480	80.3	0.805	0.385
8. Sign of stage II pressure injury	126	65.3	321	79.3	447	74.7	13.523	<0.001
9. First sign for pressure injury development	147	76.2	304	75.1	451	75.4	0.086	0.839
10. Appropriate method for skin care	123	63.7	292	72.1	415	69.4	4.310	0.046
11. Which nursing care is significant activity for protecting skin damage?	175	90.7	326	80.5	501	83.8	9.967	0.001
12. Nursing care activity appropriate for preventing maceration for a 78-year-old man having a stroke with hemiplegia	152	78.8	302	74.6	454	75.9	1.254	0.306
13. Nursing care practice for maintaining skin integrity	164	85.0	324	80.0	488	81.6	2.154	0.175
14. How to prevent heel injury	139	72.0	294	72.6	433	72.4	0.021	0.922
15. Important vitamin to maintain healthy skin	123	63.7	287	70.9	410	68.6	3.086	0.090
16. Nutrient needs to be offered to an 85-year-old bedridden patient who has a BMI < 18.5	151	78.2	295	72.8	446	74.6	2.010	0.161
17. Appropriate lab test for nutritional assessment of pressure injury patient	127	65.8	261	64.4	388	64.9	0.106	0.784
18) Appropriate nursing care for managing mechanical load	187	96.9	322	79.5	509	85.1	31.186	<0.001
19. Appropriate activity to reduce friction for an 80-year-old man having fracture hip with skeletal traction	184	95.3	326	80.5	510	85.3	22.946	<0.001
20. Nursing care activity for reducing shearing force	168	87.0	346	85.4	514	86.0	0.706	
21. Educational information is necessary for reducing pressure injury formation	172	89.1	342	84.4	514	86.0		
22. Best educational activity that enhances the competency of staff nurses in preventing pressure ulcers	163	84.5	337	83.2	500	83.6		
Total knowledge score[a]	17.41±2.82		17.26±2.88		17.31±2.86			

[a]=data was presented as mean±standard deviation

exhibited uniform understanding among both groups, statistically significant (p-value<0.05) discrepancies were found in the areas of: most vital parameter for pressure injury development (χ^2=4.903, p-value=0.033), favorable environment for bacterial growth (χ^2=63.589, p-value=<0.001), risk assessment scale (χ^2=21.102, p-value=<0.001), sign of Stage II pressure injury (χ^2=13.523, p-value=<0.001), appropriate method for skin care (χ^2=4.310, p-value=<0.001), significant activity for protecting skin damage (χ^2=9.967, p-value=0.001), appropriate nursing care for managing mechanical load (χ^2=31.186, p-value=<0.001), and proper activity to alleviate friction (χ^2=22.946, p-value=<0.001) (Table 2).

Practice of pressure injury prevention

The mean level of pressure injury prevention practice for nurses working in the private hospital was significantly different from those working in the public hospital, with practice scores of 57.16±2.718 and 56.39±3.234, p=0.004, respectively (Table 3). Best practices were noted in the documentation (2.87±0.342), while the poorest practice was noted in the lab tests (2.07±0.402) (Table 3). Additionally, a finer understanding from independent t-tests showed a number of item-specific significant variations between the two groups. The private hospital nurses scored significantly higher than the public hospital nurses in performing skin assessments guided by standard nursing care protocols (t(596)=4.564, p-value<0.001), including use of risk assessment scales (t(596)=7.101, p-value<0.001), documenting all data related to pressure injury assessment (t(596)=6.569, p-value<0.001), performing routine skin care (t(596)=3.205, p-value=0.001), placing the pillow under the leg of a patient (t(596)=3.940, p-value<0.001), and alternating positions of a patient every two hours (t(596)=5.270, p-value<0.001), etc. Conversely, public hospital nurses scored significantly higher in performing laboratory tests to assess nutritional status (t(596)=-7.172, p-value<0.001) and monitor a protein-calorie diet for patients confined to bed (t(596)=-4.057, p-value<0.001).

Factors associated with knowledge of pressure injury prevention

Private hospital nurses

Bivariate linear regression analysis (Table 4) revealed that age was a positive predictive indicator of knowledge (B=0.099, p-value<0.001), implying that as age increases among nurses, so do their scores in terms of knowledge. Duration of employment was also significantly related to knowledge (B=0.141, p-value=0.003), which means that more experienced workers (nurses) had better scores in terms of knowledge. Knowledge was also positively predicted by formal training. Nurses with formal training scored significantly higher than those with no formal training (B=1.905, p-value<0.001), highlighting the value of formal education in increasing competence amongst nurses. In terms of level of education (master's level taken as reference), diploma-trained nurses recorded lower scores of knowledge (B=-4.635, p-value<0.001), while bachelor's holders also scored lower, though not significantly (B=-0.465, p-value=0.197). Collinearity statistics revealed good tolerance and Variance Inflation Factor (VIF) values, suggesting that there was no multicollinearity issue among the predictors.

ii) Public hospital nurses

From the regression analysis (Table 5), it was noted that age (B=0.081; p-value<0.001) and duration of employment (B=0.218; p-value=0.001) were significant predictors of knowledge scores among nurses in government hospitals. Knowledge was also positively predicted by formal training. The nurses with formal training scored significantly higher than those with no formal training (B=2.295, p-value<0.001), highlighting the value of formal education in increasing competence amongst nurses. In terms of level

Table 3 Nurses' practices regarding pressure injury prevention in private, government and overall

Nurses' Practices	Private	Public	Overall	Independent t-test	
Items	Mean±S.D.	Mean±S.D.	Mean±S.D.	t	p-value
Observe how other nurses assess risk factors of pressure injury development.	2.50±0.512	2.64±0.526	2.59±0.525	-2.949	0.003
Identify common contributing factors for pressure injury development by periodical assessment of the patient's skin.	2.62±0.486	2.65±0.540	2.64±0.523	-.657	0.511
Do skin assessments guided by a standard nursing care in my ward or hospital.	2.87±0.342	2.69±0.490	2.74±0.455	4.564	<0.001
Use a risk assessment scale to assess pressure injury	2.90±0.316	2.61±0.517	2.71±0.480	7.101	<0.001
Document all data related to pressure injury assessment	2.97±0.159	2.75±0.454	2.82±0.398	6.569	<0.001
Assess and provide management of pain in the patients who experience pain from any causes.	2.59±0.503	2.55±0.532	2.56±0.523	0.876	0.381
Perform skin care as a routine work of my unit	2.74±0.442	2.60±0.516	2.64±0.497	3.205	0.001
Place the pillow under the patient's leg to prevent heel injury	2.81±0.395	2.64±0.509	2.70±0.481	3.940	<0.001
Use or advise the caregiver to use creams or oils on the patient's skin to protect from urine, stool, or wound drainage.	2.44±0.498	2.51±0.565	2.49±0.545	-1.536	0.125
Pay more attention to pressure points during cleansing the soil or maceration.	2.51±0.511	2.53±0.538	2.52±0.529	-.333	0.739
Perform lab tests for assessing nutritional status followed by physician's instruction.	2.07±0.402	2.40±0.565	2.29±0.540	-7.172	<0.001
Provide vitamins and food for patients who are malnourished	2.44±0.497	2.53±0.611	2.50±0.578	-1.846	0.065
Monitor a protein and calorie diet in a bedridden patient	2.32±0.488	2.52±0.616	2.45±0.585	-4.057	<0.001
Avoid dragging the patients during repositioning	2.82±0.382	2.66±0.511	2.71±0.479	4.038	<0.001
Always use a special mattress to prevent pressure loadings, such as foam or air.	2.58±0.506	2.57±0.574	2.57±0.553	0.047	0.962
Avoid massage over the patient's bony prominences to prevent pressure injury formation.	2.66±0.474	2.53±0.599	2.57±0.565	2.694	0.007
Avoid using donut-shaped (ring) cushion at bony prominences to prevent pressure injury formation.	2.52±0.501	2.55±0.594	2.54±0.565	-0.452	0.651
Turn a patient position every two hours	2.82±0.386	2.60±0.526	2.67±0.496	5.270	<0.001
Put a pillow under patients' legs from mid-calf to ankle to keep heels off the bed.	2.71±0.455	2.52±0.603	2.58±0.566	3.857	<0.001
Use an air-bed for a patient who is at high risk for pressure injury formation, followed by physician's prescription.	2.40±0.491	2.57±0.539	2.51±0.530	-3.630	<0.001
Always attend seminars for pressure injury prevention	2.41±0.515	2.41±0.714	2.41±0.656	.038	0.970
Advise the patient or caregiver regarding pressure injury preventive care before discharging the patient from a hospital.	2.46±0.510	2.37±0.641	2.40±0.603	1.818	0.070
Total Practice Score Mean±S.D. (range)	57.17±2.718 (15)	56.39±3.234 (23)	56.64±3.095 (43-66)	2.883	0.004

S.D=standard deviation

of education (master's level taken as reference), diploma-trained nurses recorded statistically significantly lower scores of knowledge (B =-4.060, p-value<0.001), while bachelor's holders also scored slightly higher, though not significantly (B=0.097, p-value=0.079). Collinearity statistics revealed good tolerance and VIF values, suggesting that there was no multicollinearity issue among the predictors.

Factors associated with the practice of pressure injury prevention among nurses

Private hospital nurses

Additionally, the analysis (Table 6) identified age (B=0.095; p-value=0.001) as a significant predictor of practice scores. Older nurses had better practice scores in private hospitals. The practice score was also positively

Table 4 Assessing sociodemographic and work-related factors with nurses' knowledge in a private hospital using multiple linear regression

	Unstandardized Coefficients		t	Sig.	Collinearity Statistics	
	B	Std. Error			Tolerance	VIF
(Constant)	12.940	0.813	15.923	0.000		
Age	0.099	0.021	4.745	0.000	0.231	4.334
Duration of employment	0.141	0.047	2.966	0.003	0.252	3.961
Formal Training (0=No is the reference)	1.905	0.226	8.446	0.000	0.650	1.539
Education level (0=masters is the reference)						
Education: Diploma	−4.635	0.474	−9.787	0.000	0.278	3.603
Education: Bachelor	−0.465	0.359	−1.296	0.197	0.276	3.622

VIF=variance inflation factor

Table 5 Coefficients of association between nurses' sociodemographic and work-related factors and pressure injury prevention knowledge in the public hospitals

	Unstandardized Coefficients		t	Sig.	Collinearity Statistics	
	B	Std. Error			Tolerance	VIF
(Constant)	12.597	0.941	13.391	<0.001		
Age	0.081	0.020	4.097	<0.001	0.292	3.430
Duration of employment	0.218	0.065	3.344	0.001	0.230	4.347
Formal training (0=Not is the reference)	2.295	0.221	10.383	<0.001	0.651	1.536
Marital status (0=widowed as the reference)						
Single	−0.114	0.448	−0.255	0.799	0.205	4.886
Married	−0.385	0.415	−0.928	0.354	0.173	5.786
Divorced	−0.509	0.478	−1.065	0.287	0.317	3.159
Education Level (0=Masters as reference)						
Diploma	−4.060	0.502	−8.090	<0.001	0.288	3.478
Bachelor	0.097	0.355	0.273	0.785	0.280	3.565
Area of Practice (0=PICU as refence)						
Medical	0.039	0.476	0.083	0.934	0.395	2.531
Surgical	0.109	0.447	0.243	0.808	0.318	3.146
Orthopedic	−0.025	0.429	−0.059	0.953	0.267	3.749
Neuro Surgery	0.121	0.508	0.238	0.812	0.477	2.096
Neuro Medicine	−0.024	0.446	−0.053	0.958	0.309	3.239
CCU	−0.215	0.438	−0.490	0.624	0.300	3.333
ICU	0.068	0.428	0.158	0.875	0.271	3.687
NICU	0.431	0.476	0.905	0.366	0.395	2.534

CCU=Cardiac care unit, ICU=Intensive care unit, NICU=Neonatal intensive care unit, PICU=Pediatric intensive care unit

Table 6 Association between selected sociodemographic and work-related factors with nurses' practice of pressure injury prevention in a private hospital

	Unstandardized Coefficients		t	Sig.	Collinearity Statistics	
	B	Std. Error			Tolerance	VIF
(Constant)	54.538	1.086	50.239	<0.001		
Age	0.095	0.028	3.445	0.001	0.201	4.982
Duration of employment	0.066	0.059	1.109	0.269	0.245	4.090
Formal training (0=Not is the reference)	1.605	0.284	5.656	<0.001	0.618	1.617
Education level (0=Masters as reference)						
Diploma	−4.398	0.590	−7.455	<0.001	0.270	3.709
Bachelor	−2.128	0.452	−4.711	<0.001	0.263	3.799
Marital status (0=widowed as the reference)						
Single	−0.057	0.253	−0.224	0.823	0.810	1.235
Divorced	−0.319	0.547	−0.583	0.561	0.849	1.178

VIF=variance inflation factor

predicted by formal training. The nurses with formal training scored significantly higher than those with no formal training (B=1.605, p-value<0.001), highlighting the value of formal education in increasing practice capabilities amongst nurses. In terms of level of education (master's level taken as reference), diploma-trained nurses recorded statistically significantly lower practice scores (B=-4.398, p-value<0.001), and bachelor's holders also scored significantly lower practice scores (B=-2.128, p-value<0.001). Collinearity statistics revealed good tolerance and VIF values, suggesting that there was no multicollinearity issue among the predictors.

Public hospital nurses

Additionally, regression analysis was conducted (Table 7), showing that age (B=0.109, p-value<0.001) is a crucial predictor, indicating that older nurses had higher practice scores. In addition, formal training (B=2.640, p-value<0.001) showed that nurses who received formal training had higher practice scores. Again, gender (B=-.517, p-value=0.008) indicated that female nurses registered higher practice scores compared to males. With regard to marital status, there was a significant difference in practice scores between single versus widowed nurses (p-value=.003), as well as married versus widowed (p-value=0.001) nurses, with widowed nurses having lower scores. Further, in terms of level of education (master's level taken as reference), diploma-trained nurses recorded statistically significantly lower practice scores (B=-4.670, p-value<0.001), and bachelor's holders also scored significantly lower practice scores (B=-1.505, p-value<0.001). This suggests that academically more highly qualified nurses exhibit higher levels of pressure injury prevention practices, most prominently in comparison to diploma and bachelor's degree holders. Additionally, the area of practice showed that nurses in the general wards registered statistically significantly lower practice scores (B=-1.112, p=0.031) compared to those in the PICU area. Finally, based on the collinearity statistics, there were good tolerance and VIF values, suggesting that there was no multicollinearity issue among the predictors.

Overall, the study outcomes show that nurses had an average level of knowledge in pressure injury prevention (mean score=17.31±2.86 out of 22). Strong knowledge areas included causes of pressure injury, use of risk assessment scales, and patient repositioning, although

Table 7 Coefficients of association

	Unstandardized Coefficients		t	Sig.	Collinearity Statistics	
	B	Std. Error			Tolerance	VIF
(Constant)	51.279	1.016	50.471	<0.001		
Age	0.109	0.021	5.092	<0.001	0.291	3.431
Duration of employment	0.129	0.070	1.834	0.067	0.230	4.351
Formal training (0=No as reference)	2.640	0.239	11.057	<0.001	0.650	1.538
Gender (0=Female as reference)						
Male	−0.517	0.194	−2.665	.008	0.923	1.083
Marital status (0=widowed as the reference)						
Single	1.459	0.485	3.011	0.003	0.204	4.902
Married	1.497	0.448	3.342	0.001	0.173	5.789
Divorced	1.052	0.518	2.029	0.043	0.314	3.182
Education level (0=Masters as reference)						
Diploma	−4.670	0.542	−8.616	<0.001	0.287	3.479
Bachelor	−1.505	0.385	−3.910	<0.001	0.278	3.594
Area of practice (0=PICU as reference)						
Medical	−1.112	0.514	−2.164	0.031	0.395	2.533
Surgical	−0.767	0.483	−1.590	0.113	0.318	3.146
Orthopedic	−0.754	0.465	−1.623	0.106	0.265	3.766
Neuro Surgery	−1.060	0.551	−1.924	0.055	0.474	2.112
Neuro Medicine	−0.621	0.482	−1.286	0.199	0.308	3.251
CCU	−0.675	0.473	−1.426	0.155	0.300	3.333
ICU	−0.452	0.463	−0.976	0.330	0.271	3.691
NICU	−0.221	0.514	−0.430	0.668	0.395	2.534

Dependent variable: total nurses practice, PICU=Pediatric intensive care unit, CCU=Cardiac care unit, ICU=intensive care unit, NICU=Neonatal intensive care unit

notable item-specific differences were observed between private and public hospital nurses. In terms of practice, overall performance was moderate, with significantly higher mean practice scores reported by nurses in private hospitals compared to those in public hospitals. Documentation and routine skin care were the strongest areas of practice, while laboratory-based nutritional assessments were performed the least. Predictor analysis showed that age, work experience, and formal training consistently emerged as positive predictors of both knowledge and practice across hospital types. Nurses with higher academic qualifications (master's level) demonstrated superior competence, while diploma-trained nurses had significantly lower knowledge and practice scores. In addition, gender and marital status influenced practice scores among public hospital nurses, with female and married nurses showing higher scores.

Discussion

Nurses' knowledge about pressure injury prevention in private and government hospitals was noted to be average, indicating a generally reliable knowledge level, with little concern/worry over patients' safety. The overall mean knowledge score indicates a moderate level of awareness among ICU nurses regarding pressure injury prevention. When considered in relation to standardized nursing education and accreditation requirements, which emphasize competency in patient safety and evidence-based preventive care, this score suggests that while basic

knowledge is present, there may be gaps in translating standardized education into clinical practice.

Nurses in private hospitals scored slightly higher (mean=17.41) than those in public hospitals (mean=17.25). This difference may be explained by many factors, including better access to educational resources and training in private hospitals, as noted by Altarawneh and colleagues[23], and lower patient volumes, allowing for more focus on preventive care[24]. Private institutions also often emphasize quality improvement programs, enhancing staff knowledge[25]. Nevertheless, this contrasts with findings by Dirgar and colleagues[26] in Turkey, where public hospital nurses demonstrated higher knowledge of the Braden scale. These differences might stem from contextual variables, such as training environments, as discussed by Jahanpeyma and others[27].

The highest-scoring item involved assessing spinal cord injury patients at high PI risk, with 93.1% overall accuracy[28]. Private hospitals again outperformed public ones, though marginally. On knowledge of the Braden scale, 89.6% of nurses answered correctly overall, with private hospitals achieving 97.9% and public hospitals 85.7%. This suggests that private hospitals invest more in ongoing education and evidence-based practices[29].

Nursing practices regarding pressure injury prevention in private and government hospitals were also noted to be average, with private hospitals scoring slightly higher (57.165) than public ones (56.3901). This difference is primarily explained by better resource availability, staffing levels, organizational cultural differences, and smaller patient loads in private hospitals[30]. Private institutions, funded through higher service fees and private insurance, are in a better position to equip themselves with advanced, modern technologies, including any other equipment needed to relieve pressure. Also, relatively better staffing in the private hospitals, coupled with investment in specialized professional staff training, may be used to explain the noted differences[31]. These findings align with those of a Brazilian study by Serpa and others[32], which reported a lower PI incidence in private hospitals (4.1%) than in public hospitals (9.9%).

Comparatively, nurses had the highest practice scores on documentation activities, with an overall mean of 2.82; private hospitals scored 2.97, while public hospitals scored 2.75. On the same note, the use of the Braden scale – a validated PI risk assessment tool – was also marked with better performance among nurses, especially in private hospitals (2.90 vs. 2.61). Additionally, older nurses and those with longer employment durations showed better practices, likely due to experience and awareness of PI risks, confirming the findings from Ebi, Hirko, and Mijena[33]. Regression analysis affirmed age, education, and training as significant predictors of good practices.

The outcomes noted under the level of knowledge and practice of pressure injury prevention among nurses working in private and governmental hospitals also showed some striking outcomes, comparable to the previous researchers' observation. There is a negligible difference in knowledge between the two groups, with private hospital nurses recording a mean score of 17.41 and public hospital nurses scoring 17.26, resulting in an overall mean of 17.31. This similarity is largely due to standardized nursing education and training programs, accredited by the same authorities, which include essential content such as wound care and pressure injury prevention[34]. Global guidelines provided by organizations like the National Pressure Injury Advisory Panel (NPIAP) also contribute to uniform knowledge across sectors. These findings align with Zhang and colleagues[35], who stressed the importance of prioritizing education on pressure injury prevention. Furthermore, Lv and others[36] emphasized that adequate knowledge combined with a positive attitude significantly enhances preventive practices.

Despite the knowledge differences, there was a notable difference in practices. Nurses in private hospitals scored a mean of 57.165, compared to 56.3901 in public

hospitals, with an overall mean of 56.64. This difference, though small, can be attributed to factors such as organizational culture, resource allocation, and staffing[37]. Private hospitals generally have better access to advanced equipment, pressure-relieving devices, and lower nurse-to-patient ratios, allowing for more individualized care[25]. Public hospitals often suffer from limited resources, staff shortages, and heavy workloads, which hinder the effective implementation of preventive practices[31].

Diverse factors affect nurses' knowledge and practices about pressure injury. Older nurses and those with longer durations of employment demonstrated better knowledge and practice scores in both sectors, likely due to increased experience and training exposure over time, as indicated in many previous studies[38]. The stronger positive correlation in private hospitals may reflect better access to specialized training and updated resources[27]. Formal training significantly improved knowledge and practice scores, with private hospitals showing a larger effect. The impact can be linked to the intellectual and enlightening influence that formal education creates among learners[39]. Gender showed no significant difference in knowledge, while marital status and level of education were associated with better knowledge and practice scores, particularly among married nurses and those with higher academic qualifications[36]. Older nurses had higher practice scores, possibly due to more practical engagement with patients. It was also noted that widowed nurses scored lower than their married/single counterparts in practice, and this is arguably due to socioeconomic elements within the family. Higher academic scores, parallel to experience, also improved practice, probably due to the impact of additional theoretical and practical knowledge acquired[36].

The area of practice had a significant impact only in public hospitals, possibly due to their broader, high-risk patient base[40]. Public hospitals showed stronger associations across all factors, highlighting the influence of workplace structure and policy[30,37]. These findings emphasize the need for equitable, structured training and policy improvements to enhance PI prevention. At the same time, there is a need for frequent skin inspections, patient repositioning, pressure-relieving surfaces, device padding, optimal nutrition, and consistent staff education to reduce the incidence of PI.

However, the study outcomes may be limited by using data from only two hospitals, which could narrow the scope in terms of subject variability and heterogeneity. Nevertheless, there is a need for future researchers to explore institutional, environmental, and organizational factors that influence nurses' knowledge and practices, with a focus on developing tailored interventions to improve pressure injury prevention outcomes. Policy makers and hospital administrators should also establish flexible and structured training programs for nurses that emphasize evidence-based guidelines, practical skills, and comprehensive patient assessments. Adequate allocation of resources, including pressure-relieving equipment, documentation tools, and sufficient staffing, remains essential, particularly in public hospitals, to reduce workload pressures and support preventive care. Strengthening interdisciplinary collaboration through policy structures and teamwork among healthcare providers will further enhance adherence to best practices. Moreover, encouraging higher academic qualifications and specialized certifications, alongside facilitating access to updated guidelines and continuous professional development, can build sustainable improvements in competency. Additionally, training programs should be sensitive to demographic factors, such as marital status and gender, to enhance nurses' engagement and adherence to pressure injury prevention practices. Regular audits and feedback systems are recommended to ensure accountability and the consistent implementation of prevention protocols. Finally, multicentre studies across diverse hospital settings are needed to generate generalizable findings and inform national policy and practice.

Conclusion

Despite the average performance, the outcomes still show the need for targeted training, continuous professional development, and interdisciplinary collaboration in both public and private hospitals to enhance pressure injury prevention.

Acknowledgement

Heartfelt appreciations go to the contributors of this paper, who worked towards building knowledge.

Conflict of interest

None.

References

1. National Institute for Health and Care Excellence (NICE). Pressure ulcers: prevention and management. Clinical guideline [CG179]. [homepage on the Internet]. London: NICE; 2014. [cited 2025, May 20]. Available from: https://www.nice.org.uk/guidance/cg179
2. Kayser SA, VanGilder CA, Lachenbruch C. Predictors of superficial and severe hospital-acquired pressure injuries: a cross-sectional study using the international pressure ulcer prevalence™ survey. Int J Nurs Stud 2019;89:46-52.
3. World Health Organization (2023). Patient Safety. [homepage on the Internet]. Geneva: WHO; 2023. [cited 2025 May 20]. Available from: https://www.who.int/news-room/fact-sheets/detail/patient-safety
4. Mallah Z, Nassar N, Sharara E, Rizk F. Prevalence and incidence of pressure injuries among older people in nursing homes: a systematic review and meta-analysis. J Clin Nurs. 2023;32:6075-87. doi: 10.1111/jocn.16744.
5. Zhou Q, Li X, Wang Y, Zhao J. Global, regional, and national burden of decubitus ulcers from 1990 to 2021: results from the global burden of disease study. Front Public Health 2025;13:1494229. doi: 10.3389/fpubh.2025.1494229.
6. Tayyib N, Coyer F, Lewis P. Saudi Arabian adult intensive care unit pressure ulcer incidence and risk factors: a prospective cohort study. International wound journal. 2016;13:912-9.
7. Al-Zahrani HA. Prevalence of pressure ulcers among patients receiving home healthcare in Makkah, Saudi Arabia. London J Med Health Res 2022;22:45-52.
8. Aljezawi M, Tubaishat A, Al Qadire M. Pressure ulcers in intensive care units: a prospective cohort study of their incidence and associated factors in Jordan and Saudi Arabia. Risk Manag Healthc Policy 2021;14:129-39. doi: 10.2147/RMHP.S290045.
9. Amirah MFY, Rasheed AMY, Parameaswari PJ, Awajeh AM, Issa MR, Abdallah M. Pressure injury prevalence and risk factors among adult critically ill patients at a large intensive care unit. J Intensive Crit Care 2019:9. doi: 10.21767/2471-8505.100128.
10. 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.
11. Chaboyer WP, Thalib L, Harbeck EL, Coyer FM, Blot S, Bull CF, et al. Incidence and prevalence of pressure injuries in adult intensive care patients: a systematic review and meta-analysis. Crit care Med 2018;46:e1074-81.
12. Rivera J, Donohoe E, Deady-Rooney M, Douglas M, Samaniego N. Implementing a pressure injury prevention bundle to decrease hospital-acquired pressure injuries in an adult critical care unit: an evidence-based, pilot initiative. Wound Manag Prev. 2020;66:20-28.
13. Zarei E, Madarshahian E, Nikkhah A, Khodakarim S. Incidence of pressure ulcers in intensive care units and direct costs of treatment: Evidence from Iran. J. Tissue Viability 2019;28:70-4.
14. Jaul E, Barron J, Rosenzweig JP, Menczel J. An overview of co-morbidities and the development of pressure ulcers among older adults. BMC geriatrics 2018;18:1-1.
15. Aydın AK, Karadağ A, Gül Ş, Avşar P, Baykara ZG. Nurses' knowledge and practices related to pressure injury: a cross-sectional study. J Wound Ostomy Continence Nurs 2019;46:117-23.
16. Saleh D, Camart N, Romo L. Predictors of stress in college students. Frontiers in psychology 2017;8:19.
17. Sengul T, Karadag A. Determination of nurses' level of knowledge on the prevention of pressure ulcers: The case of Turkey. J Tissue Viability 2020;29:337-41.
18. Saleh MY, Papanikolaou P, Nassar OS, Shahin A, Anthony D. Nurses' knowledge and practice of pressure ulcer prevention and treatment: an observational study. J Tissue Viability 2019;28:210-7.

19. Jiang L, Li L, Lommel L. Nurses' knowledge, attitudes, and behaviours related to pressure injury prevention: A large-scale cross-sectional survey in mainland China. J Clin Nurs 2020;29:3311-24.
20. Tirgari B, Mirshekari L, Forouzi MA. Pressure injury prevention: knowledge and attitudes of Iranian intensive care nurses. Advances in skin & wound care 2018;31:1-8.
21. Maylor M, Torrance C. Pressure sore survey part 2: nurses' knowledge. J Wound Care 1999;8:49-52.
22. Islam MS. Nurses' knowledge, attitude, and practice regarding pressure ulcer prevention for hospitalized patients at Rajshahi Medical College Hospital in Bangladesh [master's thesis]. Songkhla (Thailand): Prince of Songkla University; 2010.
23. Altarawneh WM, Masa'deh R, Hamaideh SH, Saleh AM, Alhalaiqa F. Nurses' knowledge, attitudes and practices towards palliative care provided to patients diagnosed with cancer. PLOS One 2023;18:e0289317.
24. Dimanopoulos TA, Chaboyer W, Plummer K, Mickan S, Ullman AJ, Campbell J, Griffin BR. Perceived barriers and facilitators to preventing hospital-acquired pressure injury in paediatrics: a qualitative analysis. J Adv Nurs 2023.
25. Abrahams C, Alley H, Downing C. Experiences of newly employed professional nurses regarding their quality of work life at a private hospital in Gauteng. Int J Afr Nurs Sci 2021;15:100362.
26. Dirgar E, Tosun B, Dokumuş H, Bülbül T. Evaluating nurses' knowledge of pressure injury prevention: a descriptive study. Adv Skin Wound Care 2022;35:1-6.
27. Jahanpeyma P, Sajadi SA, Rajai N, Akyol AD. Comparison of challenges of the nursing educational system in Iran and Turkey. Nurse Educ Today 2022;119:105540.
28. Ven S, Fulbrook P, Burston A, Lovegrove J, Miles SJ. Pressure injury risk assessment for palliative care patients in the acute hospital setting: a scoping review. BMC Palliat Care 2025 25;24:212.
29. Kottner J, Cuddigan J, Carville K, Balzer K, Berlowitz D, Law S, Litchford M, Mitchell P, Moore Z, Pittman J, Sigaudo-Roussel D. Pressure ulcer/injury classification today: an international perspective. J Tissue Viability 2020;29:197-203.
30. Aca Z, Kırcal-Şahin A, Özdemir A, Kaymakcı YS. Gender stereotypes and professional experiences of female nurses in Türkiye. Front Public Health 2025;13:1538517.
31. Moncatar TR, Nakamura K, Siongco KL, Seino K, Carlson R, Canila CC, et al. Interprofessional collaboration and barriers among health and social workers caring for older adults: a Philippine case study. Human Resources for Health 2021;19:1-4.
32. Serpa LF, Ortiz MM, Lima AC, Bueno L, Nogueira PC, Ferri C, Santos VL. Incidence of hospital-acquired pressure injury: A cohort study of adults admitted to public and private hospitals in Sao Paulo, Brazil. Wound Repair Regen 2021;29:79-86.
33. Ebi WE, Hirko GF, Mijena DA. Nurses' knowledge to pressure ulcer prevention in public hospitals in Wollega: a cross-sectional study design. BMC Nursing 2019;18:1-2.
34. Mlambo M, Silén C, McGrath C. Lifelong learning and nurses' continuing professional development, a metasynthesis of the literature. BMC nursing 2021;20:1-3.
35. Zhang YB, He L, Gou L, Pei JH, Nan RL, Chen HX, et al. Knowledge, attitude, and practice of nurses in intensive care unit on preventing medical device–related pressure injury: A cross-sectional study in western China. Int Wound J 2021;18:777-86.
36. Lv T, Tang A, Yang Y, Wang J. Clinical nurses' attitudes towards medical device-related pressure injuries and an analysis of relevant influencing factors: A cross-sectional study in China. Int Wound J 2024;21:e70093.
37. Pérez-Sánchez S, Madueño SE, Montaner J. Gender gap in the leadership of health institutions: the influence of hospital-level factors. Health Equity 2021;5:521-5.
38. Franco PL, Christie LM. Effectiveness of a one day self-compassion training for pediatric nurses' resilience. J Pediatr Nurs 2021;61:109-14.
39. Biresaw H, Asfaw N, Zewdu F. Knowledge and attitude of nurses towards patient safety and its associated factors. Int. J Afr Nurs Sci 2020;13:100229.
40. Hu L, Sae-Sia W, Kitrungrote L. Intensive care nurses' knowledge, attitude, and practice of pressure injury prevention in China: a cross-sectional study. Risk manag healthc policy 2021:4257-67