

Assessment of Pressure Ulcer Risk among Patients in Intensive Care Unit at a Tertiary Care Hospital: A Cross-sectional Descriptive Study

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ABSTRACT



Background: Pressure ulcer continues to be a major health problem and prevention has been the main emphasis of patient care. Rigorous evaluation of patients in intensive care unit is necessary for early identification of those at risk of developing pressure ulcer. Multiple risk assessment scales are in practice for its prevention. This study aims to assess pressure ulcer risk of the patients admitted in intensive care unit using Braden Scale.

Methods: A cross-sectional descriptive study was conducted among 272 patients admitted in intensive care unit of Nepal Medical College Teaching Hospital from August 2019 to January 2020. Consecutive sampling technique was used to collect data. Data was analyzed using chi-square test and multiple binary logistic regression in the statistical package for social sciences in version 16.

Results: Among 272 patients, the mean Braden score of pressure ulcer risk was 18.23 ± 3.51 . Nearly half of the patients 127 (46.7%) had risk of developing pressure ulcer, while two of them eventually developed pressure ulcer. The mean age was 51.11 ± 18.82 years. Majority of the patients 221 (81.2%) were admitted in intensive care unit with medical disorders. Risk of developing pressure ulcer was significantly associated with age, gender, fever, use of ventilator, pressure ulcer prevention device, total duration of the hospital stay and duration of Intensive Care Unit stay ($p = < 0.05$). The predictors of pressure ulcer risk were mechanical ventilation ($P = 0.001$, Adjusted Odds Ratio = 6.99) and fever ($p = 0.011$, Adjusted Odds Ratio = 3.61).

Conclusions: Routine use of Braden Scale helps in early identification of pressure ulcer risk. Nurses need to consider the patients with ventilatory support and fever as these are the strong predictors of pressure ulcer risk.

Keywords: Braden scale, intensive care unit, pressure ulcer, risk

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INTRODUCTION

Pressure ulcer (PU) is a major health problem affecting approximately three million adults.¹ Nearly 700,000 patients were affected by pressure ulcer and each year in acute care setting, 186,617 patients develop new pressure ulcer as per the report of World stop pressure ulcer day in 2014. Also, 2% of preventable deaths are due to pressure ulcers.² Globally, 60,000 people died due to the complications of pressure ulcer as per the report of Coloplast pressure ulcer summit in 2014.² In the United States, more than 2.5 million people develop pressure ulcers every year.³ In Ethiopia, 16.8% of hospitalized patients had pressure ulcer.⁴ In 2015, the prevalence rate of pressure ulcers in 12 hospitals in China was 1.58%.⁵ Likewise, in a tertiary hospital in India, 2015 the overall prevalence rate was 7.8%.⁶

PU is confronted in all care settings and is considered one of the most underestimated condition.⁷ PU leads to suffering of the patient, increase hospital stay, serve as source of infection and may even cause death.⁵ Hence identifying individuals at risk for PU and initiating effective preventive measures is of paramount importance. Prevalence of PU has been included in the Nursing Quality Indicators.⁵

Among multiple risk assessment scales, Braden scale incorporates detailed explanations of risk factors and provides better prediction of PU development.^{1,8} In the context of Nepal, studies are available in the area of the caregivers' knowledge and practice on PU prevention; the study on its risk assessment needs exploration. This study aims to find out the risk of PU in intensive care unit (ICU) of a tertiary care hospital by using Braden Scale.

MATERIALS AND METHODS

A cross-sectional descriptive study was conducted among 272 patients admitted in ICU of Nepal Medical College Teaching Hospital (NMCTH), Kathmandu, Nepal from August 2019 to January, 2020. Ethical approval was taken from the Institutional Review Committee (Reference number: 050-075/076). Consecutive sampling technique was used to collect data i.e. all the patients who were admitted in ICU during the period of our data collection who also meet the inclusion criteria were included in the study. Inclusion criteria included adult patients admitted in ICU with the age of 19 years and above while exclusion criteria included patients with pre-existing pressure ulcer and those with less than two assessments.

There were 376 patients admitted in ICU throughout our data collection period, out of which 291 met the eligibility criteria. Again, out of them, 19 patients were excluded as they had less than two assessments. Therefore, the final sample size was 272 (Figure 1).

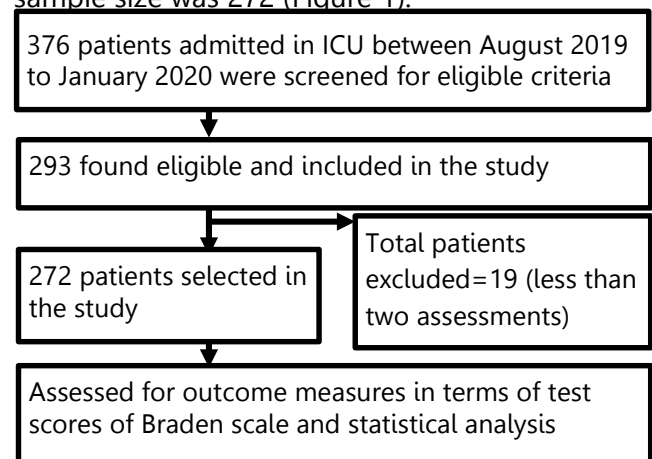


Figure 1. The schematic presentation of methodology.

The data collection tool consists of three parts which includes socio-demographic information, clinical information and the Braden Scale to assess the risk of PU.⁹ Permission and approval was taken to re-print and use it. It has six sub-scales that reflect

sensory perception, moisture, activity, mobility, friction and shear, and nutritional status. Each sub-scale is rated on a scale of 1 to 4, excluding the 'friction and shear' category which is rated on a 1-3 scale. The total score ranged from 6-23, with a higher score meaning a lower risk of developing PU and vice versa. It is categorized as: very high risk: total score 9 or less; high risk: score 10-12; moderate risk: score 13-14; mild risk: score 15-18 and no risk: score 19-23.¹⁰ The average risk score of each patient was considered to categorize the risk according to Braden scale score.

To collect the data, informed consent was obtained from the patients and patients' party of those who were unconscious or have altered mental status. First assessment of patient using BRADEN scale was done within 6 to 8 hours of admission in ICU and then every day during the morning care between 8 to 10 am. Data was collected by the on-duty nurses involved in direct patient care, who were trained accordingly. Data was rechecked by researcher themselves for completeness.

The independent variables in this study were: age, gender, history of smoking and alcoholism, diagnosis, use of mechanical ventilation, presence of fever and length of hospital and ICU stay. Dependent variable was pressure ulcer risk.

The null hypothesis for this study was: There is no significant association between dependent (pressure ulcer risk) and independent variables (age, gender, history of smoking and alcoholism, type of disorders, use of mechanical ventilation, fever, total duration of ICU and hospital stay).

Data entry and cleaning were done in MS-EXCEL (Microsoft version 10). Data analysis was done using Statistical Package for Social

Sciences (SPSS) version 16.0, Chicago, SPSS Inc. Bivariate analysis (Chi-square test) was used to identify the variables significantly associated with risk of pressure ulcer. At 95% Confidence Interval (CI), p-value less than 0.05 was considered to be statistically significant. To address the confounding variables, those variables with p-value <0.20 were further analyzed using multiple logistic regression analysis.

RESULTS

Among 272 patients, the mean Braden score of PU risk was 18.23 ± 3.51 . Among 272 patients, almost half of the patients 135 (49.6%) were between age 31 to 60 years with the mean age of 51.11 ± 18.82 years. More than half of them 140 (51.5%) were male. More than one-fourth of the patients 74 (27.2%) had history of smoking while almost one third 88 (32.4%) of them had history of alcohol intake (Table 1).

Table 1. Socio-demographic information.

Variables	Frequency (%)
Age groups(in completed years)	
19-30	48 (17.7%)
31-60	135 (49.6%)
60 and above	89 (32.7%)
Mean \pm SD = 51.11 \pm 18.82 years Minimum= 19 years, Maximum= 96 years	
Gender	
Male	140 (51.5%)
Female	132 (48.5%)
History of smoking (Yes)	74 (27.2%)
History of alcoholism (Yes)	88 (32.4%)

Majority of the patients 221 (81.2%) were admitted in ICU with medical disorders. More than one-fourth of the patients 71 (26.1%) were transferred in from other departments like medicine, surgery, orthopedics,

obstetrical/gynecological or psychiatric. Thirty-three (12.1%) patients were in ventilator, 34 (12.5%) patients had fever and 93 (34.2%) patients were provided with PU prevention device (Table 2).

Table 2. Health and medical information.	
Variables	Frequency (%)
Type of Disorders	
Medical	221 (81.2%)
Surgical	24 (8.8%)
Obstetric and Gynecological	17 (6.3%)
Psychiatric	10 (3.7%)
Use of mechanical ventilation (Yes)	33 (12.1%)
Presence of fever (Yes)	34 (12.5%)
Use of pressure ulcer prevention device (Yes)	93 (34.2%)
Transferred in from other Department (Yes)	71 (26.1%)
Total duration of ICU stay	Mean±SD= 3.93±2.69 days Min= 2 days, Max= 22 days
Total duration of hospital stay (including ICU stay)	Mean±SD = 4.63±3 days Min= 2 days, Max= 30 days

n=total number of patients, *Min*=Minimum; *Max*=maximum

Nearly half of the patients (46.7%) had risk of developing PU and out of them, three patients (1.1%) were at very high risk (Table 3). Two of the patients (0.7%) developed PU

during the period of data collection. Both the patients, 38 years/male and 35 years/female

had pneumonia, mild risk of PU according to Braden score and developed PU in 4th and 5th day of ICU admission respectively. The female patient also had fever for 5 days, was on ventilatory support and on air mattress (Table 3).

Table 3. Risk of developing pressure ulcer according to Braden scale.	
Risk Category	Frequency (%)
Very High Risk	3(1.1%)
High Risk	21(7.7%)
Moderate Risk	16(5.9%)
Mild Risk	87(32%)
No Risk	145(53.3%)
Mean Risk Score±SD= 18.23±3.51; Min= 8, Max= 23	

n=total number of patients, *Min*=Minimum; *Max*=maximum

Risk of developing PU was significantly associated with age ($p=0.016$), gender ($p=0.036$), mechanical ventilation ($p\leq 0.001$), fever ($p\leq 0.001$), use of PU prevention device ($p=0.001$) and total duration of the hospital stay ($p=0.003$) and duration of ICU stay ($p=0.001$) (Table 4).

Table 4. Association of different variables with Pressure ulcer risk.

Variables	Risk of pressure ulcer n (%)		p-value
	Risk	No Risk	
Age			
>51 years	72 (54.1%)	61 (45.9%)	0.016*
Gender			
Male	74 (52.9%)	66 (47.1%)	0.036*
Smoking (Yes)	38 (51.4%)	36 (48.6%)	0.346
Alcoholism (Yes)	43 (48.9%)	45 (51.1%)	0.619
Mechanical Ventilation (Yes)	29 (87.9%)	4 (12.1%)	<0.001*
Presence of fever	28 (82.4%)	6 (17.6%)	<0.001*
Use of Pressure Ulcer Prevention Devices (Yes)	57 (61.3%)	36 (38.7%)	0.001*
Total duration of the hospital stay			
≤4days	70 (40.0%)	105 (60.0%)	0.003*
Duration of ICU stay			
≤4days	80 (40.6%)	117 (59.4%)	0.001*

*p-value significant at <0.05

Patients who were in ventilatory support were 7 times likely to be at PU risk (P=0.001, AOR=6.99). Fever was another strong predictor of PU risk (p=0.011, AOR=3.61). Though not significantly associated, patients with age of more than 51 years were 1.69 times more likely to at pressure ulcer risk than the patients younger than their age. (Table 5)

Table 5. Predictive Factors of Pressure Ulcer Risk using Multiple Logistic Regression.

Variables	Pressure Ulcer Risk		
	p-value	AOR	95% CI (LL-UL)
Age			
≤51 (Ref)	0.050	1.69	0.99-2.88
>51			
Gender			
Male (Ref)	0.057	0.597	0.35-1.02
Female			
Use of Mechanical Ventilation			
No (Ref)	0.001*	6.99	2.24-21.83
Yes			
Fever			
Absent (Ref)	0.011*	3.61	1.34-9.74
Present			
Use of pressure ulcer prevention device			

No (Ref)	0.419	1.28	0.70-2.33
Yes			
Total duration of hospital stays			
≤4 (Ref)	0.478	1.41	0.54-3.68
>4			
Duration of ICU stay			
≤4 (Ref)	0.569	1.35	0.48-3.77
>4			

**p*-value significant at <0.05, Ref=Reference

DISCUSSION

Multiple risk assessment tools are in practice which help health personnel especially nurses to assess risk of PU in critically ill patients. Among them, the Braden scale is one of the widely used tools with high validity.^{1,8} Present study showed mean Braden score of 18.23 ± 3.51 . While previous studies showed mean scores of 12.8 and 11.2 ± 1.60 .^{11,12} The higher mean Braden score in present study may be due to shorter hospital stay and less number of patients in ventilatory support.

This study showed nearly half (46.7%) of the patients at risk of developing PU; 7.7% were at high risk and 1.1% at very high risk. The previous studies showed 7 to 28% patients at high risk and 5 to 12.7% at very high risk of PU.^{7,13} This variation may be due to the difference in the level of the critically ill patients admitted in ICU. The occurrence of PU is widely varied amongst different literatures (3.1% to 62.5%).^{12,14-18} The incidence of PU was lower (0.7%) in present study which could be due to a smaller number of cases at risk of PU according to Braden score and effective nursing care.

Medical disorders were the most common (81.2%) cause of ICU admission; with similar results in previous studies.^{14,19} While surgical cases were found highest (48.2%) in the study of de Azevedo Macena MS et al.²⁰ The mean length of hospital stay was 4.63 ± 3 days, while

it was longer in other studies (mean hospital stay of 15.8 to 17.2 days).^{12,20} Ventilatory support was required in 12.1% of patients; while it ranged in between 19 to 38% in previous studies.^{7,11,14} PU prevention device was provided in about one-third of the patients (34.2%) in present study and in more than half (53.7%) of the patients in study of Karayurt O et al.¹⁶

Most of the previous studies showed significant association between risks of developing PU and the age including in present study.^{7,13,14,17,19} Present study and study conducted by Kogila R et al also showed significant association with the gender.¹³ Risk of developing PU in patient under mechanical ventilation was significant ($p \leq 0.001$) which was similar to previous studies.^{7,14,16,17} PU prevention device and level of PU risk show significant association as similar to the study of Bereded DT et al.²⁰ Risk of developing PU was significant with duration of the hospital and ICU stay which was similar to the previous study.²⁰ Smoking and alcoholism did not show significant association with PU risk in this study. While previous studies showed increased risk of PU among smokers.^{19, 21}

Patients in ventilator were seven times more likely to be at risk of PU. It may be subjected to local effects of hypoxia, hypoperfusion and reduced mobility in these unstable patients.²¹ Age is also found to be another predictor in

the present study. Sensory deficit increases with age and reduces urge to change the position frequently. Also, there is decreased subcutaneous fat which provides buffer to pressure effects.²² The other strong predictor of PU risk in this study was fever. Similar predictor of PU risk was found in previous studies as well.²³

CONCLUSIONS

The strong predictors of PU in ICU were fever and ventilatory support. These factors along

REFERENCES

1. Cox J. Predictive power of the Braden scale for pressure sore risk in adult critical care patients: a comprehensive review. *J Wound Ostomy Continence Nurs.* 2012;39(6):613-21. <https://doi.org/10.1097/won.0b013e31826a4d83> [PubMed] [Full Text]
2. Dilie A, Mengistu D. Assessment of nurses' knowledge, attitude and perceived barriers to expressed pressure ulcer prevention practice in Addis Ababa government hospitals, Addis Ababa, Ethiopia. *Adv Nurs.* 2015. <https://doi.org/10.1155/2015/796927> [Full Text]
3. Berlowitz D, Lukas CV, Parker V et al. Preventing Pressure Ulcers in Hospitals. *Agency for Healthcare Research and Quality* 2014. [Full Text]
4. Gedamu H, Hailu M, and Amano A. Prevalence and associated factors of pressure ulcer among hospitalized patients at Felegehiwot referral hospital, Bahir Dar, Ethiopia. *Adv Nurs* 2014; Article ID 767358, 8 pages. <https://doi.org/10.1155/2014/767358> [Full Text]
5. Pattanshetty RB, Prasade PM, Aradhana KM. Risk assessment of decubitus ulcers using four scales among patients admitted in medical and surgical intensive care units in a tertiary care set up: a cross-sectional study. *Int J Physiother Res.* 2015;3(2):971-77. <https://doi.org/10.16965/IJPR.2015.117> [Full Text]
6. Jiang Q, Li X, Qu X, Liu Y, Zhang L, Su C, et al. The incidence, risk factors and characteristics of pressure ulcers in hospitalized patients in China. *Int J ClinExpPathol.* 2014;7(5):2587-94. [PubMed]
7. Ozyurek P, Yavuz M, Yildiz O. Investigation of the risk factors of pressure ulcers in intensive care unit patients: According to the Braden Scale. *East J Med.* 2016;21(1):1-9. <https://doi.org/10.5505/ejm.2016.21939> [Full Text]
8. Bergstrom N, Braden BJ, Laguzza A, Holman V. Braden scale for predicting pressure sore risk. *Nurs Res.* 1987;36(4):205-10. [PubMed]
9. British Columbia Provincial Nursing Skin and Wound Committee. Guidelines; braden scale for predicting pressure ulcer risk in adults and children. 2014. [Full Text]
10. Borghardt AT, Prado TN, Araújo TM, Rogenski NM, Bringuento ME. Evaluation of the pressure ulcers risk scales with critically ill patients: a prospective cohort study. *Rev Lat Am Enfermagem.* 2015;23(1):28-35. <https://dx.doi.org/10.1590%2F0104-1169.0144.2521> [PubMed]
11. He M, Tang A, Ge X, Z J. Pressure Ulcers in the Intensive Care Unit: An Analysis of Skin Barrier Risk Factors. *Adv Skin Wound Care.* 2016;29(11):493-98.

- <https://doi.org/10.1097/01.asw.0000494779.66288.c9> [PubMed]
12. Kogila R, Kalaiyarasi S, Pushpakala J. A study to assess the level of risk of Pressure ulcer among bed ridden patients in selected tertiary hospital. *Intl J Applied Res.* 2016;2(8):831. [Full Text]
 13. De Azevedo Macena MS, da Costa Silva RS, Dias Fernandes MIDC, de Almeida Medeiros AB, Batista Lucio KD, de Carvalho Lira ALB. Pressure Ulcer risk evaluation in critical patients: clinical and social characteristics. *Open Nurs J.* 2017;11:91-97. <https://doi.org/10.2174/187443460171101001> [PubMed]
 14. Serrano ML, Méndez MI, Cebollero JS, Rodríguez M. Risk factors for pressure ulcer development in Intensive Care Units: A systematic review. *Med Intensiva.* 2017;41(6):339-46. <https://doi.org/10.1016/j.medin.2016.09.003> [PubMed] [Full Text]
 15. Karayurt O, Akyol O, Kılıçaslan N, Akgun N, Sargin U, Kondakçı M, et al. The incidence of pressure ulcer in patients on mechanical ventilation and effects of selected risk factors on pressure ulcer development. *Turk J Med Sci.* 2016 Nov 17;46(5):1314-22. <https://doi.org/10.3906/sag-1504-139> [PubMed]
 16. Manzano F, Colmenero M, Pérez-Pérez, Roldán D, Jiménez-Quintana M, Mañas MR, et al. Comparison of two repositioning schedules for the prevention of pressure ulcers in patients on mechanical ventilation with alternating pressure air mattresses. *Intensive care medicine.* 2014;40(11):1679-87. <http://doi.org/10.1007/s00134-014-3424-3> [Full Text]
 17. Bereded DT, Salih MH, Abebe AE. Prevalence and risk factors of pressure ulcer in hospitalized adult patients; a single center study from Ethiopia. *BMC Res Notes.* 2018; 11(1):847. <https://doi.org/10.1186/s13104-018-3948-7> [PubMed]
 18. Fernandes LM, Caliri MHL. Using the braden and glasgow scales to predict pressure ulcer risk in patients hospitalized at intensive care units. *2008;16(6):973-78.* <https://doi.org/10.1590/S0104-11692008000600006> [Full Text]
 19. Ulker EE, Yapucu GU. A prospective, descriptive study of risk factors related to pressure ulcer development among patients in intensive care units. *Ostomy Wound Manage.* 2013;59(7):22. [PubMed]
 20. Qaddumi J, Almahmoud O. Prevalence and Features of Pressure Ulcers among Patients in ICU Department of Governmental Hospital in Palestine: Cross Sectional study. *Intl J Nurs.* 2018;5(2):72-80. <https://doi.org/10.15640/ijn.v5n2a6> [Full Text]
 21. Apostolopoulou E, Tselebis A, Terzis K, Kamarinou E, Lambropoulos I, Kalliakmanis A. Pressure ulcer incidence and risk factors in ventilated intensive care patients. *Health Sci J.* 2014;8(3):333-42. [Full Text]
 22. Nassaji M, Askari Z, Ghorbani R. Cigarette smoking and risk of pressure ulcer in adult intensive care unit patients. *Int J Nurs Pract.* 2014;20(4):418-23. <https://doi.org/10.1111/ijn.12141> [PubMed]
 23. Ebrahim J, Deribe B, Biru WJ, Feleke T. Prevalence and Factors Associated with Pressure Ulcer among Patients Admitted in Hawassa University Referral Hospital, South Ethiopia. *J Health Care Prev.* 2018;1(2):105. [Full Text]