International Journal of Medical and Health Research
ISSN: 2454-9142, Impact Factor: RJIF 5.54
www.medicalsciencejournal.com
Volume 3; Issue 2; February 2017; Page No. 147-151

A study of the factors associated with risk for development of pressure ulcers

[*1] Dr. Rakesh Ranjan Kumar Rahul, [2] Dr. Bachcha Prasad

[1] Assistant Professor, Department of Skin & VD, S.K.M.C.H. Muzaffarpur, Bihar, India
[2] Associate Professor & HOD, Department of Skin & VD S.K.M.C.H. Muzaffarpur, Bihar, India

Abstract
The sample consisted of 142 patients aged 18 or older, admitted before midnight of the day prior to data collection, from a total of 316 beds distributed in 22 ICUs. Presence of at least one pressure ulcer per patient was 35.2% (CI 95% = 27.4-47.7).
With regard to the participating institutions, at one of the hospital, all drafted ICU beds (02) were vacant at the time of data collection. Among the drafted beds, 67.0% (04) was vacant at another hospital and 44.0% (08 and 04) at two other institutions. At four participating hospitals, all drafted beds were occupied. The occurrence of at least one pressure ulcer per patient corresponded to 35.2% (CI 95%: 27.4-47.7).

Keywords: pressure ulcer, risk factors, epidemiology

Introduction
Pressure ulcers (PU) are generally defined as localized cell necrosis areas occurring on bony prominences exposed to pressure for sufficiently long time to cause tissue ischemia. Multiple factors are involved in ulcer development, but the main one is the pressure exerted on a capillary, between the skeleton and a surface, harming it and causing the tissue necrosis. The prevalence of pressure ulcer among adult hospitalized patients can range from 3 to 14% [1].
Of the 99 ulcers identified, the ones in the sacral region were most frequent (36.0%), followed by those in the calcaneus (22.0%). We observed that the presence of sepsis (OR = 6.04, CI 95% = 1.09- 33.53), period of stay > 10 days (OR = 7.61, CI 95% = 2.92-19.82) and being high risk and very high-risk in the Braden scale (OR = 4.96, CI 95% = 1.50-16.50) were independent factors significantly associated with the presence of pressure ulcers. Results suggest that sepsis, length of stay, and having high and very high risk" in the Braden scale are factors potentially associated to the development of ulcers in bedridden patients.
Prevention measures still have not been systematically adopted and some go against recommendations for good clinical practice, such as practicing "comfort massage on bony prominences" and repositioning every 6 hours. Pressure ulcers are difficult to treat, and treatment tends to be long and costly, supporting the premises of prevention. Therefore, in case of people at risk for the development of pressure ulcers, the multiprofessional team is responsible for putting in practice prevention measures so as to decrease the impact of this problem.

Method
An analytic cross-sectional research was carried out. In descriptive cross-sectional studies, the intent is to estimate the prevalence or occurrence of a given event. In analytic cross-sectional studies, besides the occurrence, the intent is to verify whether events are associated. It is known, however, that the conclusions reached through these study analysis are restricted to associations, instead of causal relations [4].
The study population comprised patients aged 18 years or older, hospitalized until 24h on the day before data collection, in a universe of 316 beds distributed across 22 ICUs of 15 public and private hospitals.
The software Epi Info 6.0 was used for drafting and sample size calculation, based on the following parameters: expected pressure ulcer prevalence of 30%, error 6%, confidence level 95% and 80% power, considering a universe of 316 beds available for the study.
According to these parameters, the sample should comprise 134 patients. Forty percent was added for possible losses and analyses with more than two variables, resulting in an estimate of 187 patients. Out of 187 beds drafted for the sample, 33 were vacant at the time of data collection.
Among the 154 remaining patients, 12 were not available, as five refused to participate in data collection, three had been hospitalized for less than 24 hours, two could not be manipulated and assessed and two were younger than 18. Hence, the final sample comprised 142 patients.
The data collection instrument was a form with closed and open questions regarding information on the institution, person, sociodemographic profile and clinical data; score on the Braden Risk Scale, number, staging and location of pressure ulcers, besides adopted prevention measures.
The following variables related to prevention measures were also covered in the data collection form: use of preventive surface, use of oil or moisturizing cream, maintaining clean and dry skin, repositioning, incontinence control and nutritional support or supplementation. These data were written down according to the medical and nursing records in the patient's file or according to information the professional team at the institution provided.
Practice and compliance with these measures could not be assessed, however, due to the short data collection time. The following study variables were used: age, gender, skin color, hospitalization time, ICU hospitalization time, baseline disease, medication for continuous use, smoking, body mass index, number of pressure ulcers, ulcer location, staging.

The variables sensory perception, moisture, activity, mobility, nutrition and friction and shear were used according to the Braden scale.

Data were processed and analyzed in Statistical Package for the Social Sciences (SPSS) - version 15.0. Odds ratios (OR) and 95% confidence intervals (CI 95%) were calculated to test for associations between dependent variables and the presence of pressure ulcers, using the multivariate logistic regression technique. Patients or responsible persons were asked to read and sign the Free and Informed Consent Term to give their approval for participation.

Results

The sample was characterized according to gender, age, skin color, body mass index (BMI), smoking, total hospitalization time, ICU hospitalization time and health insurance category, described in Table 1.

Table 1: Sample patient characteristics

Variables	N	%	Average	SD
Gender				
Male	75	53.0		
Female	67	47.0		
Total	142	100.0		
Age range (years)				
18 – 31	5	3.0		
32 – 45	12	9.0		
46 – 59	35	25.0		
60 or more	90	63.0		
Total	142	100.0	64.0	16.7
Skin color				
White	90	65.0		
Mulatto	34	25.0		
Black	14	10.0		
Yellow	0	-		
Red	0	-		
Total	138	100.0		
BMI (Kg/m²)				
< 18.5	3	5.0		
18.5 – 24.9	20	33.0		
25.0 – 29.9	37	62.0		
> 30.0	0	-		
Total	60	100.0		
Smoking				
No	49	55.0		
Yes	13	14.0		
Former smoker	28	31.0		
Total	90	100.0		
Total hospitalization time (days)				
1 – 10	77	54.0		
11 – 20	25	18.0		
21 – 30	11	8.0		
31 – 40	9	6.0		
41 – 50	7	5.0		
> 50	13	9.0		
Total	142	100.0	18.0	26.16
ICU hospitalization time (days)				
≤ 10	99	70.0		
11 – 20	19	13.0		
21 – 30	12	9.0		
31 – 40	6	4.0		
41 – 50	2	1.0		

It should be clarified that total patient numbers can vary due to different non-response rates for the study variables.

Hence, 111 patients (ranging between 87 and 151) were expected to present at least one pressure ulcer among all available ICU beds at the 15 institutions under assessment (316 beds). Out of 50 patients with pressure ulcers, 27 (19.0%) had one single ulcer, 11 (7.7%) two ulcers, 12 (8.5%) three or more ulcers. Among the latter, in only one patient, 12 ulcers were identified. Among the 142 patients analyzed, 92 (64.8%) did not present any pressure ulcer at the time of data collection.

No significant difference in pressure ulcer occurrence was found according to gender (p = 0.27) – 40.0% among men and 30.0% among women – and skin color (p = 0.53) – mulatto (38.0%), white (35.0%) and black (21.0%). Occurrence levels

were higher among patients between 45 and 59 years (71.4%) when compared with the ranges aged 60 years or more (40.0%), 32 to 45 years (27.3%) and 18 to 31 years (20.0%), but there were no significant differences (p = 0.45).

Pressure ulcer occurrence according to BMI categories (n = 60 patients) amounted to 50.0% in eutrophic and 16.2% in overweight patients. No pressure ulcer was found in any of the three malnourished patients. No statistically significant differences in pressure ulcer frequencies were found according to nutritional status (p = 0.179).

With regard to smoking (n = 90 patients), pressure ulcer prevalence corresponded to 42.6% among smokers, 30.6% among non-smokers and 14.3% among former smokers. No statistical association was found between these variables (p = 0.085). According to the sample patients' total hospitalization time, pressure ulcer prevalence progressively increased among patients hospitalized for more than 10 days, with statistically significant differences (p = 0.00).

In comparison with patients' ICU hospitalization time, the accumulated pressure ulcer frequency was higher among groups hospitalized at ICUs for more than 10 days. All patients who had spent more than 50 days at the ICU displayed pressure ulcer. The relation between ICU hospitalization time and presence of pressure ulcer was statistically significant (p = 0.00), according to Table 2.

Table 2: Pressure ulcer prevalence according to total hospitalization time and ICU hospitalization time

Hospitalization time (in days)	Pressure ulcer					
	Yes		No		Total	
	N	%	N	%	N	%
In hospital						
1 – 10	9	11.7	68	88.3	77	54.2
11 – 20	14	56.0	11	44.0	25	17.6
21 – 30	6	54.5	5	45.5	11	7.7
31 – 40	5	55.6	4	44.4	9	6.3
41 – 50	5	71.4	2	28.6	7	4.9
> 50	11	84.6	2	15.4	13	9.2
Total	**50**	**35.2**	**92**	**64.8**	**142**	**100.0**
At ICU						
1 – 10	22	28.6	77	71.4	99	69.7
11 – 20	11	59.9	8	42.1	19	13.5
21 – 30	9	75.0	3	25.0	12	8.4
31 – 40	3	50.0	3	50.0	6	4.2
41 – 50	1	50.0	1	50.0	2	1.4
> 50	4	100.0	0	0	4	2.8
Total	**50**	**35.2**	**92**	**64.8**	**142**	**100.0**

Pressure ulcer prevalence showed no statistical differences (p = 0.52) according to health insurance. Among patients who received care in the Unified Health System (SUS), 38.5% presented ulcers. Among patients with a supplementary health agreement, 34.7% had pressure ulcers. Only two patients paid for their own hospitalization and did not present any pressure ulcers.

The baseline diseases registered on the forms were classified according to the affected system, with those in the neurological [13], digestion [13], bone-muscle [6] and genitourinary [1] sub-groups grouped under others. According to Table 3, the highest prevalence of pressure ulcers was found among patients with sepsis, followed by respiratory illnesses like acute pulmonary respiratory failure, pulmonary thromboembolism and pneumonia, with a statistically significant association (p = 0.00).

Table 3: Pressure ulcer prevalence according to patient's baseline disease

Baseline disease	Pressure ulcer					
	Yes		No		Total	
	N	%	N	%	N	%
System						
Circulatory	9	16.6	45	83.4	54	38.0
Respiratory	24	54.5	20	45.5	44	31.0
Other	10	30.3	23	69.7	33	23.3
Sepsis	7	63.6	4	36.4	11	7.7
TOTAL	**50**	**35.2**	**92**	**64.8**	**142**	**100.0**

The data collection forms showed more than one baseline disease and more than one drug for continuing use by patients. The most prescribed medication classes were bronchodilators, analgesics, steroidal and non-steroidal anti-inflammatory drugs and anticoagulants (n = 141), followed by diuretics (n = 140), antihypertensives (n = 139) and cardiotonics (n = 137). The item others included medication like antidepressants, anxiolytics, mucolytics, hypoglycemic drugs (insulin), gastric mucosal protectors, antibiotics, thyroid hormone, vitamins, antiarrhythmics and intravenous solutions.

A significant association was observed between the use of bronchodilators and pressure ulcer (p = 0.00), but not with other drugs.

Table 4: Pressure ulcer prevalence according to medication for continuous use by the patient

Drugs	Pressure ulcer				
	Yes		No		p
	N	%	N	%	
Antihypertensives	27	29,9	50	70,1	0,94
Cardiotonics	12	31,6	26	68,4	0,58
Bronchodilators	28	60,9	18	39,1	0,00
Analgesics	25	40,3	37	59,7	0,37
Anti-inflammatory drugs	18	43,9	23	56,1	0,25
Diuretics	24	43,6	31	56,4	0,16
Anticoagulants	32	36,4	56	63,6	0,91
Others	44	37,9	72	62,1	0,27

Pressure ulcer location was registered on all forms. Some patients had more than one ulcer though, totaling 99 ulcer, distributed among the following regions: ear lobes (3.0%), occipital (1.0%), shoulder blades (3,0%), spinous process (2.0%), ilium (6.0%), sacrum (36.0%), elbows (3.0%), trochanters (9.0%), ischiatic prominences (4.0%), shinbones (4.0%), malleoli (4.0%), toes (2.0%) and heels (22.0%).

The 99 ulcers were staged from I to IV. Stage I ulcers represented 25.0%; stage II 57.0%; stage III 9.0% and stage IV 6.0%. Three wounds (3.0%) were not staged as they were totally covered by necrosis. The application of the multivariate logistic regression technique showed that the presence of sepsis (OR = 6.04; CI 95% = 1.09-33.53), hospitalization time > 10 days (OR = 7.61; CI 95% = 2.92-19.82) and high and very high risk on the Braden scale (OR = 4.96; CI 95% = 1.50-16.50) were independent factors significantly associated with the presence of pressure ulcer.

Table 5: Factors associated with pressure ulcer, odds ratio and 95% confidence interval

Variables	OR	CI 95%
Sepsis	6.04	1.09 - 33.53
Hospitalization time > 10 days	7.61	2.92 - 19.82
High to very high risk on Braden scale	4.96	1.50 - 16.50

The 140 patients' average Braden score was 13.86; according to gender, the average score was 14.13 (SD = 4.63) for men and 13.56 (SD = 4.91) for women, without statistical differences (p = 0.48). According to age, the average scores corresponded to 15.22 (SD = 4.41) for patients younger than 60 and 13.03 (SD = 4.79) for patients aged 60 years or more, with a statistically significant difference (p = 0.00).

Discussion

The researchers characterized the sample of 142 patients, determined the prevalence of pressure ulcers and established the factors associated with ulcer development. The sample's description in terms of body mass index (BMI) and smoking habits was impaired by sub notification. The BMI variable considered weight and height records of 60 patients only. This finding can be justified by the impossibility to find these data in the patients' files and difficulties to determine these measures at the ICUs.

As for the smoking habit, for example, many patient files did not contain information on this variable or the patient or companion could not provide the information. Hence, in 52 forms, the fields reserved for this variable were not completed.

With regard to pressure ulcer occurrence at the ICUs in the sample, rates exceeded literature findings, although Biharian studies on the subject are scarce. The pressure ulcer occurrence levels found in studies carried out in other countries are worth mentioning, such as: Germany (21.1%) [5], Sweden (13.2%) [6] and Singapore (18.1%) [7].

In another study, pressure ulcer prevalence in adult patients ranged from 3% to 11% in hospitalized patients and could reach 18% among bedridden patients, like in ICUs [8]. An occurrence level of 3% is found in acute hospital care, against 45% in clinical hospitals [9]. In a study carried out to identify pressure ulcer incidence rates among patients hospitalized at the University Hospital of the University of São Paulo (USP), a global incidence rate of 39.8% was found, with variations according to the hospital unit under analysis: medical clinic (42.6%), intensive care unit (41.0%) and surgical clinic (39.5%) [3].

As for the ulcers' location, in a study carried out in Bihar [3], it was verified that the sacral (33.6%), heel (24.6%) and gluteal (23.9%) regions were the predominant sites for the development of these ulcers, with 53% analyzed as stage II, similar to the present study findings. In this study, pressure ulcer development was not associated with age. Studies reveal, however, that advanced age is a triggering factor for these ulcers, with 50% to 70% of these injuries developing in patients older than 70 years [11- 12].

An association was found, however, between age (> 60 years) and low average Braden scale scores (13.0), that is, elderly people were at risk of developing these ulcers, as people scoring 17 or higher are considered at risk in this population [11]. Although the elderly population was more prone to the development of pressure ulcer, the association with age was not maintained in the final model [12]. Regarding aging, it is known that decreased skin elasticity, texture, circulation, cell replacement level and scarring process, as well as reduced peripheral sensitivity, are inherent in advanced age and undoubtedly lead to increased skin trauma risks [12].

The authors reported that approximately 80% of deaths associated with pressure ulcers occurred in people aged 75 years or older. This mortality rate was higher among black than white people [13]. When comparing pressure ulcer occurrence according to skin color among patients hospitalized at ICUs in Muzaffarpur, no differences were found.

Conclusion

The occurrence of at least one pressure ulcer per patient corresponded to 35.2%. In the consulted literature, in general, pressure ulcer prevalence in adults ranges from 3 to 14% and

can reach 21% in intensive care units. Hence, the levels found in this study exceeded those found in literature.

Total and ICU hospitalization time of more than 10 days, sepsis and high and very high risk on the Braden scale were strongly associated with pressure ulcer. In total, 99 pressure ulcers were identified, frequently located in the sacral (36.0%) and heel regions (22.0%), with 57.0% of all ulcers in stage II, i.e. superficial, whose partial skin loss involves either the epidermis or dermis, or both.

References

1. National Pressure Ulcer Advisory Panel. Pressure ulcers prevalence, cost and risk assessment: consensus development conference statement. Decubitus. 1989; 2(2):24-8.
2. Amlung SR, Miller WL, Bosley LM. The 1999 National Pressure Ulcer Prevalence Survey: a benchmarking approach. Adv Skin Wound Care. 2001; 14(6):297-301.
3. Lahmann NA, Halfens RJ, Dassen T. Pressure ulcers in german nursing homes and acute care hospitals: prevalence, frequency, and ulcer characteristics. Ostomy Wound Manage. 2006; 52(2):20-33.
4. Gunningberg L. Risk, prevalence and prevention of pressure ulcers in three Swedish health-care settings. J Wound Care. 2004; 13(7):286-90.
5. Chan EY, Tan SL, Lee CK, Lee JY. Prevalence, incidence and predictors of pressure ulcers in a tertiary hospital in Singapore. J Wound Care. 2005; 14(8):386-8.
6. Allman RM, Goode PS, Patrick MM, Burst N, Bartolucci AA. Pressure ulcer risk factors among hospitalized patients with activity limitation. JAMA. 1995; 273(11):865-70.
7. Donovan WH, Garber SL, Hamilton SM, Krouskop TA, Rodrigues GP, Stal S. Úlceras por pressão. In: Delisa JA. Medicina de reabilitação. São Paulo: Manole, 1992, 553-70.
8. Pieper B. Mechanical forces: pressure, shear, and friction. In: Bryant RA, Nix DP. Acute and chronic wounds: current management concepts. 3rd ed. St. Louis: Mosby; 2007, 205-34.
9. Redelings MD, Lee NE, Sorvillo F. Pressure ulcers: more lethal than we thought? Adv Skin Wound Care. 2005; 18(7):367-72.
10. Ratliff CR, Bryant DE. Guideline for prevention and management of pressure ulcers. Glenview: Wound Ostomy and Continence Nurses Society, 2003.
11. Smith LN, Booth N, Douglas D, Robertson WR, Walker A, Durie M, *et al*. A critique of at risk pressure sore assessment tools. J Clin Nurs. 1995; 4(3):153-9.