

Risk factors of Pressure Ulcers in hospitalized elderly Egyptian people

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Abstract

Background: Pressure ulcers affect a large scale of elderly people. Despite advances in technology, the rate continues to increase. This increases morbidity, health care costs and mortality.

Aim: searching for risk factors of pressure ulcers in elderly patients admitted to acute geriatric care units.

Methods: A case control study was conducted recruiting 100 elderly male and female patients above the age of sixty. History and physical examination were done, as well as nutritional and functional assessment. Nursing care was assessed using a checklist and Braden scale was done as a risk assessment scale for pressure ulcers. Blood samples were collected for laboratory measures.

Results: pressure ulcers result from contribution of many factors as cardiovascular and cerebrovascular diseases, urinary incontinence, poor nutrition, immobility. Patients free from pressure ulcers had better nursing care with more frequent repositioning and use of air mattress (in more than 80%, compared use of air mattress in about 40% only of patients acquiring pressure ulcers). Braden scale was highly sensitive for the occurrence of pressure ulcers (cutoff point ≤ 17) with 77.4% positive predictive value and 97.3% negative predictive value.

Conclusion: Pressure ulcers are multifactorial in origin. Nursing care is of utmost importance for their prevention. Braden scale should be applied to elderly patients upon admission to hospital.

Keywords: Pressure ulcers – nursing- Braden scale- Egyptians

Background

Pressure ulcers (PUs) are increasing with aging of the population around the world and represent a common and frustrating problem affecting geriatric patients. Age-related skin changes increase the vulnerability to ulceration. Aging not only increases the risk of PU occurrence, but also affects healing of such ulcers. Also, frailty, associated comorbidities, impaired mobility, and cognitive impairment predispose many elderly populations to the development of PUs (1, 2). The prevalence of PUs peaks in those between age 70 and 80 years. They occur in hospitals, nursing homes, and even in community settings. The highest incidence of new ulcers occurs in hospitals and may be as high as 50% in acute care geriatric units, increasing health care expenditure and mortality rate, whereas the highest prevalence occurs in long-term care facilities (3). Also, the incidence of ulcers differs by the stage of ulceration. Stage 1 and 2 occur more frequently than later stages (4). Despite the progress in technology and medical advances, the cost of management of hospital acquired PU is increasing. The cost of treating these mainly preventable ulcers in the United Kingdom (UK) accounts for about 4% of the total National Health

Service (NHS) expenditure (5). Therefore, the identification of people at risk for PUs is an important component of preventive care for the elderly (6). The National Pressure Ulcer Advisory Panel (NPUAP) has agreed that not all PUs are preventable and there are clinical situations in which the development of PUs can be unavoidable such as end stage dementia, severe congestive heart failure and forced immobilization (7). To our knowledge only few studies were done in Egypt, approaching mainly nurses' knowledge and educational programs about PU and no studies searched for risk factors for PU in Egyptian population (8, 9, 10).

Methods

A case control study, recruiting 100 male and female elderly patients aged ≥ 60 years old from acute geriatric care units. The study was conducted in Ain Shams University Hospitals and in Suez Canal University Hospitals. It was designed to study risk factors for the occurrence of PUs in hospitalized elderly Egyptian patients. After assessment and follow up, all Patients were divided according to the presence or absence of pressure ulcers into cases (Group A) which included 50

elderly patients who developed pressure ulcers and controls (Group B) which included 50 elderly patients without pressure ulcers matched for age and sex. Informed consent was taken from the patient or caregiver after explanation of the study's aim and procedures. Patients or caregiver who refused to participate were excluded from the study. Follow up of the patients was done till discharge and the development of PUs was recorded. To assess risk factors for pressure ulcers, all participants were subjected to full medical history and physical examination, with special concern to daily skin examination. Functional status of the patients was assessed by the ability of the patient to perform activities of daily living (ADL) scale (11). Basic activities of daily living includes the following basic tasks (e.g. bathing- dressing- toileting- transfer - continence and feeding). Nutritional assessment was done by Mini Nutritional Assessment scale (12), the Arabic version (13). It is a validated nutritional screening and assessment tool that can identify geriatric patients who are malnourished or at risk of malnutrition. Assessment of nursing care was done through a checklist that included four items: daily initial and reassessment of skin, the use of lifting devices to help move and reposition of patients, the use of pressure reducing mattress bed and the use of pillows or foam wedges to keep bony prominences away from direct contact with each other (14). Braden scale was used as a risk assessment scale and performed within 24 hours of hospital admission. It is widely used, sensitive and specific and consists of six subcategories assessing sensory perception, moisture, activity, mobility, nutrition and friction/shear. The total score ranges from 6-23, with lower values indicating higher risk for PUs (15). Blood samples were collected to measure kidney functions, electrolytes, blood count and proteins.

Statistical Analysis

The statistical analysis was carried out with the Statistical Package for the Social Sciences for Windows version 16.0 (SPSS Inc., Chicago, IL, USA.). Description of data in the form of mean (M) and standard deviation (SD) for all quantitative variables and frequency and percentage for all qualitative variables. Comparison of qualitative variables was done using chi-square test (X²). Significance levels measured according to P value (probability) P>0.05 insignificant, P<0.05 significant, P<0.01 highly significant. Sensitivity, specificity, positive and negative predictive values for cutoff point were calculated Braden scale. ROC curve was conducted to determine Braden scale cut off point.

Results

The study included 59 male and 41 female elderly patients. Mean age was 68.92 in cases and 66.18 in controls as shown in Table 1. Illiteracy was more prevalent in patients with PUs (p 0.033). About 25% of cases and 50% of controls were non-smokers. There was no significant difference between both groups regarding sex, age, smoking and socioeconomic status. Cardiovascular diseases, hypertension, cerebrovascular stroke, dementia, fractures and urinary incontinence were more prevalent in cases than controls, whereas diabetes mellitus, chronic kidney disease (CKD) and chronic obstructive lung diseases (COPD) showed no statistical differences between cases and controls. PUs significantly increased the length of hospital stay. As shown in Table 2, there was a great difference in function between patients with and without PUs, with more dependency in daily activities in cases (p <0.001) for all items of ADL scale. Only one patient with PUs had adequate nutrition and the rest were either malnourished or at risk of malnutrition, in contrast to controls in which 48% had adequate nutrition (p <0.001). Checklist for nursing care in Table 3 showed that the use of air mattress beds, pillows and foam and frequent reposition of the patients were more in control group; without PUs (p<0.001) for all. Table 4 showed that the mean Braden scale was 10.66 in cases and 18.82 in controls (p <0.001). ROC curve showed that score ≤ 17 in the Braden scale had 97.96 % sensitivity, 72% specificity, 77.4% positive predictive value (PPV) and 97.3% negative predictive value (NPV) for predicting PUs. Comparing laboratory results in Table 5, Total proteins, albumin and Mg levels were significantly lower in cases (p≤ 0.001, 0.032, ≤ 0.001) respectively, whereas total leukocytes count and creatinine levels were higher (p 0.004, 0.010) respectively.

Discussion

Many studies were performed to determine risk factors for PU development, but only few studies were targeted to identify risk factors among elderly people who are more likely to develop PUs than others. About 34% of patients having PUs had heart disease (including heart failure and ischemic heart disease) and 76% had hypertension. Also 30% of cases had either recent or old cerebrovascular stroke. This agrees with a study done in America, relating cardiovascular and cerebrovascular diseases to PU occurrence (16). Urinary incontinence is of utmost importance, increasing PU risk. In a systemic review done in 2013, moisture from either urinary or stool incontinence was studied in more than 27 studies, about 14 studies found that moisture significantly increased PU risk (17).

Table 1: Demography and clinical characteristics of the study population.

	Group A Patients having PUs (cases) Number =50		Group B Patients with no PUs (controls) Number =50		Chi-square test	
	No.	%	No.	%	x2	p-value
Sex						
Male	30	60.0%	29	58.0%	0.041	0.839
Female	20	40.0%	21	42.0%		
Age						
Mean \pm SD	68.92 \pm 6.01		66.18 \pm 3.92		1.800	0.061
Range	60-84		60-76			
Education						
Illiterate	38	76.0%	26	52.0%	8.747	0.033
Primary school	11	22.0%	16	32.0%		
Prep. school	1	2.0%	6	12.0%		
High school	0	0.0%	2	4.0%		
Smoking						
Smoker	12	24.0%	18	36.0%	3.000	0.223
Non smoker	25	50.0%	25	50.0%		
Ex-smoker	13	26.0%	7	14.0%		
Socio-economic						
Low	7	14.0%	3	6.0%	1.778	0.182
Average	43	86.0%	47	94.0%		
	17	34.0%	7	14.0%	5.482	0.019
Heart Disease						
Hypertension	38	76.0%	26	52.0%	6.250	0.012
Diabetes Mellitus	23	46.0%	24	48.0%	0.040	0.841
Liver disease	14	28.0%	15	30.0%	0.049	0.826
Stroke	15	30.0%	1	2.0%	14.583	<0.001
Dementia	10	20.0%	1	2.0%	8.274	0.004
Falls	3	6.0%	1	2.0%	1.042	0.307
Fractures	12	24.0%	3	6.0%	6.353	0.012
COPD	5	10.0%	7	14.0%	0.379	0.538
CKD	8	16.0%	3	6.0%	2.554	0.110
Urinary incontinence	11	22.0%	3	6.0%	5.316	0.021
Length of hospital stay Mean \pm SD	6.60 \pm 2.63		3.64 \pm 1.45		14.857	<0.001
Range	2-13		1-7			

COPD= chronic obstructive pulmonary disease

CKD= chronic kidney disease

Table 2: Comparison between group A and group B regarding activities of daily living (ADL) and Mini-nutritional assessment.

	Group A Cases		Group B Controls		Chi-square test x2	p-value
	No.	%	No.	%		
Bathing						
Independent	0	0.0%	21	42.0%	41.308	<0.001
Assisted	9	18.0%	18	36.0%		
Dependent	41	82.0%	11	22.0%		
Dressing						
Independent	0	0.0%	29	58.0%	46.855	<0.001
Assisted	14	28.0%	13	26.0%		
Dependent	36	72.0%	8	16.0%		
Toileting						
Independent	0	0.0%	22	44.0%	38.966	<0.001
Assisted	11	22.0%	17	34.0%		
Dependent	39	78.0%	11	22.0%		
Transfer						
Independent	0	0.0%	21	42.0%	38.370	<0.001
Assisted	11	22.0%	18	36.0%		
Dependent	39	78.0%	11	22.0%		
Continence						
Independent	0	0.0%	23	46.0%	40.850	<0.001
Assisted	13	26.0%	18	36.0%		
Dependent	37	74.0%	9	18.0%		
Feeding						
Independent	11	22.0%	36	72.0%	35.143	<0.001
Assisted	4	8.0%	8	16.0%		
Dependent	35	70.0%	6	12.0%		
Mini-Nutritional assessment score normal(24-30 points)	1	2.0%	24	48.0%	33.429	<0.001
at risk of malnutrition (17-23.5 points)	36	72.0%	25	50.0%		
malnourished(<17points)	13	26.0%	1	2.0%		

Table 3: Nursing care in patients with and without pressure ulcers.

	Group A		Group B		Chi-square test	
	No. (50)	%	No. (50)	%	x2	p-value
Using lifting devices	1	2.0%	0	0.0%	1.010	0.315
Using air mattress beds	20	40.0%	43	86.0%	20.482	<0.001
Using pillows or foams	11	22.0%	39	78.0%	47.868	<0.001
Frequent reposition of the patient	10	20.0%	43	86.0%	25.010	<0.001

Table (4): Braden scale score in Group A and B and Receiver operating characteristics (ROC) curve for Braden scale cutoff value

Braden scale score		Group A	Group B	t-test	p-value
Mean ±SD		10.66±3.15	18.82±4.06	125.817	<0.001
Range		7-19	8-23		
Cut-off.	Sensitivity	Specificity	PPV	NPV	Accuracy
<17	97.96%	72%	77.4%	97.3%	92.1%

Figure 1: Receiver operating characteristics (ROC) curve for Braden scale cutoff value

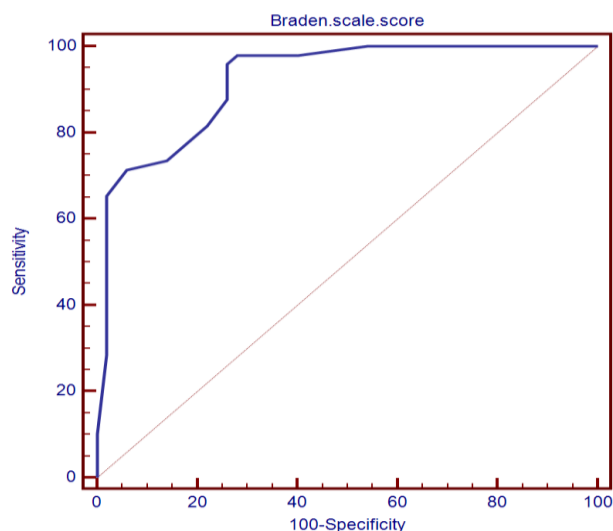


Table (5): Laboratory data in Group A and Group B

	Group A	Group B	t-test	p-value
Hemoglobin				
Mean ±SD	11.11±1.52	11.74±2.26	2.681	0.105
Range	7-14.2	7.6-15.7		
Total leukocytic count				
Mean ±SD	12.25±6.08	9.10±4.60	8.532	0.004
Range	3.3-31	2.9-21.8		
Platelet count				
Mean ±SD	234.78±88.32	246.34±103.14	0.362	0.549
Range	67-401	6-568		
Total proteins				
Mean ±SD	5.00±0.60	6.51±1.02	12.870	<0.001
Range	4.1-6.1	4.4-8.1		
Albumin				
Mean ±SD	2.46±0.62	3.52±1.2	3.762	0.032
Range	1.5-3.6	1.9-4.9		
Na				
Mean ±SD	135.02±5.14	133.87±19.22	0.168	0.683
Range	125-158	5.4-149		
K				
Mean ±SD	3.81±0.50	3.71±0.59	0.701	0.404
Range	2.8-5.1	1.6-5.4		
Mg				
Mean ±SD	1.66±0.23	1.84±0.21	17.712	<0.001
Range	1.2-2.1	1.5-2.2		
Serum creatinine				
Mean ±SD	1.60±0.93	1.13±0.87	6.848	0.010
Range	0.6-4.9	0.5-6		
HbA1c				
Mean ±SD	8.19±0.99	7.82±0.86	1.709	0.198
Range	6.8-11	6.6-10.7		

Urinary incontinence increases PU risk by more than one mechanism. Urine changes the skin PH, which become predisposed to heavy bacterial load, leading to dermatitis and breakdown of the skin surface (18). Also, urine as well as sweat increases moisture, so the skin becomes more vulnerable to the effect of friction and shear forces (well known risk factors also) which weakens the dermis; which is considered a picture of microclimate (19). Nutrition has a vital role in PU prevention. Malnutrition was strongly associated with ulcer development as shown in many studies (20, 21). The appearance of pressure ulcers reflects a catabolic state accompanied by protein malnutrition and low consumption, resulting in muscle wasting and skin destruction (22). Regarding Nursing care, the use of pressure-reducing support surfaces (air mattress beds) had a vital role in prevention or reduction of the incidence of PUs among the hospitalized patients, especially elderly patients in acute care units. More than 85% of patients without PUs were using air mattress, while it was the case only in 40% of patients with PUs. Pressure relieving support surfaces are designed to prevent occurrence or promote the healing of PUs by reducing or eliminating tissue interface pressure applied on tissues for longtime. However, they represent one part of an overall system of care which must be implemented to reduce the risk of pressure associated tissue damage (23). Frequent repositioning of the patients had a great role in PU prevention with a big difference in nursing care between our cases and controls; may be due to patients' factors like uncooperative or agitated patients or nursing problems like deficiency of their numbers or more workload sometimes. These results are in agreement with the systemic review done in 2014 about the effect of repositioning in prevention of PUs, highlighting the great role of nurses in prevention of PUs and the importance of nurse' education in this issue (24). The mean score for Braden Scale in the study was much lower in patients with PUs, [10.66 (SD, 3.15) in cases and 18.82 (SD, 4.06) in controls, $P < 0.001$]. This ensures that the Braden scale is a good predictor for PU occurrence, as lower Braden scores indicate higher risk of developing a PU. Coleman et al., 2013 reported in their systemic review that overall, 22 studies out of 54 included a total score of risk assessment scales in their analysis and in 10 studies the total score emerged as statistically significant for prediction of PU (17). The Braden Scale cut-off point was ≤ 17 in the study, with sensitivity of 97.96%, specificity of 72%, PPV of 77.4%, and NPV of 97.3% with diagnostic accuracy of 92.1% for the occurrence of PUs. These results are in agreement with a retrospective study examining patients admitted to Englewood Hospital and Medical Center, in which mean Braden Scale scores also were statistically lower with patients with PUs. At a cut-off score of 18, the sensitivity was 100%, specificity was 71%, positive predictive value was 20%, and negative predictive value was 100% (25). Biochemical data

analysis is one component of the comprehensive nutrition assessment process. Serum albumin and total protein levels were measured as a part of nutritional evaluation. As shown in a previous study, there is a relation between level of total proteins, serum albumin and occurrence of PUs (P -value < 0.001 , 0.032) respectively (2). Higher white blood cell (WBC) count in the study increased the risk of PU. This is in agreement with surveys on risk factors associated with PUs. Pieper et al., 1998 reported that older age, prolonged hospital stays, multiple co-morbidities, anemia, decreased serum albumin, increased WBC, and low Braden scores to be risk factors for PUs (26). However, leukocytosis occurs in many inflammatory conditions and in infection, so it is difficult to depend on it alone as a predictor of PUs. A significant correlation was found between magnesium levels, PU development. Hypomagnesaemia can lead to the induction of proinflammatory response, increased oxidative stress and apoptosis. It was found that hypomagnesaemia in diabetic patients was associated with poorer glycemic control, foot ulcers and impaired wound healing (27). As found in a previous study (28), the development of PU increased the length of hospital stay. The presence of PU had prolonged the hospital stay in cases by about 5 or 6 days. This represents a burden increasing healthcare costs.

Conclusion

There is no single risk factor for PU occurrence. Urinary incontinence, nutritional and functional status are important predictors of PUs. Nursing care is of utmost importance for PU prevention. Braden scale should be applied to elderly patients upon admission to hospital.

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