The Role of APACHE II Scores on the Risk of Skin Dryness in Critically Ill Patients

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ABSTRACT

Objectives: this study explored the extent to which APACHE II could affect the risk of skin dryness in critically ill patients.

Design: A retrospective cohort study was carried out. A cohort of patients with acute illness retrospectively admitted to a tertiary care hospital between May 2023 and July 2023.

Materials and methods: patients were categorized into two groups related to presence or absence of skin dryness. Four APACHE groups were assigned based on the APACHE scores: group 1 (APACHE score 31-40), group 2 (APACHE score 21-30), group 3 (APACHE score 11-20), and group 4 (APACHE score 3-10).

Results: The percentage of patients with skin dryness was 43.1%. Patients with skin dryness have a mean APACHE II score of 17.70, with a standard deviation of 7.75, while patients without skin dryness have a mean APACHE II score of 15.31, with a standard deviation of 5.56. The p-value of > 0.05 suggests that there is no statistically significant difference.

Conclusion: The incidence of skin dryness in the study population is most likely not related to the APACHE II death risk.

Keywords: APACHE II; skin dryness; Critical illness.

INTRODUCTION

The main targets of the hospital system are the safety of all patients and the quality of care delivered to them. The occurrence of any defect or damage in this delivered care will lead to undesirable events to patients and hospitals (1). Consequently, adverse events reflect the quality of the delivered care and become an indicator of the quality of health care in hospitals. Healthcare is therefore safer when such incidents are avoided (2). Skin integrity maintenance is one of the pertinent facets of critical patient care (3).

Frail patients who are in critical condition are more vulnerable to external and internal assaults on their skin. When the epidermis lacks moisture or sebum, it can cause dry skin, which affects approximately 75% of those people who are feeble. The symptoms of dry skin include scaling, itching, and fine wrinkles. (4).

One of the most common factors of increasing hazard of secondary infection is the disturbed skin barrier (5), and various studies indicate that the development of pressure ulcers/injuries may be associated with skin dryness (6,7). This illustrates the importance of preventing skin dryness and appropriate skincare interventions in nursing practice.

ICUs frequently employ the Acute Physiology and Chronic Health Evaluation (APACHE) score system to determine the extent of a patient's illness, forecast their prognosis, and inform clinical decision-making (8). Nonetheless, not much study has been done to investigate the possible link between APACHE scores and the onset of skin dryness in patients in the intensive care unit. By enabling the early identification of at-risk individuals and the implementation of preventative measures, this research aims to improve the care and outcomes of critically ill patients by examining the relationship between the development of skin dryness and APACHE scores in ICU patients.

HYPOTHESIS

The null hypothesis (H0) there is no meaningful correlation between APACHE scores and the onset of skin dryness in patients in the intensive care unit.

The alternative hypothesis (H1) there is a correlation between higher APACHE scores and a higher chance of developing skin dryness.

Goals

Finding out if there is a statistically significant correlation between the onset of skin dryness and APACHE scores in patients in the intensive care unit is the aim of this study.

PATIENTS AND METHODS:

Study Design and setting: The researchers collected data retrospectively from medical records of ICU patients in a large, tertiary care hospital in Amman over a 3-month period from May 2023 to July 2023 by using a retrospective cohort study design.

Study Population: The study included male and female adult ICU patients (aged 18 and above) who have been admitted for a minimum of 4 days. Patients with existing pressure ulcer or skin dryness upon admission were excluded. A total of 100 patients were involved in this study. Sixty six people had been examined by the time the trial concluded. The 66 patients were divided into two groups according to the data presented, depending on whether they had dry skin or not: presence (n = 31) and absence (n = 35).

Data Collection: Data were collected from hospital's electronic medical records to obtain the contained clinical and sociodemographic information about the patients. Patients are categorized according to

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presence or absence of skin dryness into two groups (group 1 with skin dryness) and (group 2 without skin dryness) The Acute Physiology and Chronic Health Evaluation II (APACHE II) death risk score was calculated at the time of admission in order to describe the severity of the patient. Over time, a number of rating systems for critically ill patients have been established. APACHE II is one of the most popular grading systems in the intensive care unit. This score, which goes from 0 to 71, takes into account 12 physiological factors, the Glasgow coma scale (which is determined after the anesthetic agents have worn off), age, the necessity of urgent surgical treatments, and any comorbidities that have been confirmed in the patient's medical records. The patient's risk of dying increases with an elevated APACHE II score (8). Using defined criteria, the APACHE II score was determined for every patient within 24 hours of ICU admission. Based on their individual APACHE II scores, patients were divided into four groups. Group 1 included patients with an APACHE II score between 31 and 40. Group 2 included patients with an APACHE II score between 21 and 30. Group 3 included patients with an APACHE II score between 11 and 20. Group 4 included patients with an APACHE II score of 3–10.

Four skin areas—the face, trunk, hands, arms, feet, and legs—were assessed to determine the prevalence and severity of skin dryness. The Overall Dry Skin Score, which rates clinical indications of dryness from 0 (=absent) to 4 (=large scales, roughness, redness, cracks/fissures), was used to gauge the severity of the condition. The European Group on Efficacy Measurement of Cosmetics and other Topical Products proposed this clinical scoring method for dry skin assessment (9), and Kang et al. (2014)(10) recently confirmed its validity. The term "dry skin overall" was defined as having dry skin at the "face," "trunk," "hands and arms," and/or "feet and legs" (category 1 or higher). Mild dry skin was classified as category 1, and moderate-to-severe dry skin as categories 2-4. The presence or absence of skin dryness and pressure ulcer, Pressure ulcer stage, and location were assessed at day seven of ICU admission.

Statistics: SPSS was Version 22.0 was used to analyze the data. A two-tailed significance level of a= 0.05 was established. Descriptive statistics were used to describe patients. Bivariate statistics applied to evaluate the relationship between the development of skin dryness and APACHE scores. Proportions were utilized to define various features, including demographic ones. The study utilized independent t-tests to compare continuous variables, such as age and APACHE II. When comparing dichotomous or ordinal variables, in addition chi-square tests were employed.

RESULTS

The percentage of patients with skin dryness was 43.1% (Figure 1). The highest percent 26 (83.9%) and 25 (71.4%) of patients were male in the group of patients with and without skin dryness respectively. Spinal cord injury was the most common diagnosis with the highest percentage (42.2% and 40%) in the group of patients with and without skin dryness respectively without statistically significant difference (table1).

The mean and SD of age was 45.87±15.5 in patients with skin dryness, versus 40.94 ±14.5 in patients without. The mean and SD of weight was 67.87±12.74 in patients with skin dryness, versus 62.6±14.1 in patients without skin dryness. Patients with skin dryness have a mean and SD of 21.87±5.7 ICU days, whereas patients without skin dryness have 20.11±5.85 of ICU days. Patients with skin dryness have a mean APACHE II score of 17.70, with a standard deviation of 7.75, while patients without skin dryness have a mean APACHE II score of 15.31, with a standard deviation of 5.56. The p-value of > 0.05 suggests that there is no statistically significant difference in gender, age, weight, ICU stay, and APACHE II between the two groups. (table2).

Among patients with immobility, 28 (90.3%) of patients had skin dryness. Among patients with malnutrition, 12 (38.7%) of patients had skin dryness. Compromised blood flow, diabetes and dehydration were diagnosed in 6 patients, and all these cases developed skin dryness 6 (19.4%), (table3). A highly significant p-value of 0.001*, indicating a strong association between immobility, compromised blood flow, diabetes and dehydration and malnutrition and the development of pressure injuries (table3).

In groups of APACHE categories, group 2(21-30) was 9 cases (29%), group3 (11-20) was 16(51.6%) with skin dryness. The percentages within APACHE categories indicate the distribution of patients in the "very high risk" category within each APACHE group. For instance, 100% of patients in group 1 fall into the "very high risk" category and very sever category of the overall skin dryness scale (table 4, 5).

The results indicate a notable variation in the occurrence of skin dryness across different anatomical locations. Buttocks injuries are the most prevalent (22%) in patients with skin dryness. (table6). There was a strong association between the occurrence of pressure ulcer and skin dryness, as all cases that developed skin dryness also developed pressure ulcer (table 7).

Table 1. Frequency Distribution of study sample regarding socio demographic data and clinical data (n=66)

		skin dryness		P value
		yes	No	
sex	male	26(83.9%)	25(71.4%)	0.22
	female	5(16.1%)	10(28.6%)	
diagnosis	Pelvic fracture	2(6.5%)	7(20%)	0.05*
	Diabetic ketoacidosis	1(3.2%)	3(8.6%)	
	renal failure	1(3.2%)	3(8.6%)	
	pneumonia	0(0.0%)	1(2.9%)	
	spinal cord injury	14(42.2%)	14(40%)	
	septic shock	2(6.5%)	0(0.0%)	
	chest and head trauma	11(35.5%)	4(11.4%)	
	respiratory failure	0(0.0%)	3(8.6%)	

Table 2. Mean and standard deviation numerical data of study

	skin dryness	Mean	Std. Deviation	P value
age	yes	45.8710	15.50858	0.18
	no	40.9429	14.53584	
length of ICU stays	yes	21.8710	5.70229	0.22
	no	20.1143	5.85999	
weight	yes	67.8710	12.74818	0.11
	no	62.6000	14.10715	
Acute Physiology and Chronic Health Evaluation (APACHE II)	yes	17.7097	7.75110	0.15
	no	15.3143	5.56656	

Table 3: Frequency Distribution of study sample regarding risk factors

of skin dryness (n=66)

		skin dryness		P value
		yes	No	
immobility	yes	28(90.3%)	2(5.7%)	0.001*
	no	3(9.7%)	33(94.3%)	
malnutrition	yes	12(38.7%)	2(5.7%)	0.001*
	no	19(61.3%)	33(94.3%)	
Compromised blood flow	yes	6(19.4%)	0(0.0%)	0.006*
	no	25(80.6%)	35(100%)	
Dehydration	yes	6(19.4%)	0(0.0%)	0.006*
	no	25(80.6%)	35(100%)	
Diabetes	yes	6(19.4%)	0(0.0%)	0.006*
	no	25(80.6%)	35(100%)	

Table 4. Frequency Distribution of study sample regarding categories of APACHE II score on day of admission (n=66)

		skin dryness		P value
		yes	no	
APACHE categories	group 1 (31-40)	1(3.2%)	0(0.0%)	0.39
	group 2(21-30)	9(29%)	6(17.1%)	
	group3(11-20)	16(51.6%)	24(68.6%)	
	group 4(3-10)	5(16.1%)	5(14.3%)	

Table 5. Frequency Distribution of study sample regarding occurrence of skin dryness at day seven (n=66)

			skin dryness score					P value
			absent	mild	moderate	sever	very sever	
APACHE categories	group 1 (31-40)	Count	0	0	0	0	1	0.65
		% within skin dryness score	0.0%	0.0%	0.0%	0.0%	5.0%	
	group 2(21-30)	Count	6	0	1	3	5	
		% within skin dryness score	17.1%	0.0%	25.0%	50.0%	25.0%	
	group3(11-20)	Count	24	1	3	3	9	
		% within skin dryness score	68.6%	100.0%	75.0%	50.0%	45.0%	
	group 4(3-10)	Count	5	0	0	0	5	
		% within skin dryness score	14.3%	0.0%	0.0%	0.0%	25.0%	

Table 6. Frequency Distribution of study sample regarding location of skin dryness at day seven (n=66)

			skin dryness
			yes
location of skin dryness	Occiput	Count	3
		% within skin dryness	9.7%
	Heel	Count	4
		% within skin dryness	12.9%
	arms, legs and buttocks	Count	2
		% within skin dryness	6.5%
	Buttock	Count	7
		% within skin dryness	22.6%
	occiput and buttock	Count	3
		% within skin dryness	9.7%
	sacrum and buttock	Count	1
		% within skin dryness	3.2%
	right and/or left arms	Count	3
		% within skin dryness	9.7%
	right and / or left leg	Count	1
		% within skin dryness	3.2%
	face	Count	1
		% within skin dryness	3.2%
	heal and buttock	Count	6
		% within skin dryness	19.4%
Total		Count	31
		% within skin dryness	100.0%

Table 7. Frequency Distribution of study sample regarding occurrence of pressure ulcer at day seven (n=66)

		skin dryness		P value
		yes	no	
Presence of pressure ulcer	yes	31(100%)	0(0.0%)	0.001*
	no	0(0.0%)	35(100%)	
Stages of pressure ulcer				
Pressure ulcer stages day 14	First "non-bleachable erythema	24(77.4%)	0(0.0%)	0.001*
	Second "partial thickness of skin loss	6(19.4%)	0(0.0%)	
	Third "full thickness of skin loss	1(3.2%)	0(0.0%)	

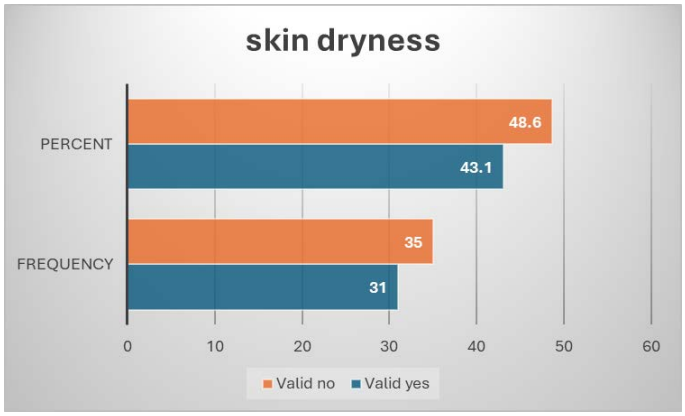

Figure 1. Occurrence of skin dryness in the study sample.

DISCUSSION

Clinical research and practice have placed a great emphasis on several skin hazards related to nursing care, including skin dryness (16,17), diaper dermatitis (14), incontinence-associated dermatitis (13), intertrigo (12), and skin tears (15). Basic preventive and treatment measures, such as the use of leave-on products to treat dry skin and avoid skin tears, are comparable even when the origins, clinical indicators, and symptoms of various skin concerns vary (18). The sample's prevalence of skin dryness (43.1%) was similar to earlier research by Lichterfeld et al. (48.8%) (19).

There is disagreement in the research on the relationship between gender and the genesis of pressure ulcers or dry skin. However, our findings support those of previous research and demonstrate that gender is not linked to the prevalence of skin dryness; as a result, it should only be included as a demographic trait (20, 21).

Patients with spinal cord injuries in this study had the highest percentage of dry skin. The patient's limit movement may account for the correlation with skin dryness. Heart failure, oxygenation, mechanical ventilation, and blood perfusion factors were found to be strongly correlated with PI in a different study (22).

Tissue vulnerability to the formation of pressure ulcers is thought to be increased by reduced blood flow (23). Our findings suggest that skin dryness and diabetes are closely related. Advanced glycation end products are thought to be the cause of the characteristically elevated skin stiffness in diabetes because they build up in the dermal collagen (24).

The distribution of skin areas impacted by dryness is also consistent with the research that is currently available, which indicates that the heal and buttocks are the locations where dry skin is most common (19; 21). This could be because of the significant danger of friction with linen or great pressure in these locations.

The current investigation discovered no correlation between the incidence of skin dryness and APACHE II risk.Nonetheless, there is a statistically significant rise in the number of patients with sever and very sever dry skin in the APACHE II group 2 and group3. This suggests that patients in APACHE category group 2 are more likely to develop pressure injuries compared to those in group 4. Clinicians may find this information useful in identifying patients who are more likely to sustain pressure injuries and in putting preventative measures in place. This result is consistent with studies by Campanili et al., 2015(19), which examined the relationship between pressure injury development and severity as determined by APACHE II. This study came to a different conclusion: patients with and without PI had mean APACHE II ratings that were comparable (P = 0.689). This may be explained by the researched ICU's higher specificity, which helped mostly patients recovering from heart surgery and who might have other, more pertinent factors to consider for the development of PIs. Consequently, dry skin lowers its elastic qualities and impairs the function of the skin barrier (25).These dry skin characteristics may increase the risk of developing pressure ulcer.

The creation of an evidence-based guideline would be a major help and might increase awareness that dry skin is a health issue that needs to be addressed with proper skincare practices in order to prevent secondary skin illnesses (7).Our findings are supported by the fact that nearly all of the subjects with dry skin experienced pressure ulcer development.This is explained by the strong correlation seen between the development of pressure ulcers and dry skin.

The overall conclusion of the current study raise concerns about the kind, suitability, and effectiveness of skin care treatment for those who were at risk of developing skin dryness or pressure ulcer. The National Pressure Ulcer Advisory Panel et al. guidelines (26) advise hydrating skin dryness as a preventive approach. Nevertheless, there is not much data to back up the suggestion to hydrate dry skin.To find out if applying skin moisturizing products to skin areas that are prone to deterioration on a regular basis lowers the chance of developing pressure ulcers, randomized controlled trials are required.

CONCLUSIONS

Our findings imply that there is no correlation between the study population and APACHE II death risk. Nursing directors can create continuing education programs to lower the frequency of this serious consequence by identifying the factors linked to skin dryness occurrence in critically sick patients.

LIMITATIONS

There are a few noteworthy limitations to the current study. Since this is a retrospective study, error in recording of data cannot be ruled out. The functional skin metrics trans-epidermal water loss, skin surface

pH, and stratum corneum hydration could not be measured. Disclosure Section:

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Competing Interest: None

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