RESEARCH PAPER

"An Experimental Study to Assess the Effect of Dermal Applicant on Pressure Points Among Patients in Critical Care Unit"

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ABSTRACT

Introduction: Skin health is essential for overall well-being, acting as the body's primary barrier against pathogens, injury, and environmental factors, while supporting functions such as protection, temperature regulation, sensation, and vitamin D synthesis.

Aims of the Study: To assess the effect of dermal applicant on pressure points among patients in critical care unit.

Methodology: The study assessed the effectiveness of a dermal applicant on pressure points among CCU patients to improve skin integrity. A quantitative, quasi-experimental pre-test and post-test control group design was used. The sample included 80 patients (40 experimental, 40 control) selected through non-probability purposive convenient sampling. Data were collected using a demographic sheet, Braden Scale, and Structured Comprehensive Derma Assessment Scale (CDAS). Reliability was good, with Kappa values of 0.776 (Braden) and 0.747 (CDAS). A pilot study on 10% of the sample confirmed feasibility and showed a positive effect of the intervention.

Results: Most participants in the experimental group were ≥65 years (72.5%), while in the control group most were 45–64 years (47.5%); females were slightly higher in the experimental group (55%). Braden scores improved in the experimental group (92.5% to 52.5%), while worsening in the control group (70% to 97.5%). CDAS showed 100% good condition post-test in the experimental group, whereas the control group declined (95% to 35%). Significant improvement was seen in the experimental group ($Z=5.49, 5.55$; $p<0.001$), while control showed deterioration. Between-group results were significant ($Z=5.91, 7.48$; $p<0.001$). GCS, age, and mattress showed significant associations.

Conclusion: The study concludes that the dermal applicant was effective in improving skin integrity and reducing pressure injury risk among CCU patients, as evidenced by significant improvement in Braden and CDAS scores in the experimental group, while the control group showed deterioration. Thus, the intervention is beneficial for preventing pressure-related skin complications.

Keywords: Assess, Effect, Dermal Applicant, Pressure Points, Patients, Critical Care Unit.

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INTRODUCTION

The skin is the largest organ in the body and is integral to both physical and psychosocial health.[1] However, pressure ulcers are a common problem in critical care units, arising from prolonged immobility in individuals who are weak, ill, paralyzed, or unconscious. The occurrence of pressure ulcers is influenced by a number of risk factors, such as lifestyle factors (nutritional deficiency, impaired mobility, and altered mental status), non-physiological factors (age over 70, smoking, and low BMI), and physiological conditions (obesity, cardiovascular disease, and cerebral vascular accident).[2] Dermal application refers to the application of medication directly onto the skin for therapeutic purposes, producing localized or systemic effects. It involves the use of various formulations, including advanced systems like nanoparticles, to enhance drug delivery and effectiveness in treating skin conditions.[3]

A major health risk is pressure ulcers, sometimes referred to as bedsores, decubitus ulcers, or pressure sores. The Agency for Healthcare Research and Quality first used the phrase "pressure ulcer" to refer to "an area of unrelieved pressure, commonly over prominent bones, that leads to tissue ischemia, and necrosis." Hospitalized patients in India have a 4.94% chance of developing pressure ulcers. Because pressure ulcers increase the risk of

nosocomial and kidney infections, lengthen hospital stays, and raise readmission expenses, prevention is essential. Notably, protecting patient health and avoiding these crippling injuries depend heavily on staff nurses' understanding and awareness of pressure ulcer prevention.[4]

Immobile patients in critical care units (CCUs) are particularly vulnerable to pressure sores, which can lead to longer hospital stays, more medical expenses, and a worse standard of living. The occurrence of pressure sores is still significant despite current preventive efforts, and they can result in catastrophic complications like infection, sepsis, and even death.[5]

The prevalence of pressure ulcers in observational studies was evaluated by a global systematic review and meta-analysis. Data were collected from several kinds of databases, including Web of Science, Embase, PubMed, Scopus, and Google Scholar. The study found that the combined estimate of pressure ulcer incidence was 12%, with the highest incidence 18.5% occurring among inpatients in orthopaedic surgery units.[5]

Need of the study:

ICU patients who are critically ill are more vulnerable to hospital-acquired pressure ulcers for a variety of reasons. Multiple comorbidities, unstable hemodynamic, extended bed rest, increased usage of medical devices, and particular medications are some examples of these issues. Estimates indicate that up to 49% of ICU patients experience HAPUs, which has a substantial physical and financial impact. This concerning figure emphasizes the necessity of efficient management and preventative techniques. Additionally, pressure ulcer development can result in longer hospital admissions, higher medical expenses, and a marked reduction in patients' quality of life. Furthermore, pressure ulcers can cause pain, discomfort, and impaired movement, among other physical, psychological, and social problems that eventually lower patients' independence and general well-being.[6]

According to a recent study, undernutrition, tissue ischemia, and immobility are major contributing factors to pressure ulcers in hospitals, nursing homes, and community settings in a number of nations. The effect of Aloe Vera gel on preventing pressure ulcers in 80 orthopaedic patients (control and experimental) involved applying pure Aloe Vera gel twice daily to the hip, sacrum, and heel. In the control group, a placebo consisting of water and starch was used, and the two groups were then assessed for pressure ulcer symptoms on days 3, 7, and 10. Owing to the fact that Aloe Vera gel helps hospitalized patients in the orthopaedic department avoid pressure ulcers by preventing fever, non-blanchable redness, swelling, and pain in the skin of the studied areas.[7]

Therefore, the researcher felt the need of application of the dermal applicants on pressure points which will helps to improve skin integrity and reduce the risk of pressure damage and skin tear by using low-cost ingredients which are also available at the home.

MATERIALS AND METHODS

The present study was conducted to assess the effectiveness of a dermal applicant on pressure points among patients in the critical care unit with the objective of improving skin integrity and comparing pre-test and post-test outcomes between experimental and control groups. A quantitative research approach with a quasi-experimental research design was adopted, involving two groups with pre-test and post-test assessments. The sample consisted of 80 CCU patients, with 40 in the experimental group and 40 in the control group, selected using a non-probability purposive convenient sampling technique.

Data were collected using a demographic data sheet, Braden Scale to assess pressure ulcer risk, and Structured Comprehensive Derma Assessment Scale (CDAS) to evaluate skin condition. The intervention was applied to the experimental group, while the control group received routine care. Reliability of the tools was established using inter-rater reliability, with Kappa values of 0.776 for the Braden Scale and 0.747 for the CDAS, indicating good consistency. A pilot study was conducted on 10% of the sample, confirming feasibility and demonstrating a positive effect of the intervention on improving skin integrity among patients.

RESULTS

SECTION-I

This section deals with the demographic data of patients in both experimental and control group. The data is presented in the form of frequency and percentage.

The demographic data indicate that most participants in the experimental group were aged ≥65 years [29 (72.5%)], while in the control group the majority were 45–64 years [19 (47.5%)]. Females were slightly higher in the experimental group [22 (55.0%)], whereas the control group had equal gender distribution [20 (50.0%) each]. Most participants had normal BMI [23 (57.5%) experimental; 20 (50.0%) control]. Moderate GCS (9–12) was common in the experimental group [21 (52.5%)], while severe GCS (3–8) predominated in the control group [25 (62.5%)].

Hypertension and diabetes were common in the experimental group, whereas 18 (45.0%) in the control group had no medical history. Foam mattresses were mostly used [31 (77.5%) experimental; 27 (67.5%) control], and “other diagnoses” formed the largest category. All patients

stayed 7 days in CCU [40 (100%)], and none reported allergy to skincare products. Overall, both groups were comparable with slight variations.

SECTION II

This section deals with assessment of Effect of dermal applicant on pressure points among patients in critical care unit admitted in CCU. Assessment is done by the Braden scale and Comprehensive Derma Assessment Scale (CDAS).

Table 1 - Assessment according to Braden scale among patients in CCU in experimental group.

N = 40

Sr. No.	Braden Scale Levels	Score Range	Pre-test		Post-test	
			(F)	(%)	(F)	(%)
1	**VERY HIGH RISK**	6–9	37	92.5	21	52.5
2	**HIGH RISK**	10–12	3	7.5	17	42.5
3	**MEDIUM RISK**	13–15	0	0	2	5
4	**LOW RISK**	16–18	0	0	0	0
5	**NO RISK**	>18	0	0	0	0
	Total		**40**	**100**	**40**	**100**

Table 1 depict the assessment of patients in the experimental group using the Braden Scale, showing improvement in skin integrity after the intervention. In the pre-test, most participants 37 (92.5%) were at very high risk and 3 (7.5%) at high risk, with none in other categories. In the post-test, very high risk reduced to 21 (52.5%), while 17 (42.5%) shifted to high risk and 2 (5.0%) improved to medium risk. Overall, these findings indicate that the dermal application was effective in reducing the risk of pressure injuries.

Table 2 - Assessment according to Braden scale among patients in CCU in Control group.

n = 40

Sr. no.	Braden Scale Levels	Score Range	Pre-test		Post-test	
			(F)	(%)	(F)	(%)
1	**VERY HIGH RISK**	6–9	28	70	39	97.5
2	**HIGH RISK**	10–12	10	25	1	2.5
3	**MEDIUM RISK**	13–15	1	2.5	0	0
4	**LOW RISK**	16–18	1	2.5	0	0
5	**NO RISK**	>18	0	0	0	0
	Total		**40**	**100**	**40**	**100**

Table 2 depict the assessment of patients in the control group using the Braden Scale, showing a decline in skin integrity over time. In the pre-test, most participants 28 (70.0%) were at very high risk and 10 (25.0%) at high risk, while 1 (2.5%) each were in medium and low risk categories. In the post-test, very high risk increased to 39 (97.5%), with only 1 (2.5%) remaining in the high-risk category and none in other categories. Overall, these findings indicate worsening skin integrity in the control group, with a marked shift toward the very high-risk category.

Assessment according to CDAS scale among patients in CCU in experimental group.

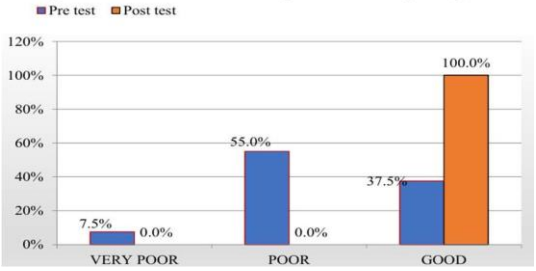

Fig. 1: Assessment according to CDAS scale among patients from experimental group. Figure No.1 depict the assessment of patients in the experimental group using the CDAS, showing significant improvement in skin condition after the intervention. In the pre-test, 22 (55.0%) participants had poor skin condition, 3 (7.5%) had very poor condition, and 15 (37.5%) were in the good category. In the post-test, all 40 (100.0%) participants shifted to good skin condition, with none remaining in poor or very poor categories. Overall, these findings indicate that the dermal application was highly effective in improving skin condition.

Assessment according to CDAS scale among patients in CCU in control group.

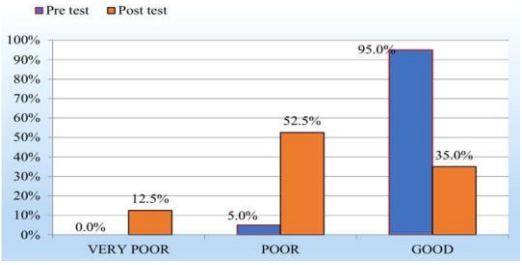

Fig. 2: Assessment according to CDAS scale among patients from control group

Figure No. 2 depict the assessment of patients in the control group using the CDAS, showing a decline in skin condition over time. In the pre-test, most participants 38 (95.0%) had good skin condition, while 2 (5.0%) had poor condition and none had very poor condition. In the post-test, good skin condition decreased to 14 (35.0%), while 21 (52.5%) shifted to poor and 5 (12.5%) to very poor categories. Overall, these findings indicate worsening skin condition in the control group without dermal application.

SECTION III

This section deals with effectiveness of Dermal applicant on pressure points among Patients in CCU. It consists of two parts-

Table No.3 - Effectiveness of dermal applicant on pressure points by comparing pre and post Braden scale and CDAS among patients in CCU within the experimental group.

n = 40

Sr. No.	Braden scale and CDAS comparison within experimental group		Mean	W value	Z value	p value
1	Braden Scale	Pre-test	7.27	0	5.49	<0.001
		Post-test	9.45			
2	CDAS	Pre-test	12.67	0	5.55	<0.001
		Post-test	17.8			

Table No.3 shows a significant difference between day 1 and day 7 mean scores in the experimental group using the Wilcoxon Signed Rank Test (Z table value ±1.96 at 0.05 level). The Braden Scale mean increased from 7.27 to 9.45 ($Z = 5.49$, $p < 0.001$) and the CDAS mean improved from 12.67 to 17.80 ($Z = 5.55$, $p < 0.001$), indicating statistically significant improvement. Hence, the null hypothesis (H01) is rejected and the alternate hypothesis (H1) is accepted, showing that the dermal applicant was effective in improving skin integrity and reducing pressure injury risk.

Table No. 4 - Effectiveness of dermal applicant on pressure points by comparing pre and post Braden scale and CDAS among patients in CCU within the control group.

n =40

Sr no	Scale	Test	Mean	W value	Z value	p value
1	Braden Scale	Pre-test	7.8	0	6.002	<0.001
		Post-test	6.95			
2	CDAS	Pre-test	16.65	0	5.53	<0.001
		Post-test	12.33			

Table No.4 indicate a significant difference between pre- and post-test scores in the control group. Using the Wilcoxon Signed Rank Test (Z table value ±1.96 at 0.05 level), the Braden Scale mean decreased from 7.80 to 6.95 ($Z = 6.002$, $p < 0.001$), indicating an increased risk of pressure injuries. Similarly, the CDAS mean declined from 16.65 to 12.33 ($Z = 5.53$, $p < 0.001$), reflecting deterioration in skin condition. Since the calculated Z values exceed the table value, the null hypothesis is rejected, confirming a statistically significant decline in skin integrity among patients in the control group.

Table 5 - Effect of dermal applicant on pressure points by comparing Post Intervention Braden scale and CDAS scale between the experimental and control group.

n = 80

Sr. No	Scale Comparison	Group	Mean	Sum of Ranks	U value	Z value	p value
1	Braden Scale	Experimental	9.45	2224	196	5.91	<0.001
		Control	6.93	1016			
2	CDAS Scale	Experimental	17.8	2393	26.5	7.48	<0.001

		Control	12.33	846			

Table No.5 shows a comparison of Braden Scale and CDAS Scale scores between the experimental and control groups using the Mann–Whitney U test. For the Braden Scale, the experimental group had a higher mean score (9.45) compared to the control group (6.93), with a U value of 196, Z value of 5.91, and a p-value of <0.001, indicating a highly statistically significant difference. Similarly, for the CDAS Scale, the experimental group showed a higher mean score (17.80) than the control group (12.33), with a U value of 26.5, Z value of 7.48, and a p-value of <0.001, which is also highly significant. Overall, these findings demonstrate that the intervention was effective, as both scales show significantly better outcomes in the experimental group compared to the control group, and the differences observed are not due to chance.

SECTION IV

This section deals with Analysis and interpretation of data in order to find out association of Braden scale and CDAS scale with selected demographic variables.

Section IV analyzes the association between demographic variables and Braden and CDAS scale scores using ANOVA in the experimental group. For the Braden Scale, only GCS showed a significant association ($F = 15.3$, $p < 0.001$), while age, gender, BMI, and mattress used were not significant ($p > 0.05$). For the CDAS Scale, age ($F = 5.50$, $p = 0.008$) and mattress used ($F = 24.6$, $p < 0.001$) showed significant associations, whereas gender, BMI, and GCS did not. Thus, GCS significantly influences Braden scores, while age and mattress type significantly influence CDAS scores, with no significant association observed for other variables.

DISCUSSION

The study by Sevda Onen and Ozlem Dogu (2025) reported that the incidence of pressure injuries decreased from 30.43% in the control group to 17.5% in the intervention group ($p < 0.05$). Similarly, the present study demonstrated significant improvement in skin integrity, with the Braden mean score increasing from 7.27 to 9.45 and CDAS mean from 12.67 to 17.80 in the experimental group ($p < 0.001$), while the control group showed deterioration. Both studies indicate that appropriate interventions significantly reduce pressure injury risk and improve patient outcomes in critical care settings.[8]

The study by Aditya Diwakar Kamble (2023) demonstrated that Aloe vera gel significantly improved pressure ulcer healing, with the experimental group mean score reducing from 10.95 to 8.88 compared to minimal change in the control group (10.35 to 10.10) ($t = 8.479$, $p = 0.0001$). Similarly, the present study showed significant improvement in skin integrity, with Braden scores increasing from 7.27 to 9.45 and CDAS from 12.67 to 17.80 ($p < 0.001$) in the experimental group, while the control group deteriorated. Both studies confirm the effectiveness of Aloe vera–based interventions in improving pressure ulcer outcomes.[9]

The study by Safia Arbab et al. (2021) demonstrated that Aloe vera possesses significant antimicrobial activity against common skin pathogens, supporting its role in managing and preventing skin infections. In comparison, the present study evaluated the clinical effectiveness of dermal application on pressure points among CCU patients and found a statistically significant improvement in skin integrity, as evidenced by increased Braden and CDAS scores in the experimental group ($p < 0.001$). While the previous study focused on the in-vitro antibacterial properties of Aloe vera, the present study provides in-vivo clinical evidence of its effectiveness in preventing pressure injuries. Thus, both studies complement each other by linking antimicrobial action with improved clinical outcomes.[10]

CONCLUSION:

The present study concludes that dermal application on pressure points is an effective intervention for improving skin integrity and reducing the risk of pressure injuries among patients admitted to the critical care unit. The findings revealed a statistically significant improvement in the experimental group, as evidenced by increased Braden Scale scores (7.27 to 9.45) and CDAS scores (12.67 to 17.80) ($p < 0.001$), while the control group showed deterioration in both parameters. This clearly indicates that dermal application plays a vital role in preventing pressure ulcers and maintaining skin condition in immobilized patients.

Furthermore, the study highlights those certain demographic variables such as GCS, age, and mattress type have a significant influence on skin integrity outcomes. The results are supported by previous studies, which also demonstrate the effectiveness of Aloe vera and other interventions in preventing pressure injuries.

Thus, the study emphasizes the importance of incorporating cost-effective and simple dermal applications into routine nursing care practices. It also underlines the crucial role of nurses in early prevention and management of pressure ulcers, ultimately improving patient outcomes, reducing hospital stay, and enhancing the quality of care in critical care settings.

DECLARATION BY AUTHORS:

Ethical Approval: The study was approved by the institutional ethics committee of K.J. Somaiya College of Nursing, Mumbai. The study participants were briefed about the purpose and nature of the

study and written informed consent was obtained before data collection.

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Conflict of Interest: The authors declare no conflict of interest.

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