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A Comparative Study to Assess the Effectiveness of Normal Saline-soaked Dressing Versus Magnesium Sulphate and Glycerin Dressing on Cellulitis

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Abstract **Original Research Article**

Background of the Study: Cellulitis is a common bacterial infection of the skin and subcutaneous tissues, characterized by redness, swelling, pain, and fever. If not managed effectively, it can progress to severe complications such as abscesses, septicemia, and necrotizing infections. Wound care plays a crucial role in the treatment of cellulitis, alongside antibiotics. Various dressing methods are practiced, including the traditional use of Magnesium sulphate with Glycerine, which reduces inflammation and draws out exudates, and Normal Saline-soaked dressings, which provide a moist environment, aid healing, and are inexpensive and easily available. Despite their wide usage, comparative evidence is limited. Hence, this study was undertaken to evaluate the effectiveness of Normal Saline-soaked dressing versus Magnesium sulphate and Glycerin dressing in reducing grades of cellulitis.

Objectives of the Study:

- To assess the grades of cellulitis among cellulitis patients who are admitted at selected hospitals in both the groups.
- To determine the effectiveness of Normal Saline-soaked dressing in experimental group versus Magnesium sulphate and Glycerine dressing in control group among cellulitis patients who are admitted at selected hospitals.
- To find out the association between pretest grades of cellulitis and their socio- demographic variables among cellulitis patients who are admitted in selected hospitals.

Methodology: The research design selected for this study was True Experimental Pre-Test–Post-Test Control Group Design**.** The sample size comprises 60 cellulitis patients admitted to surgical wards of Daddenavar Hospital and B.V.V.S. HSK Hospital, Bagalkot, selected using purposive sampling and randomized into two groups of 30 each. The experimental group received Normal Saline-soaked dressing, while the control group received Magnesium sulphate and Glycerine dressing. In the present study data was collected by standardized cellulitis grading scale at three points—pre-test, post-test 1, and post-test 2. The data analysis done by using descriptive and inferential statistics. ***Result:*** Findings of the study revealed that a significant reduction in cellulitis grades in both groups, but the experimental group (Normal Saline dressing) showed greater improvement (mean score reduction from 2.46 at pre-test to 1.33 at post-test 2) compared to the control group (2.53 at pre-test to 1.63 at post-test 2). Statistical analysis using paired *t*-test and repeated measures ANOVA confirmed that the differences were highly significant ($p < 0.05$). Chi-square test showed significant associations between cellulitis grades and variables such as education, occupation, income, history of cellulitis, and type of footwear. ***Conclusion:*** The study concludes that the Normal Saline-soaked dressing is more effective than Magnesium sulphate and Glycerine dressing in reducing the grades of cellulitis, and may be considered a safe, cost-effective, and efficient alternative for clinical practice.

Keywords: Cellulitis, Normal Saline-soaked dressing, Magnesium sulphate and Glycerine dressing, Wound care, Experimental study.

INTRODUCTION

Human body is an amazing machine which comprises of all vital organs and systems. In that the skin is considered as largest organ. The skin serves as a protective barrier preventing normal skin flora and other microbial pathogens from reaching

Cellulitis are simply defined as an acute infection of the skin involving the dermis and

subcutaneous tissues. Erysipelas classically refers to more superficial cellulitis of the face or extremities with lymphatic involvement, classically due to streptococcal infection. Diabetic foot infections and wound infections are specific entities. [1]

Cellulitis is characterized by localized pain, erythematic, swelling and heat. Cellulitis may be caused by indigenous flora colonies of the skin appendages e.g, S. Aureus and S. pyogenes or by a wide variety of exogenous bacteria. Relatively, low number of bacteria may cause cellulitis and that the expanding area of erythema within the skin maybe a direct effect of extracellular toxins or of the soluble mediators of inflammation elicited by the host [2].

J. K. Lim and et.al in their study "Normal saline wound dressing- is it really normal, British Journal of Plastic" tested a hypothesis that "normal saline dressings function in part as an osmotic dressing". The result revealed that with evaporation of water the dressing becomes hypertonic. The hyper tonicity of the normal saline dressing provides an osmotic gradient for absorption of wound fluid, contributing to its effectiveness as a wound dressing [3].

Patients treated with Glycerine & Magnesium Sulphate dressing responded better than normal saline dressing. No complication was observed; healing was faster and reduced hospital stay. Conclusions: In this study, author have observed patients treated with Glycerine & Magnesium sulphate dressing responded better than normal saline dressing. No complication was observed; healing was faster and reduced hospital stay.[4]

MATERIAL AND METHODS

Study Design and Participants

A researcher's overall plan for obtaining answers to the research question for testing the research hypothesis is referred to as the "research design". It spells out the basic strategies that the researcher adopts to develop information that is accurate and interpretable. The research design adopted for the study is True Experimental pretest –posttest control group Design. The experimental group receive the Normal Saline-soaked dressing whereas control group receives the Magnesium sulphate and Glycerine dressing.

Table 4.1: Research design.

Group	Pre-Test	Intervention	Post-Test 1	Post-Test 2
Experimental Group	O_1	X	O_2	O_3
Control Group	O_1	X	O_2	O_3

O_1 –pretest of both control group and experimental group

X- Application of Normal Saline-soaked dressing for experimental group and Magnesium sulphate and Glycerine dressing for control group treatment.

O_2- post test -1for both control group and experimental group

O_3- posttest -2 for both control group and experimental group

Settings of the Study:

The Surgical Intensive Care Unit and Surgical Wards of selected hospitals of Bagalkot.

POPULATION

Target population: Cellulitis patients who all are admitted in surgical units of various hospitals of Bagalkot District.

Accessible population: The accessible population for the present study consists of cellulitis patients who are admitted in the surgical units of selected hospitals of Bagalkot (HSK and Daddenavar Hospital).

SAMPLE:

In the present study sample consists of cellulitis patients who are admitted in Surgical Intensive Care Unit and Surgical Wards of selected hospitals of Bagalkot.

SAMPLING TECHNIQUE:

Non -Probability Purposive Sampling Technique will be used to select the samples. After randomisation the samples will be divided into experimental and control group through simple random sampling technique (lottery method).

Inclusion criteria:

The following criteria are used to select the sample in the present study

1. Patients age from 18 years to above 60 years.
2. Patients who all are having the cellulitis with grade 1,2 and 3.
3. Patients who all having controlled diabetic mellitus

Patients who are admitted in Hanagal Shree Kumareshwar Hospital and Research Centre Navanagar, Bagalkot and Daddenavar Hospital and Research Centre, Bagalkot.

Exclusion criteria:

The Study Excluded

1. Patients who all are having uncontrolled diabetic mellitus.
2. Patients who all are not co-operative during the intervention.

3. Patients who are critically ill.

STANDARDISED GRADES OF CELLULITIS

The Cellulitis Grading Scale was designed to assess the grades of cellulitis before and after intervention. This contains various grades of cellulitis from Grade 1to 4.

Table 4

Grades of cellulitis (Eron, 2000; CREST, 2005)

Class I
Patients have no signs of systemic toxicity, have no comorbidities and can usually be managed with oral antimicrobials as outpatients.

Class II
Patients are either systemically ill or systemically well but with a comorbidity such as peripheral vascular disease, chronic venous insufficiency or morbid obesity which may complicate or delay resolution of their infection.

Class III
Patients may have a significant systemic upset such as acute confusion, tachycardia, tachypnoea, or may have unstable comorbidities that may interfere with a response to therapy, or have a limb-threatening infection due to vascular compromise.

Class IV
Patients have sepsis syndrome or severe life-threatening infection such as necrotising fasciitis.

DATA COLLECTION PROCEDURE:

The data collection was carried out from 21-05-2025 to 20-06-2025, among cellulitis patients who are undergoing treatment the BVVS HSK Hospital and Research Centre, Bagalkot. Permission was obtained from the medical superintendent of BVVS HSK Hospital before data collection. Written consent was obtained from 60 subjects. Cellulitis patients were selected on the basis of Non -Probability Purposive Sampling Technique. Then the investigator conducted pretest on assessment of grades of cellulitis among patients by using cellulitis grading scale. Then the application of normal saline soaked dressing for experimental group and the application of magnesium sulphate and glycerine dressing for control group. Then the post test severity of cellulitis was assessed after intervention for all the seven days.

DATA ANALYSIS:

Data analysis is a systemic organization and synthesis of research data and testing of research hypothesis by using those data. The data obtained is analyzed in terms of objectives of the study using descriptive and inferential statistics. The plan of data analysis is as follows:

- ✓ Organization of data in master sheet/computer
- ✓ Computation of frequencies and percentage for the analysis of socio-demographic data.
- ✓ Computation of mean and standard deviation for pretest and post test scores.
- ✓ "Paired-t" test was used to determine the effectiveness of magnesium sulphate and glycerine dressing.
- ✓ "Paired-t" test was used to determine the effectiveness of Normal saline soaked dressing.
- ✓ Chi – square test is used to find the association between the pre-test cellulitis scores with their selected socio-demographic variables. The level of significance would be set at $p \leq 0.05$ levels to test the significance of difference.

This level is often used as a standard for testing the difference.

RESULTS

SECTION I: Description of socio-demographic and clinical demographic characteristics of sample. Demographic characteristics of study subjects

		Experimental Group		Control Group	
Sl No	**Socio Demographic Variable**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
1	**Age in year**				
	a)18-30 year	7	23.33%	4	13.33%
	b 31-45 year	16	53.33%	20	66.67%
	c)46-60 year	7	23.33%	6	20.00%
	d)Above 60 years	0	0.00%	0	0.00%
2	**Gender**				
	a) Male	20	66.66%	17	56.67%
	b) Female	10	33.33%	13	43.33%
3	**Marital Status**				
	a) Single	8	26.67%	5	16.67%
	b) Married	18	60.00%	24	80.00%
	c) Divorced	3	10.00%	1	3.33%
	d) Widowed	1	3.33	0	0.00%
4	**Education**				
	No Formal Education	1	3.33%	2	6.67%
	Primary Education	5	16.67%	10	33.33%
	Secondary Education	11	36.67%	7	23.33%
	Higher Secondary Education	8	26.67%	4	13.33%
	Graduate and above	5	16.67%	7	23.33%
5	**Occupation**				
	Unemployed	2	6.67%	4	13.33%
	Daily Wage Worker	4	13.33%	7	23.33%
	Private Employee	11	36.67%	11	36.67%
	Government Employee	29	30.00%	5	16.67%
	Business Person	3	10.00%	3	10.00%
	Retired	1	3.33%	0	0.00%
6	**Monthly Household income**				
	Rs < 10000	9	30.00%	13	43.33%
	Rs 10000 - 40000	15	50.00%	15	50.00%
	Rs < 40000	6	20.00%	2	6.67%
7	**Do you have any known chronic illness?**				
	Diabetes Mellitus	10	33.33%	7	23.33%
	Hypertension	4	13.33%	7	23.33%
	Heart Disease	7	23.33%	4	13.33%
	Kidney Disease	5	16.67%	5	16.67%
	None	4	13.33%	7	23.33%
8	**Do you have a history of cellulitis or other skin infections?**				
	Yes	9	30.00%	4	13.33%
	No	21	70.00%	26	86.67%
9	**Do you smoke?**				
	Yes	7	23.33%	10	33.33%
	No	23	76.67%	20	66.67%
10	**Do you consume alcohol?**				
	Yes	16	53.33%	13	43.33%
	No	14	46.67%	17	56.67%
11	**Do you have any known allergies?**				
	Yes	10	33.33%	5	16.67%

	No	20	66.67%	25	83.33%
12	**How often do you clean and dress your wounds?**				
	Regularly (Daily)	15	50.00%	10	33.33%
	Occasionally (2-3 times a week)	11	36.67%	8	26.67%
	Rarely (Less than once a week)	4	13.33%	12	40.00%
13	**What type of footwear do you usually wear?**				
	Closed Shoes	10	33.33%	2	6.67%
	Open Sandal/slippers	17	56.67%	16	53.33%
	Barefoot	3	10.00%	12	40.00%
14	**Do you work in an environment that exposes you to injuries or infections**				
	Yes	10	33.33%	9	30.00%
	No	20	66.67%	21	70.00%

SECTION II: Evaluation of the Effectiveness of Normal saline soaked dressing versus Mgso4 and glycerine dressing among cellulitis patients.

There will be significant difference between Mean Pre-test and post-test scores of cellulitis patients.

	Experimental group (normal saline)			**Control group (Magnesium Sulphate)**		
	Pre test	Post test 1	Post test 2	Pre test	Post test 1	Post test 2
Mean	2.46	1.93	1.33	2.53	2.26	1.63
SD	0.57	0.63	0.47	0.50	0.52	0.49

Table 5.16;- the table presents the mean and standard deviation of pretest and post test score of cellulitis patients for two groups

- Experimental group (normal saline soaked dressing)
- Control group (Magnesium sulphate and glycerin dressing)

This shows that in both group the mean cellulitis score decreased overtime suggesting improvement in condition, but the experimental group had a greater reduction in the mean score by post test 2.

SECTION III: Evaluation of the Effectiveness of Normal saline soaked dressing versus Mgso4 and glycerine dressing among cellulitis patients

EVALUATION OF POST-TEST 1 AND 2 WITH PRE-TEST IN EXPERIMENTAL GROUP (ANOVA).

Summary of data

Treatments				
	Pre-Test	**Post-Test 1**	**Post-Test 2**	**Total**
N	30	30	30	90
Σ^X	74	58	40	172
MEAN	2.4667	1.9333	1.3333	1.911
Σ^{X2}	192	124	60	376
Std.Dev	0.5713	0.6397	0.4795	0.7289

Result: ANOVA between the groups.
The F-ratio value is 55.69027.
ANOVA between experimental groups.
The *f*-ratio value is 29.96667.
The *p*-value is < .00001.
The result is significant at $p < .05$.

SECTION IV: Evaluation of the Effectiveness of Normal saline soaked dressing versus Mgso4 and glycerine dressing among cellulitis patients.

Table 5.18: Compare the post-test of experimental and control group

Pairwise comparisons		**$HSD_{.05}$=0.3493 $HSD_{.01}$=0.4382**	**$Q_{.05}$=3.3722 $Q_{.01}$=4.2308**
$T_1.T_2$	M_1=2.47 M_2=1.93	0.53	Q=5.15 p=0.00132
T_1-T_3	M_1=2.47 M_3=1.33	1.13	Q=10.94 p=0.0000
T_2-T_3	M_2=1.93 M_3=1.33	0.60	Q=5.79 p=0.00027

RESULT

The *f*-ratio value is 16.71628. The *p*-value is < .00001. The result is significant at *p* < .05.

The repeated measures ANOVA showed a significant difference across the 3 times points (f = 16.716 and p < 0.00001), these measures mean cellulitis severity scores changed significantly overtime with a dressing intervention.

- The results clearly shows progressive and statistically significant reduction in cellulitis severity scores from pre test to post test 1 and further to posttest 2.
- Patients improved significantly after the initial intervention
- The improvement was even greater after extended treatment indicating that the dressing intervention was consistently effective overtime.

SECTION V: Evaluation of the Effectiveness of Normal saline soaked dressing versus Mgso4 and glycerine dressing among cellulitis patients.

To find out the Association between pretest grades of cellulitis among cellulitis patients with their selected socio demographic and clinical variable.

Association between levels of pre test cellulitis with their selected socio-demographic variables experimental group

EXPERIMENTAL GROUP				
Sl No	**Socio Demographic Variable**	**Chi Square**	**P Value**	**Association**
1	Age	1.233	0.2668	Not Significant
2	Gender	1.3715	0.2416	Not Significant
3	Marital Satus	2.0952	0.1478	Not Significant
4	Education	7.7439	0.0054	Significant
5	Occupation	9.1298	0.0025	Significant
6	Monthly Income	5.9429	0.0148	Significant
	2)Health And Lifestyle Factors			
1	Any Chronic Illness	2.4978	0.1140	Not Significant
2	History Of Cellulitis or Skin Infection	4.059	0.0439	Significant
3	Do You Smoke	1.7836	0.1817	Not Significant
4	Do You Consume Alcohol	1.2245	0.2685	Not Significant
5	Do You Have Any Known Allergies	0.9428	0.3316	Not Significant
	3)Environmental And Hygiene Factors			
1	How Often Do You Clean and Dress Your Wounds	2.1117	0.1462	Not Significant
2	Type of Footwear	6.5255	0.0106	Significant
3	Environment Exposed to Injuries or Infections	2.5928	0.1074	Not Significant

Findings related to the association between pretest grades of celluitis patients with their selected socio demographic variables reveals that, there are five significant association found between the pre test level of grades of celluilitis score of patients of Age ($\chi2$=1.23, P=0.26), Gender ($\chi2$=1.37, P=0.24), Marital status ($\chi2$=2.09, P=0.14), Educational status ($\chi2$=7.74, P= 0.005), occupation ($\chi2$=9.12, P=0.002), family monthly income ($\chi2$=5.94, P=0.01), any chronic illness ($\chi2$=2.49, P=0.11), history of cellulitis or skin infection ($\chi2$=4.05, P=0.04), do you smoke ($\chi2$=1.78,P=0.18),do you consume alcohol ($\chi2$=1.224, P=0.26).do you have any known allergies ($\chi2$=0.94, P=0.33),how often do you clean and dress your wounds($\chi2$=2.11, P=0.14),type of footwear($\chi2$=6.52, P=0.01),environment exposed to injuries or infections($\chi2$=2.59 P=0.10),

NON-SIGNIFICANT ASSOCIATION: -

Age, Gender, Marital status, Any chronic illness, Smoking, Alcohol consumption, Known allergies, Wound cleaning frequency, Environment exposure or injuries or infections.

SIGNIFICANT ASSOCIATION

Educational status, Occupation, Family monthly income, History of cellulitis or skin infection, Type of footwear. Thus five factors showed statistically significant association with cellulitis pretest grades.

Association between levels of pre test cellulitis with their selected socio-demographic variables control group

Control Group				
Sl No	**1) Socio Demographic Variable**	**Chi Square**	**P Value**	**Association**
1	Age	2.2619	0.1326	Not Significant
2	Gender	3.7039	0.0543	Not Significant
3	Marital Satus	1.5047	0.2199	Not Significant
4	Education	7.5296	0.0061	Significant

5	Occupation	6.3959	0.0114	Significant
6	Monthly Income	1.3631	0.2430	Not Significant
	2)Health And Lifestyle Factors			
1	Any Chronic Illness	13.9714	0.0002	Significant
2	History Of Cellulitis Or Skin Infection	0.1648	0.6848	Not Significant
3	Do You Smoke	0.5357	0.4642	Not Significant
4	Do You Consume Alcohol	0.8339	0.3611	Not Significant
5	Do You Have Any Known Allergies	0.3771	0.5392	Not Significant
	3)Environmental And Hygiene Factors			
1	How Often Do You Clean And Dress Your Wounds	1.6071	0.2049	Not Significant
2	Type Of Footwear	3.6667	0.0555	Not Significant
3	Environment Exposed To Injuries Or Infections	0.5216	0.4702	Not Significant

Findings related to the association between pretest grades of cellulitis patients with their selected socio demographic variables reveals that, there are three significant association found between the pretest level of grades of cellulitis score of patients of Age (χ^2=2.26, P=0.132), Gender (χ^2=3.70, P=0.054), Marital status (χ^2=1.504, P=0.219), Educational status (χ^2=7.529, P= 0.0061), occupation (χ^2=6.395, P=0.0114), family monthly income (χ^2=1.3631, P=0.243), any chronic illness (χ^2=13.971, P=0.0002), history of cellulitis or skin infection (χ^2=0.164, P=0.684), do you smoke (χ^2=0.535,P=0.464),do you consume alcohol (χ^2=0.833, P=0.361).do you have any known allergies (χ^2=0.377, P=0.539),how often do you clean and dress your wounds(χ^2=1.60, P=0.204),type of footwear(χ^2=3.666, P=0.0555),environment exposed to injuries or infections(χ^2=0.521, P=0.470).

NON-SIGNIFICANT ASSOCIATION:

Age, Gender, Marital status, Monthly income, History of cellulitis or skin infections, Smoking, Alcohol consumption, Any known allergies, Wound cleaning frequency, Type of footwear, Environment exposure or Injuries or infections.

SIGNIFICANT ASSOCIATION: Any chronic illness, educational status, Occupation.
Thus, three factors showed significant association with cellulitis pretest grades.

DISCUSSION

The present study was designed to find out the effectiveness of Normal saline soaked dressing versus magnesium sulphate and glycerine dressing on cellulitis on reduction of grades of cellulitis patient.

The present study shows that the majority of cellulitis patients were males 66.66% and remaining 33.33% were females in experimental group. The majority of cellulitis patients were males 57% and remaining 43% were females in control group.

The result of the present study are supported by the study conducted by Kondireddy Suhas, Kalakoti Chandra Sekhar Reddy, Kalidindi Suryateja and M Vishnu Swaroop Reddy. Department of General Surgery, Alluri Sitaramaraju Academy of Medical Sciences (ASRAM), Eluru, Andhra Pradesh, India showed that in experimental group and control group with regard to the gender, it depicts that percentage wise distribution of samples according to gender Out of 60 patients, 28 patients underwent normal saline dressing, in that 14 were males and 14 were females. 32 patients underwent glycerin and magnesium sulfate dressing, in that 22 were males and 10 were females[5].

The findings related to the significance of the difference between pretest, post test1 and posttest 2 with the grades of cellulitis among cellulitis patients shows that difference between mean pretest[2.46]with SD 0.57 and mean posttest 1[1.93]with SD0.63 and mean post test2 [1.33] SD 0.47 in experimental group and that difference between mean pretest[2.53]with SD 0.50 and mean posttest 1[2.26]with SD0.52 and mean post test2 [1.63] SD 0.49 in control group**.**

- Experimental group (normal saline soaked dressing)
- Control group (Magnesium sulphate and glycerin dressing)

This shows that in both group the mean cellulitis score decreased overtime suggesting improvement in condition, but the experimental group had a greater reduction in the mean score by post- test 2. As Hypothesis H_1 states that the Mean post test grades of cellulitis will be significantly higher than the mean pretest grades of cellulites in experimental group (Normal Saline-soaked dressing).

Hence H_1 is accepted.

The repeated measures ANOVA showed a significant difference across the 3 times points (f = 16.716 and $p < 0.00001$), these measures mean cellulitis severity scores changed significantly overtime with a dressing intervention.

The study supported with A study was conducted to assess the comparison between dressing of cellulitis with normal saline and Magnesium sulphate at MNR Medical College and Hospital, Telangana. They have selected 112 patients. The result showed that

patients treated with normal saline dressing responded better than magnesium sulphate dressing. No complication was observed and healing was faster. The study concluded that the researcher has observed patients treated with normal saline dressing responded better than Magnesium sulphate dressing. No complication was observed and healing was faster.[6]

Association between pretest grades of cellulitis among cellulitis patients with their selected socio demographic and clinical variable.

- The results clearly show progressive and statistically significant reduction in cellulitis severity scores from pre- test to post -test 1 and further to post -test 2.
- Patients improved significantly after the initial intervention
- The improvement was even greater after extended treatment indicating that the dressing intervention was consistently effective overtime.

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