

A COMPARATIVE STUDY BETWEEN MAGNESIUM SULPHATE AND GLYCERIN COMBINATION DRESSING VERSUS NORMAL LIMB ELEVATION AND USE OF COMPRESSION BANDAGE DRESSING IN DIABETIC CELLULITIS PATIENTS

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Abstract

Diabetic cellulitis is a common and severe bacterial skin infection that commonly results in increased morbidity, delayed wound healing, and hospitalization. Due to the impaired immunity and healing that accompany diabetes, it becomes necessary to look at treatments that are not only safe and effective but also affordable. This study aimed to compare the efficiency of a Magnesium Sulphate and Glycerin combination dressing with that limb elevation and compression bandaging in the healing of diabetic cellulitis. The primary objectives are to compare wound healing, control of the infection, pain, and quality of life in patients. The study was a prospective, randomized controlled trial that spanned six months in a tertiary care hospital. Sixty patients with diabetic cellulitis were divided randomly into two groups: one received the Magnesium Sulphate and Glycerin dressing, and the other received limb elevation and compression bandaging. Initial assessments, application of the treatments, follow-up, and measurement of the outcomes in terms of control of the infection, wound healing, pain, and quality of life were all included in the methodology. The results showed that patients who received the Magnesium Sulphate and Glycerin dressing had a faster recovery, with more efficient reduction in edema, erythema, pain, and inflammation as opposed to those who received limb elevation and compression bandaging. The average hospital stay in the Magnesium Sulphate and Glycerin group was considerably shorter at 9.5 days as opposed to the compression bandage group at 17.5 days. The study concluded that even though the two treatments are helpful, the Magnesium Sulphate and Glycerin dressing is more efficient in the control of active infections through symptom control and healing, and limb elevation and compression bandaging are more useful in the prevention of long-term oedema.

Keywords: Diabetic cellulitis, Magnesium sulphate, Glycerin dressing, Compression bandage, wound healing, Infection control, control trail.

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INTRODUCTION

The chronic metabolic disorder known as diabetes mellitus (DM) is typified by high blood glucose levels. This causes because:

1. These results from the body producing too little insulin, a hormone that lets glucose enter cells for use.
2. Insulin resistance-that is, the body's cells show poor response to insulin.

If diabetes is still uncontrolled, raised blood glucose levels can damage many body systems and cause major health problems [1-2].

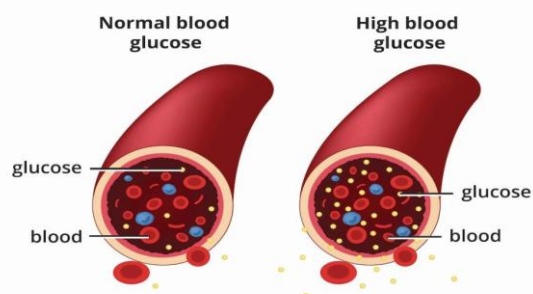


Figure 01: diabetes mellitus

THE PREVALENCE OF DIABETES

The most common world-wide disease is "diabetes". Affected are millions of people; the incidence is rising annually. Especially in developing countries, diabetes is

mostly caused by inadequate diet, insufficient physical activity, and obesity [2].

INDIA IS THE DIABETIC CAPITAL OF WORLD.

India is home to the world's second highest number of diabetic patients. Within the age group of 20–79 years, India has 74.9 million diabetics in 2021 projected to increase to 124.9 million by 2045 [3].

Type 1 Diabetes: it is less common and usually first presenting in infancy or early adulthood, for those with this type, the body stops producing insulin, which means lifetime insulin shots [4].

Type 2 diabetes: The most common variation of diabetes, which usually first shows up in adulthood. Usually from an unhealthy lifestyle, the body uses insulin wrongly. Gestational diabetes affects all pregnancy and increases the risk of later type 2 diabetes [5].

COMPLICATION RELATED TO DIABETES

Unchecked diabetes can cause raised blood glucose levels, which damages many different organs in the body. One could categorize these problems as either acute-short-term, or chronic- long-term [6].

Acute complications:

Diabetic ketoacidosis: It is life threatening condition. A vital disorder in which the body uses fat for energy, diabetic ketoacidosis (DKA) causes the accumulation of harmful acids in the bloodstream [7].

Hyperosmolar hyperglycemic: A dangerous condition marked by greatly raised blood glucose levels leading to dehydration and cognitive confusion is known as hyperosmolar hyperglycemic state (HHS) [8,10].

Hypoglycemia: Low blood sugar or hypoglycemia, can come from either too much or too little insulin used or from skipping a meal, causing vertigo, confusion, and perhaps coma [10].

Chronic complications:

Diabetes gradually affects small and major blood vessels, therefore affecting various organs.

Diabetic Retinopathy: Damage to the tiny blood vessels in the eyes causes diabetes to minor blood vessels, so resulting in blindness.

Diabetic Nephropathy: Renal failure can follow from improperly controlled diabetes.

Diabetic neuropathy: Particularly in the feet, nerve loss from diabetes can cause tingling, pain, or numbness [8].

Diabetic Cellulitis

Cellulitis is an acute bacterial infection of dermis and subcutaneous tissues, characterized by redness, swelling, warmth, and pain in the impacted area. Primarily caused by Streptococcus or Staphylococcus, it starts when germs-usually via a cut, wound, or bug bite-enter via a skin breach. Untreated, cellulitis can migrate to deeper tissues and possibly enter the bloodstream, causing major problems.

One form of cellulitis that affects persons with diabetes is diabetic cellulitis. Wounds and infections heal more slowly since diabetes can compromise the immune

system and result in impaired blood circulation. This increases diabetics' susceptibility to infections including cellulitis, particularly in their lower legs and feet. In severe circumstances, diabetic cellulitis can cause major consequences including abscesses, ulcers, or even the necessity for amputation if not controlled effectively. Early identification and treatment of cellulitis-especially in diabetics-are crucial in avoiding complications. Timeliness of medical action, blood sugar control, and good wound care assist limit and lower diabetic cellulitis risk.

AIM AND OBJECTIVES

Aim

Aim of the current study is to compare the efficacy of Magnesium Sulphate and Glycerin combination dressing versus normal limb elevation and use of compression bandage dressing in the management of diabetic cellulitis with regard to wound healing, infection control, pain, relief, and patient outcomes.

Objectives

1. To assess the healing time: Evaluate and compare the rate of healing in diabetic cellulitis patients treated with Magnesium Sulphate and Glycerin dressing versus limb elevation and use of compression bandages.
2. To compare infection control: Determine the effectiveness of both dressing methods in controlling and reducing the spread of infection.
3. To evaluate pain management: Analyses the difference in pain levels experienced by patients during the treatment course.
4. To study overall patient outcomes: Examine patient satisfaction, cost-effectiveness, and reduction in hospitalization or treatment duration between the two treatment methods.
5. To assess any complications: Identify and document any adverse effects or complications associated with each type of treatment.

MATERIALS AND METHODS

Study Design

A prospective, observational control study that include, controlled trial will be conducted to compare the efficacy of Magnesium Sulphate and Glycerine combination dressing with normal limb elevation and compression bandage dressing in diabetic cellulitis patients. The study will be conducted in a clinical setting over a period of 6 months.

Study Duration

The study was conducted for 6 months November 2024 to April 2025.

Study site

The present study, In-patients were selected from SURGICAL DEPARTMENT at AC SUBBA REDDY Government general hospital (GGH) a 1000 bedded tertiary care teaching hospital, NELLORE, Andhra Pradesh.

Study Population:

- Participants in the study are diabetic cellulitis, In-patients.
- This study focused on 60 people of the age above 18yrs in both genders

Inclusion criteria

- Adult patients (age above 18) diagnosed with diabetic cellulitis.
- Patients with well-controlled or moderately controlled diabetes (HbA1c < 9%).
- Presence of mild-to-moderate cellulitis without deep tissue involvement.
- Patients who give informed consent.

Exclusion criteria

- Patients with severe systemic infections or deep tissue involvement (e.g., abscesses, osteomyelitis)
- Patients allergic to magnesium sulphate or glycerine.
- Patients with poorly controlled diabetes (HbA1c > 9%).
- Pregnant or lactating women.
- Non diabetic cellulitis patients.

RESULTS

The results of the study are mentioned below
Incidence of age:

The age group in the study includes above 18 years.

8% - <40 years of age (5cases)

89% - 41 to 70 years of age (44 cases)

3% - >70 years of age (11 cases)

Table 01: Distribution of subjects according to Age

Age group in years	No. of subjects	Percentage
20-39	5	8%
40-59	29	49%
60-79	24	43%
>80	2	3%
Total	60	100

This study shows that subjects in the age group of 41 to 79years are most affected, 20 to 39 years are moderately affected, age group above 80 years are less affected.

Incidence of Gender:

Table 02: Distribution of subjects according to Gender

Gender	No. of subjects	Percentage
Female	27	45%
Male	33	55%
Total	60	100

This study shows those males are more affected than female with ratio of 9:11 in the subjects.

DISTRIBUTION INTO GROUPS:

Table 6.3: patients undergoing different kinds of dressing

Gender	Group A (Magnesium Sulphate and Glycerin combination dressing)	Group B (normal limb elevation and compression bandage dressing)
Female	14	13
Male	16	17
Total	30	30

Out of 60 patients, 30 patients underwent Magnesium Sulphate and Glycerin combination dressing, in that 16 were males and 14 were females. 30 patients underwent normal limb elevation and compression bandage dressing, in that 17 were males and 13 were females.

Signs of improvement:

This comparison of signs of improvement based on dressings Most common clinical manifestations are

1. Erythema
2. Oedema
3. Pain

Table 04: evaluation of erythema improvement based on dressing

Dressings	Group A (Magnesium Sulphate and Glycerin combination dressing)	Group B (normal limb elevation and compression bandage dressing)
1ST DRESSING	10 patients (33.33%)	8 patients (26.67%)
2ND DRESSING	8 patients (26.67%)	8 patients (26.67%)
3RD DRESSING	6 patients (20%)	8 patients (26.67%)
After 7 days	6 patients (20%)	6 patients (20%)

- On comparing of two groups, Group A was treated with Magnesium Sulphate and Glycerin combination dressing, while Group B was treated with normal limb elevation and compression bandage dressing.
- The findings were,
- After the first dressing, 10 patients (33.33%) in Group A showed improvement, whereas 8 patients (26.67%) in Group B showed improvement.
- After the second dressing, 8 patients (26.67%) in Group A and 8 patients (26.67%) in Group B showed improvement.

- After the third dressing, 6 patients (20%) in Group A and 8 patients (26.67%) in Group B showed improvement.
- After 7 days, 6 patients (20%) in both Group A and Group B showed improvement.

Table 05: evaluation of oedema improvement based on dressing

Dressings	Group A (Magnesium Sulphate and Glycerine combination dressing)	Group B (normal limb elevation and compression bandage dressing)
1ST DRESSING	8 patients (26.67%)	6 patients (20%)
2ND DRESSING	8 patients (26.67%)	8patients (26.67%)
3RD DRESSING	7 patients (23.33%)	7 patients (23.33%)
After 7 days	7 patients (23.33%)	9 patients (30%)

The comparison of two groups reflects that oedema improvement varied over time between the two treatment groups, with differences in effectiveness at each stage.

1. After the first dressing, improvement was observed in 8 patients (26.67%) in Group A and 6 patients (20%) in Group B.
2. Following the second dressing, 8 patients (26.67%) in Group A and 8 patients (26.67%) in Group B showed improvement.
3. During the third dressing, 7 patients (23.33%) in Group A and 7 patients (23.33%) in Group B demonstrated improvement.
4. After 7 days, oedema improvement was noted in 7 patients (23.33%) in Group A and 9 patients (30%) in Group B.
5. Thus, the comparison reflects that pain improvement varied over time between the two treatment groups, with differences in effectiveness at each stage.
6. After the first dressing, 11 patients (36.67%) in Group A and 6 patients (20%) in Group B showed improvement.
7. After the second dressing, 9 patients (30%) in Group A and 8 patients (26.67%) in Group B showed improvement.
8. After the third dressing, 6 patients (20%) in Group A and 7 patients (23.33%) in Group B showed improvement.
9. After 7 days, 4 patients (13.33%) in Group A and 9 patients (30%) in Group B showed improvement.

Table 07: mean HbA1c in both the study groups

Parameter	GROUP A	GROUP B
HbA1c	4.55 - 7.68	4.55 - 7.65
Mean HbA1c	6.1	6.1

The mean HbA1c in group A was 4.55 - 7.68 and in group B was 4.55 - 7.65

Length of stay in hospital (LOS)

Table 6.8: length of stay

	Minimum LOS	Maximum LOS	Average length of hospital stay (mean LOS)
Group A	7 days	12 days	9.5 days
Group B	10 days	25 days	17.5days

Group A had hospital stays ranging from 7 to 12 days (average 9.5 days), while Group B stayed longer, spanning 10 to 16 days (average 13 days).

DISCUSSION

Diabetes cellulitis remains a significant concern for diabetes individuals due to weakened immunity, poor circulation, and delayed wound healing.

In our prospective observational controlled study, we evaluated two therapy strategies: magnesium sulphate and glycerin combination dressing (MSGD) to normal limb elevation and compression bandage dressing (LECB), with the goal of determining their efficacy in diabetic cellulitis care.

Demographics

- The study population consisted of 60 patients , with a slight male predominance [55% male and 45% female]
- This indicates that males are more likely to develop diabetic cellulitis compared to females due to several physiological, hormonal and behavioral factors.
- Our study revealed that most subjects were in the age group of 41-70 years, highlighting that middle-aged and elderly individuals are particularly vulnerable to diabetic cellulitis. Age- related immune decline and prolonged diabetes duration could explain this distribution.

Clinical Manifestations

The common presenting features included erythema, oedema, and pain, which are classic signs of cellulitis. The severity of these symptoms varied among patients but was prominent in both groups at baseline. These symptoms also served as important markers to evaluate treatment progress.

Evaluation of Treatment Outcomes

- In our study, patients receiving the Magnesium Sulphate and Glycerin dressing demonstrated earlier symptomatic relief compared to the compression bandage group.
- Erythema Reduction: After the first dressing, Group A showed a higher improvement (33.33%) compared to Group B (26.67%). Over successive dressings, both groups showed improvements, but Group A demonstrated a faster initial response.
- Oedema Reduction: In the early phase (first dressing), Group A had better oedema control (26.67%) than Group B (20%). However, after 7 days, Group B showed slightly better results (30% vs 23.33%).
- Pain Relief: Group A again exhibited faster initial pain reduction (36.67% after first dressing) compared to Group B (20%). Nevertheless, by day 7, more patients in Group B reported pain improvement, possibly due to the sustained mechanical support offered by compression bandages.
- Hospital Stay: The average length of hospital stay was shorter for Group A (9.5 days) compared to Group B (17.5 days). A less hospital stay indicates quicker recovery, reduced hospital costs, and reduce the risks of hospital-acquired infections for patients treated with Magnesium Sulphate and Glycerin dressings.
- HbA1c Control: Only patients with well-controlled or moderately controlled diabetes (HbA1c < 9%) were included in this study. Both groups had identical mean HbA1c readings (approximately 4.55 - 7.68%). Poor glycemic management can delay wound healing and increase infections, hence eliminating patients with high HbA1c reduced bias. As a result, the differences in outcomes are likely attributable to the dressing methods rather than differences in diabetes severity.

CONCLUSION

Based on the findings of this study, it can be concluded that Magnesium sulphate and Glycerin combination dressing is better than Normal Limb elevation and compression bandaging dressing for reducing erythema in patients with diabetic cellulitis, by virtue of its hygroscopic action. In this study the overall length of hospital stay (LOS) was significantly less for patients treated with dressing. The findings of this study are also suggestive of the possible anti-inflammatory action of Magnesium sulphate and Glycerin combination dressing, as evidenced by lesser duration required for resolution of erythema and pain among diabetic cellulitis patients treated with modality and heal faster than Normal Limb elevation and compression bandaging dressing.

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CONFLICT OF INTEREST

Nil

INFORMED CONSENT

Not applicable

ETHICAL STATEMENT

Not Applicable.

AUTHOR CONTRIBUTION

All authors contributed equally towards the process.

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