International Journal of Experimental Biology
Website: http:ijeb.online Email: editor@ijeb.online
ISSN: 3104-3984 (Print), 3104-3992 (Online)

CLINICAL OUTCOMES AND POSTOPERATIVE COMPLICATIONS FOLLOWING SKIN GRAFTING IN PATIENTS WITH BURN INJURIES: A QUANTITATIVE STUDY AT CIVIL HOSPITAL HYDERABAD, PAKISTAN

Dr. Kashan Qayoom Shaikh[*1], Dr. Sadia Rasheed[2], Dr. Hira Sangrasi[3]

[*1]*Senior registrar Dept of Plastic and Reconstructive Surgery LUMHS Jamshoro*
[2]*Assistant Professor, Department of Plastic/ Reconstructive Surgery & Burns Unit, LUMHS, Jamshoro*
[3]*Consultant Plastic Reconstructive Burn Surgeon, Senior Women Medical Officer, LUMHS, Hyderabad*

[*1]kashan.shaikh@icloud.com, [2]drsadiarasheedlumhs13@yahoo.com, [3]hira.Sangrasi@yahoo.com

Article History

Received: January 29, 2026

Revised: February 27, 2026

Accepted: April 03, 2026

Available Online: June 30, 2026

Abstract

Background: Burn injuries frequently result in extensive tissue damage and may require surgical intervention to achieve wound closure and restore skin integrity. Skin grafting is an established treatment for deep burn injuries; however, postoperative complications, including infection, hematoma, seroma, delayed wound healing, and graft loss, may affect clinical recovery.

Objective: This study aimed to evaluate clinical outcomes and postoperative complications following skin grafting in patients with burn injuries at Civil Hospital Hyderabad, Pakistan. It also examined graft take percentage, patient and burn characteristics, surgical factors, hospital length of stay, and the need for additional surgical interventions.

Methods: A quantitative, prospective observational study was conducted among patients with burn injuries undergoing skin grafting at Civil Hospital Hyderabad. Data were collected using a structured clinical data collection questionnaire, medical records, operative notes, and postoperative assessments. Variables included demographic characteristics, comorbidities, total body surface area (TBSA), burn depth, injury mechanism, graft type, surgical preparation, graft take percentage, and postoperative complications. Only descriptive statistical analysis was performed using SPSS, because the final analyzed sample was very small (n = 4). Inferential tests were planned in the protocol but were not performed.

Results: Four patients were included, with a mean age of 18.50 ± 11.15 years and mean TBSA of 12.75 ± 2.99%. Flame burns accounted for 75.0% of cases. All patients underwent autologous split-thickness skin grafting with a mean graft take of 90% at postoperative day 5, achieving successful graft survival in all cases. Partial graft loss was documented in all patients, while no complete graft failure, surgical-site infection, hematoma, or seroma was documented. No patient required regrafting, and the mean post-grafting hospital stay was 1.75 ± 0.50 days.

Conclusion: The preliminary findings demonstrate the importance of systematic postoperative assessment of graft survival and complications among burn patients. Evaluation of a larger patient sample is necessary to determine complication rates and establish associations between patient-related, burn-related, and surgical factors and clinical outcomes. The study may provide locally relevant evidence to support improved postoperative monitoring and burn surgical care at Civil Hospital Hyderabad.

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

Keywords: Burn injuries; skin grafting; graft take; postoperative complications; split-thickness skin graft; graft failure; hospital stay; Pakistan

INTRODUCTION

Burn injuries are still a public health and clinical issue with the potential for a wide range of issues and consequences such as extensive tissue damage, long periods of hospitalization, disability, functional limitations and significant psychosocial and psychological impacts. The depth and extent of tissue damage, its anatomical location, the mechanism of the burn, and associated trauma and underlying health status are all factors that determine the severity of a burn. A substantial burn can necessitate the use of wound management techniques, surgical procedures, post-burn rehabilitation, and follow up care to cover the burned skin and maintain function. Burns are known to be a preventable cause of morbidity and mortality as stated by the World Health Organization (WHO) and the burden of burns is especially significant in low- and middle-income countries. In these environments, specialized treatment may be limited, presentation may be delayed, and first aid may be substandard and inadequate, as well as resources. These are challenges that make it crucial to measure treatment outcomes to enhance clinical practice and to use healthcare resources wisely (World Health Organization).

Skin grafting has been a tried and tested surgical method for the closure of burn wounds when spontaneous epithelialization is not likely to occur within a clinically acceptable time or early closure of the wound is clinically indicated. Split thickness skin grafting is a technique widely used in burn treatment because it allows the wounds on relatively large areas to be covered, while leaving the lower part of the dermis at the donor site. Selected wounds in which their characteristics and functional and/or cosmetic requirements justify their use may be candidates for full-thickness skin grafts. The type of graft chosen is related to the depth of the wound, its anatomical position, the amount of donor tissue available, the patient's condition and the goals of the reconstruction. The preparation of an appropriate wound bed, hemostasis, close apposition of the graft to the recipient site, and the development of appropriate blood supply are all important to a successful skin grafting. The initial plasmatic imbibition, inosculation and revascularization are responsible for graft survival. Any interference with these processes will lead to a loss of part or all of the graft. Graft adherence and healing can be compromised by factors like hematoma, seroma, infection, graft movement, lack of adequate wound bed vascularity and patient related risk factors.

The skin grafting technique is a definitive technique for wound coverage but recovery can be complicated. Complications after surgery include surgical site infection, hematoma, seroma, partial graft failure, total graft failure, delayed wound healing and donor site complications. These can range in severity from further dressings to antibiotic treatment, further surgery, extended hospital stays and impaired function. It is therefore important that these outcomes are properly documented to assess the effectiveness and safety of skin grafting in clinical practice.

Assessments of clinical outcomes should be based on explicit and repeatable assessment tools. An important outcome is the percentage of graft that is viable and sticks to the graft recipient wound at a defined time after surgery, called graft take. Graft take can be reported as a percentage of the grafted area. The distinctions between successful graft healing, partial graft failure, and total graft failure should be clearly differentiated to prevent misclassification of graft outcomes. Other outcomes that are relevant are time to wound closure, infection, reoperation, donor site healing, and hospital stay. It is important to take into account patient and injury characteristics when interpreting these results. Complexity of treatment may be related to burn depth and the effect total body surface area (TBSA) Tissue repair may be influenced by age, diabetes, anemia, nutritional status, smoking (if relevant) and other comorbidities. Healing also may be related to surgical conditions, such as the time elapsed between injury and grafting, preparation of the recipient site, graft type, graft anatomical location, and postoperative immobilization. These factors should be recorded systematically, so that the observed differences in outcomes can

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

be analyzed statistically using appropriate methods.

This is important in Pakistan because the referral system, availability of specialized treatments, the patient presentation, and access to follow-up after surgery, all of which can affect clinical outcomes, may be different. Evidence from hospitals can inform the ways in which complications occur in their own environment and not assume that findings from other healthcare systems are applicable to their local population. The proposed setting for the study of the outcomes after skin grafting among patients with burn injuries is Civil Hospital Hyderabad. A prospective quantitative study would enable the collection of standardized data about characteristics, burn severity, surgical treatment, postoperative outcome and complications of patients for a predetermined follow-up period from their enrolment. This method can be used to increase the consistency of outcome measurement compared to using only historical data, but the results obtained will depend on the quality of the recruitment, follow-up and clinical assessments In Pakistan, flame burns accounted for 58.32% of cases in a systematic review (Kausar et al., 2024), and children under 10 years were most affected in Hyderabad (Memon et al., 2023).

With this in mind the present study aimed to look into the clinical results and post-operative complications of skin grafting in burn patients at Civil Hospital, Hyderabad, Pakistan. The study will measure graft take, record complications, and evaluate some patient, injury and procedure-related factors to generate locally applicable evidence to support postoperative surveillance, audit and future research in burn surgery.

Problem Statement

Skin grafting plays a role in treating deep burns through surgery; however its results depend upon patients' condition, type of burn injury, preoperative preparation for bedside procedures, operative techniques used during operation as well as postoperative care. A wound infection, hematoma, seroma and graft loss may be some of them which could cause delays in recovery process and require additional treatment by doctors or surgeries. Postoperative evaluation by means of a systematic approach to assessing patients' health status after surgery was found through studies on burns, wound infections and graft failure rates.

While burn surgeries are becoming more effective today, their occurrence rate and severity can vary between different medical facilities. Other hospital data is not available for replication at Civil Hospital Hyderabad because there are differences between patients' characteristics, referrals, surgical facilities, wound care services and follow-up procedures.

Another problem is that standardized outcome definitions may not be used to document the success of a graft and its complications. If there is no consistent assessment of graft take-set, infection, wound healing, reoperation rates and hospital length of stay, it would be challenging to compare results for evaluating effectiveness; identifying which factors are modifiable by patients' actions; and assessing the quality of post-surgery care.

Therefore, this study aims at evaluating clinical results after skin grafts for burns by patients admitted from Civil Hospital Hyderabad and investigating if there are any relationship between selected patient related, burn related and surgical factors with those outcomes. This paper proposes a future research study to solve that issue through data collection. Standardized data at baseline, during surgery, and at predefined postoperative assessments. This paper does not assume any particular complication rates or graft success rates for hospitals. Instead of these results would be measured on an individual basis through a survey instrument for reporting purposes using appropriate descriptive as well as inferential statistics methods.

Research Objectives

1. To calculate the percentage of graft take at a predetermined postoperative evaluation.
2. To assess the percentage of patients with postoperative complications such as surgical-site infection, hematoma, seroma, and partial and total graft failure.
3. To outline clinical and demographic profile of skin grafting patients.
4. To analyze the relationships between patient factors, degree of burn, surgical factors, and graft results.

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

5. To determine the correlation between the length of stay in the hospital and postoperative complications.
6. To record the number of further surgical procedures (regrafting) if necessary.

Research Questions

What is the success rate for skin grafts among burn victims at Civil Hospital Hyderabad regarding percentage of graft take, incidence and types of post-burn surgical and non-surgical complications, demographics, medical history, burns characteristics and surgery details, length of hospitalization and additional surgeries needed because of graft loss or failure of wound healing.

1.2 Significance of the Study

This research could be useful to doctors for characterizing graft take and post-operative complications of burns patients treated at Civil Hospital Hyderabad, as well as serving as a reference point for clinical audits and future quality improvement programs. Documentation on graft loss, infections, hematomas, seromas and delayed wound healing can help to identify areas for further evaluation of wound care management such as wound prep techniques, dressings use during surgery and post-operative care. This paper will provide prospective clinical information on patients treated at a Pakistani hospital under standardized outcomes to enable comparison with future studies due to variations among patient groups, levels of burns, types of surgery performed and duration of follow-up period. Moreover, enhancing knowledge about surgical wound care could help decrease preventable complications and enhance recovery rates due to high incidence of burns that result in permanent disabilities, scars, functional impairments, and economic difficulties among patients. Lastly, these results could serve as a basis for further research on long-term effects such as scar quality, contracture, functional recovery, patient-reported outcomes, and cost of care that might need more extensive follow-up compared to this study.

1.3 Operational Definitions of Key Terms

The following definitions should be incorporated into the study protocol before recruitment begins. Where a definition is not universally standardized, the study-specific criterion should be agreed upon with the supervising surgeon and documented in advance.

Term	Operational definition for this study
Burn injury	Tissue injury caused by thermal, chemical, electrical, or other recognized burn mechanisms, as documented in the patient's clinical record.
Skin grafting	Surgical transfer of skin tissue to a prepared recipient wound. The graft type and whether the graft is autologous should be recorded.
Graft take	The proportion of the grafted recipient area that remains viable and adherent at the specified postoperative assessment, expressed as a percentage.
Successful graft take	For the primary analysis, a prespecified graft take of at least 90% at the designated assessment. This is a study-defined threshold, not a universal definition of success.
Partial graft loss	Loss of part, but not all, of the grafted area. The percentage of loss should be documented.
Complete graft failure	Failure of the entire graft to survive or provide viable coverage of the intended recipient area.
Surgical-site infection	Infection involving the surgical recipient or donor site, identified using prespecified clinical criteria and the applicable institutional or accepted surveillance definition.
Hematoma	Accumulation of blood beneath or around the graft or at the donor site, documented clinically or through investigation.

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

Seroma	Accumulation of serous fluid beneath or around the graft or at the donor site.
Delayed wound healing	Failure to achieve the protocol-defined wound-closure endpoint within the prespecified assessment period. The endpoint and time limit must be defined before recruitment.
Total body surface area (TBSA) burned	The percentage of body surface affected by burn injury, assessed and recorded by the treating team using an appropriate clinical method.
Length of hospital stay	The number of inpatient days from admission to discharge. Postoperative length of stay may additionally be measured from the grafting procedure to discharge.
Regrafting	A subsequent skin-grafting procedure performed because the original graft failed to provide adequate wound coverage.

A graft take should ideally be measured by means of an average rate and also as a yes/no result. It saves patient data while not depending solely upon an individual cutoff value. Standardized assessment date like postoperative day 5, if it is compatible with the hospital's dressing protocol, should be chosen by a surgeon. Wound healing assessment could also be done later for evaluating wound closure and complications over time. Postoperative graft take assessments and wound healing measurements are used for evaluating these results; however, there is a difference between them in terms of method and threshold values.

2: Literature Review

Burn injuries are a major public health concern as they can lead to severe wounds, amputations or blindness; long-term rehabilitation costs due to scarring, disfigurement of limbs and other complications like infections that may require additional surgeries. Burns are severe injuries that destroy a person's outer layer of skin which increases susceptibility to infections, dehydration and slow recovery from wounds. Surgical treatment is often needed for deep dermal and full-thickness burns because they need a procedure like skin grafts so that wounds can be closed out properly and skin health restored. A skin graft is done by transplanting healthy skin from an organ donor to a patient's surgical site. While it is a standard therapy for severe burns, success depends upon various factors such as patient health status, degree of injury, surgical procedures performed during surgery, preoperative wound management and post-operative care. Infection, hematoma, seroma, delayed healing and graft loss are complications that can adversely impact recovery rates and lead to more surgeries being required. Graft takes rate of patients related to burns surgery, patient related factors and surgical characteristics, post-operative complications, length of hospitalization, and other types of surgeries. This paper also addresses a research gap related to this proposal for study of Civil Hospital Hyderabad.

2.2 Burn Injuries and the Importance of Skin Grafting

Thermal, chemical, electrical, and radiation burns can occur due to burn injuries. Severity is determined by depth of burns, size of affected areas to skin surface area, anatomic site of injury and type of trauma involved. Superficial burns usually heal on their own while deep dermal and full thickness burn may need to be surgically removed from the body by a doctor for skin grafts. Burns are considered an important contributor to morbidity and mortality rates among people living in developing nations according to WHO. Limited access to specialized care, delayed presentation, and poor wound management can lead to higher rates of complications. Wound coverage is provided through skin grafts which are transferred from a healthy part of the body to an injured area. The split thickness skin grafts consist of the epidermis and part of the dermis, which is often used for treating burns as it covers a larger area than other types of grafts. Full-thickness skin grafts (FTSGs) contain the entire dermis and are generally used for selected smaller defects (Unal et al., 2005) Early excision and grafting may reduce the period during which wounds remain exposed and potentially decrease

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

hospitalization. However, the timing of surgery depends on patient stability, wound condition, burn severity, and available clinical resources (Awe, 2019).

2.3 Skin Graft Take and Successful Healing

Graft takes refers to the successful attachment and survival of transplanted skin at the recipient site. It is an important indicator of surgical effectiveness. Successful graft survival involves three biological stages: plasmatic imbibition, inosculation, and revascularization (Jeschke et al., 2020) These processes allow the graft to receive nutrients and establish a blood supply from the recipient wound bed. Successful graft take requires adequate blood circulation, proper wound preparation, stable graft fixation, and the absence of significant infection or fluid accumulation. Hematoma, seroma, excessive movement, and poor wound-bed vascularity may interfere with graft survival (Khalid et al., 2008) Graft take can be measured as a percentage of the transplanted area that remains viable:

$$\text{Graft Take (\%)} = \frac{\text{Total grafted area}}{\text{Area of viable graft}} \times 100$$

A higher percentage indicates better graft survival, whereas partial or complete graft loss indicates unsuccessful healing. Standardized assessment methods and follow-up periods are essential for accurately comparing graft outcomes (Pham et al., 2008)

2.4 Factors Associated with Graft Take

2.4.1 Patient-Related Factors

Tissue healing process may be affected by patient characteristics during surgery. Age matters as it affects circulatory system efficiency, immune function, and other health issues related to wounds. Diabetes mellitus and cardiovascular diseases are comorbidities that can lead to more severe complications. Nutrition also plays a role in this matter. Metabolic needs are increased due to burn injury; therefore, proper nutrition including proteins, calories and vitamins is required for healing tissues. (Memon et al., 2023). Body mass index and serum albumin are nutritional indicators that could give some insight into a patient's nutrition status; however, it should be taken with caution since inflammation and acute diseases might affect their levels. Birthday party for a 5-year-old girl is an excellent opportunity to celebrate her special day by having fun activities that are suitable for children of this age group (Farooq et al., 2011).

2.4.2 Burn-Related Factors

Burn severity is commonly assessed through total body surface area (TBSA), burn depth, anatomical location, and injury mechanism. Patients with extensive TBSA involvement may experience greater physiological stress, increased infection risk, and more complex surgical requirements Kausar, S., et al. (2024). Burn depth also influences graft outcomes. Deep dermal and full-thickness burns frequently require excision because the skin's natural regenerative structures may be severely damaged. (Hanson-Viana et al., 2024) Anatomical location can affect graft healing because different body regions experience different levels of movement, pressure, and mechanical tension. Burn mechanisms, including flame, scald, electrical, and chemical injuries, may produce different patterns of tissue damage. These characteristics can influence wound preparation and surgical complexity (Holm et al., 2024). A recent burn-patient cohort identified extensive TBSA involvement and other patient characteristics as important predictors of graft loss, highlighting the need to consider multiple factors when evaluating graft outcomes (Herndon, 2018).

2.5 Surgical Factors Influencing Graft Outcomes

2.5.1 Timing of Grafting

The timing of excision and grafting is an important consideration in burn management. Early excision removes damaged tissue and allows definitive wound coverage, potentially reducing prolonged wound exposure and hospitalization. However, delayed grafting may be necessary when patients are unstable or the recipient wound is unsuitable for surgery (Wong, L., Rajandram, R., et al. 2021). A 2026 systematic review and meta-analysis comparing early and delayed excision reported that early surgery was associated with shorter hospital stays, although differences in graft success were not statistically significant. This suggests that surgical timing should be considered alongside patient condition and wound characteristics Early excision has been associated with shorter hospital stay in meta-analyses (Ong et al., 2006;

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

Wong et al., 2021), although findings differ between low- and high-income settings.

2.5.2 Graft Type and Recipient-Site Condition

Graft choice is determined by wound size, anatomic site, degree of burns and availability at donor sites. Split thickness grafts are often used to treat large burns since they have a wider coverage area than other types of skin grafts. Thick full thickness grafts might be suitable for certain small lesions. Recipient site conditions are also very important. Sufficient blood flow, good granulation tissue formation, removal of dead cells and prevention from infections are necessary to provide an ideal condition for successful transplantation. Graft fixation proper and postoperative dressing management helps to prevent movement and fluid accumulation beneath the graft (Fabrini da Silva, J. P., et al. (2026).

2.6 Postoperative Complications Following Skin Grafting

Postoperative complications may reduce graft survival, delay healing, and increase treatment requirements. Infection: Burn wounds are vulnerable to bacterial colonization and infection because the skin's protective barrier is damaged. Infection may interfere with graft adherence and revascularization, potentially resulting in partial or complete graft loss. Wellkamp et al. (2023) examined the relationship between bacterial colonization and skin-graft loss, highlighting the importance of infection prevention Pathak, K. R., Basnet, S. J., & Rai, S. M. (2023). Hematoma and seroma: Hematoma refers to blood accumulation beneath the graft, while seroma involves the collection of serous fluid. Both may separate the graft from the recipient wound bed and interfere with nutrient exchange and revascularization Kinnunen, E., et al. (2026).

Delayed wound healing: Delayed healing may occur because of infection, poor circulation, inadequate nutrition, or an unsuitable recipient-site condition. It can increase treatment duration and delay recovery Saaiq, M., Zaib, S., & Ahmad, S. (2012). Donor-site complications: The donor area may develop infection, pain, bleeding, delayed epithelialization, or abnormal scarring. These complications should be considered when assessing the overall outcomes of skin grafting.

2.7 Hospital Stay and Additional Surgical Interventions

Length of hospital stay is an important indicator of treatment duration and healthcare utilization. Patients with successful graft healing and no significant complications may recover more quickly. However, infection, graft loss, delayed healing, and other postoperative complications may require additional monitoring, medication, dressing changes, and surgical treatment De La Tejera, G., Corona, K., Efejuku, T., et al. (2023). Graft loss may result in partial or complete failure of wound coverage. Depending on its severity, patients may require debridement, repeated wound management, or regrafting. These interventions can increase hospitalization and treatment costs. Hasan, R. A. (2026). Research examining early and delayed burn excision has also identified hospital stay as an important outcome, suggesting that surgical timing and postoperative recovery are closely related. Therefore, evaluating complications alongside hospital stay and reoperation can provide a broader understanding of clinical outcomes following skin grafting.

2.8 Research Gap

While there are some studies on burn management, surgical excision, graft survival, and postoperative complications; however, there is still a lot of work to be done. Initially, most research is concerned with general burn outcomes like mortality and infections instead of joint evaluation of graft take percentage, graft loss rate, and postoperative complications. Secondly, there is a need for more research on how patients' related factors, burns and surgeries affect graft survival rates at various hospitals. Age, comorbidities, TBSA, burn depth, graft type and timing of surgery may have different effects on patients' outcomes. Thirdly, postoperative complications are not always studied for their impact on length of stay and rate of further surgeries. A comprehensive evaluation of these results can be useful for medical purposes. In conclusion, there are few studies on this topic about skin grafts done by public sector hospitals like Civil Hospital Hyderabad. Variations among patients'

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

demographics, availability of surgical facilities for surgery; sanitation procedures during operations; and postoperative care are all reasons why a study should be done locally. Thus, this research aims to fill those gaps through quantitative analysis of graft take rate, post-operative complications, related patient characteristics such as age and gender, burns history and type of surgery performed; duration of hospitalization period and requirement for further surgeries on burn victims who are being treated with skin grafts at Civil Hospital Hyderabad, Pakistan.

Conceptual Framework

The study proposes that patient characteristics, burn characteristics, and surgical factors may be associated with postoperative graft outcomes. Postoperative complications will also be assessed in relation to hospital stay and additional surgical intervention.

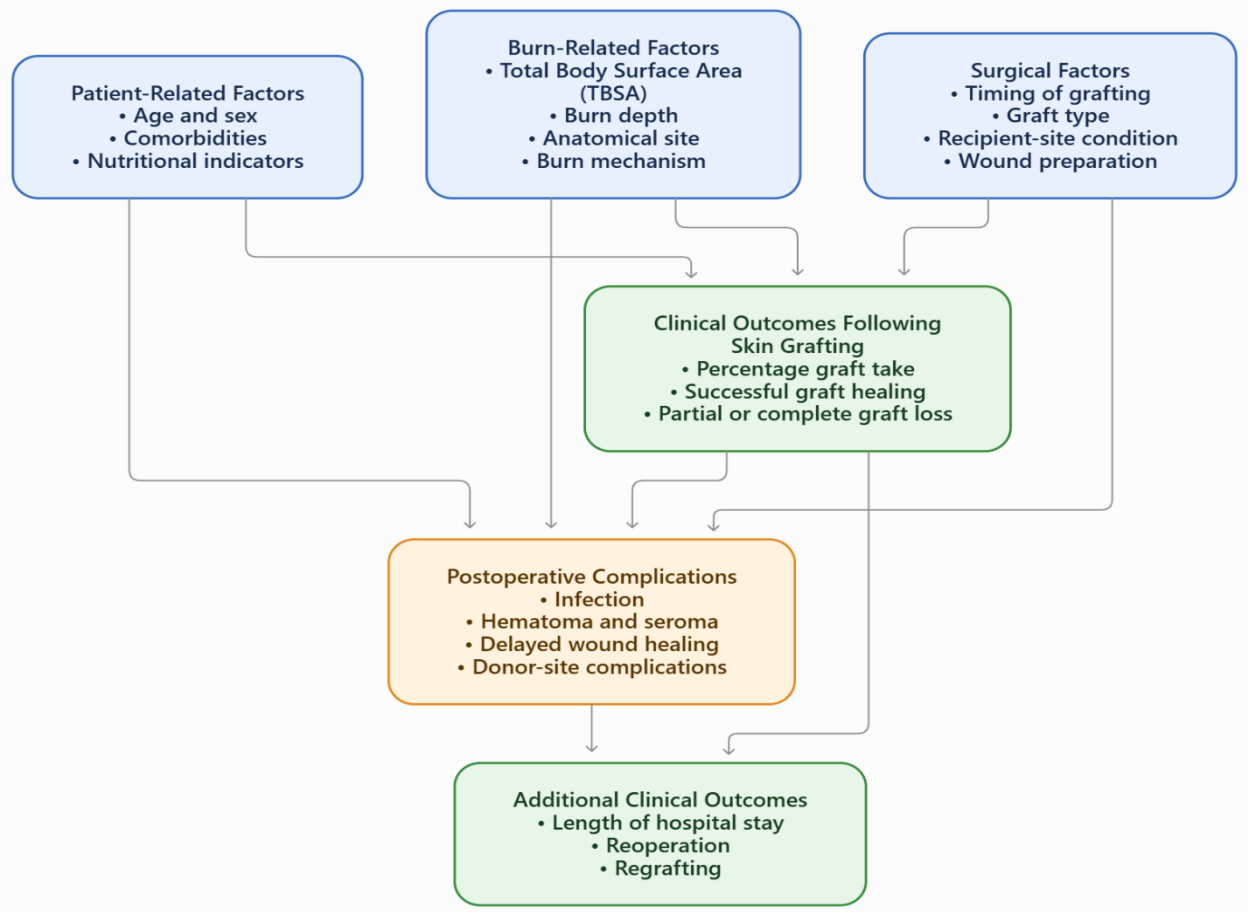


Figure 1. Conceptual Framework of Factors Associated with Clinical Outcomes and Postoperative Complications Following Skin Grafting in Patients with Burn Injuries.

3. Research Methodology

This research was conducted as an experimental study on clinical results and post-operative complications of burn victims who underwent skin grafts from Civil Hospital Hyderabad, Pakistan. The data was obtained from surveys of patients' health status, hospitalization history, physician's notes and post-operative evaluation reports. This research is concerned with graft take rate, post-operative complications, related to patients' health status, burns, surgeries; duration of hospitalization and requirement for further surgery procedures.

3.1 Research Design

A hospital-based prospective observational design was employed to assess clinical outcomes following skin grafting. Patients were monitored from the time of surgery through postoperative assessments to evaluate graft survival, complications, healing progress, and additional surgical interventions.

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

3.2 Study Setting and Population

The study was conducted at Civil Hospital Hyderabad, Pakistan, in the relevant burn and surgical departments. The study population consisted of patients with burn injuries who underwent skin grafting during the study period. Participants were identified through hospital admission records, surgical registers, and operative documentation.

3.3 Sample Size and Sampling Technique

The present paper reports a preliminary descriptive analysis of the first four recruited patients (n = 4). No formal sample-size target is claimed for this preliminary analysis. Consecutive sampling was used to recruit all eligible patients until the required sample size was achieved. An allowance was included for incomplete records and potential loss to follow-up.

3.4 Inclusion and Exclusion Criteria

The study included male and female patients with burn injuries who underwent skin grafting at Civil Hospital Hyderabad and had provided informed consent. Patients undergoing grafting for non-burn injuries, those with incomplete essential clinical records, and those transferred before the required postoperative assessment were excluded. Patients who declined or withdrew consent were also excluded.

3.5 Data Collection Procedure and Instrument

Data were collected using a structured questionnaire and clinical assessment form. Information included demographic characteristics, comorbidities, nutritional indicators, TBSA, burn depth, anatomical site, and injury mechanism. Surgical details included grafting time, graft type, recipient-site condition, and wound preparation.

Postoperative assessments documented graft survival, healing progress, and complications. Graft take was assessed according to clinical protocols, preferably on postoperative days 5–7. Complications and additional surgical procedures were recorded throughout the follow-up period. The data collection instrument was reviewed by relevant experts and pilot-tested before implementation.

3.6 Study Variables and Measurement

Independent variables included patient-related factors (age, sex, comorbidities, and nutritional status), burn-related factors (TBSA, burn depth, anatomical site, and injury mechanism), and surgical factors (grafting time, graft type, recipient-site condition, and wound preparation). Secondary outcomes included successful graft healing, partial or complete graft loss, infection, hematoma, seroma, delayed wound healing, and donor-site complications. Length of hospital stay, reoperation, and regrafting were also assessed.

Variable category	Variables	Measurement
Patient-related factors	Age, sex, comorbidities, nutritional indicators	Years, categories, clinical records
Burn-related factors	TBSA, burn depth, anatomical site, mechanism	Percentage, clinical classification, categories
Surgical factors	Timing, graft type, recipient-site condition, wound preparation	Clinical and operative records
Primary outcome	Graft take	Percentage of viable graft area
Secondary outcomes	Successful healing, partial or complete graft loss	Clinical assessment
Postoperative complications	Infection, hematoma, seroma, delayed healing, donor-site complications	Presence or absence and complication type
Additional outcomes	Hospital stay, reoperation, regrafting	Number of days and frequency

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

3.7 Data Analysis

Data was coded, entered, cleaned, and analyzed by means of SPSS. Frequencies, percentages, mean values and standard deviation are descriptive statistics that help describe patients' characteristics such as severity of burns; surgery details like type and duration; graft take rate; and post-operative complication rates. Descriptive statistics is given here. The chi-square test of independence, t-test, and regression analysis were specified by this paper; however they are NOT done due to a small sample size. No p-values are reported. To find out what causes graft failure rates, complications of transplantation, success rate for transplanted organs, and length of hospitalization. The following is a list of some of the most common types of tests used for testing software development life cycle models.

3.8 Ethical Considerations

The ethical clearance was obtained by an appropriate institution's ethics board. Committee name, approval number and date of [author] along with administrative permission from Civil Hospital Hyderabad. Informed written consent was given by participants or their legal guardians. Voluntary participation was ensured by using unique identifiers for anonymity purposes. The patient data is kept safe to be used as a source of information for studies. This research was done without interfering on routine care and clinical decision-making process.

RESULTS AND FINDINGS

Table 1. Patient-wise Demographic Characteristics, Burn Details, and Clinical Outcomes (n = 4)

Variable	P1	P2	P3	P4
Age / Sex	18/F	28/M	25/F	3/M
Residence	Rural	Rural	Rural	Urban
Mechanism of Injury	Flame	Electrical	Flame	Flame
TBSA (%)	16	9	12	14
Burn Depth	Mixed	Mixed	Mixed	Deep partial-thickness
Site Grafted	Upper limb	Hand/Foot	Lower limb	Lower limb
Pre-graft Culture	Pseudomonas	Staphylococcus	Klebsiella	Pseudomonas
Injury-to-Graft Interval (days)	8	20	10	39
Graft Take (POD-5)	90%	90%	90%	90%
Post-graft Hospital Stay	2 days	2 days	1 day	2 days

Abbreviations: **TBSA = Total Body Surface Area; POD-5 = Postoperative Day 5; F = Female; M = Male.**

Note: Patient-wise findings are presented descriptively. All four patients demonstrated 90% graft take on postoperative day 5, with post-graft hospital stays ranging from 1 to 2 days.

Table 2. Demographic and Burn Characteristics of Patients (n = 4)

Variable	Mean ± SD / n (%)
Age (years)	18.50 ± 11.15
Range	3–28
Median	21.5
Sex	
Female	2 (50.0%)
Male	2 (50.0%)
Residence	
Rural	3 (75.0%)
Urban	1 (25.0%)
Mechanism of Injury	
Flame	3 (75.0%)

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

Electrical	1 (25.0%)
Total Body Surface Area (TBSA %)	12.75 ± 2.99
Range	9–16
Median	13.0
Burn Depth	
Mixed	3 (75.0%)
Deep partial-thickness	1 (25.0%)
Pre-graft Wound Infection	
Yes	4 (100%)
Graft Type	
Autologous Split-Thickness Skin Graft (STSG)	4 (100%)
Wound Preparation	
Excision / Debridement	4 (100%)
Injury-to-Graft Interval (days)	19.25 ± 14.17
Range	8–39
Median	15.0

Table 3. Clinical Outcomes and Postoperative Complications (n = 4)

Clinical Outcome / Complication	N	%
Graft Outcomes		
Mean Graft Take (%) ± SD	90.0 ± 0.0	–
Successful Graft Take (≥90%)	4	100
Partial Graft Loss	4	100
Complete Graft Failure	0	0
Postoperative Complications		
Surgical Site Infection (Recipient Site)	0	0
Donor-site Infection	0	0
Hematoma	0	0
Seroma	0	0
Delayed Wound Healing	0	0
Unplanned Return to Theatre	0	0
Regrafting Required	0	0
Discharge Outcomes		
Wound Healed / Closed at Discharge	4	100
Discharged Home	4	100

There are four cases where there is a burn injury to be treated by skin grafts for these studies. Mean age of patients is 18.5±11.15 years (range 3-28 years) where there are equal numbers of female and male patients at 50% each. The majority of patients were from rural areas (75.0%). Burns of flame are more frequent than those caused by electricity at 75.0% while electrical burns account for 25.0%. Mean TBSA burned is 12.75 ± 2.99%, range 9-16%. Mixed depth burns are present for 75.0% of cases. There is a pre-grafting wound infection for all

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

four patients (100%) where Pseudomonas, Staphylococcus and Klebsiella were found from their wounds. Autologous split thickness skin grafts were performed on all patients following excision/debridement procedures. Mean time between injury and grafting is 19.25±14.17 days (range 8-39 days).

Mean graft take at postoperative day 5 was 90.0±0.0%, and all four patients (100%) had a successful graft survival rate according to this definition of ≥90% graft take. All four patients had partial graft loss (100%) but no complete graft failure. There were no cases of surgical site infections, donor site infections, hematomas or seromas reported by patients with complete complications. There was no need for any surgery or unexpected return to the operating room by a patient. Patients left at home had healed/closed wounds. Mean post-grafting hospital stay is 1.75 ± 0.50 days.

5.1 Discussion

This paper is about evaluating clinical results and post-operative complications from skin grafts on four patients who had burns at Civil Hospital Hyderabad. Mean graft take of 90% at postoperative day 5 and 100% successful graft survival indicate that autologous split-thickness skin grafting (STSG) is still an effective method for wound coverage by burn patients even in a resource-limited setting.

This research showed that the demographics are similar to those who suffer from burns at low and middle income levels. Mean age is 18.5±11.15 years; flame burns account for 75%. It aligns with WHO that flame burns are among the most common causes of burn related morbidity, especially at home. The predominance of rural patients (75.0%) in this study might be due to differences in exposure to open flame, cooking practices and access to early burn care; however, it is not possible to confirm that without a larger sample size.

Mean TBSA is 12.75 ± 2.99% for this study which indicates moderate burns. Patients were treated with excision/debridement followed by STSG because it is a standard treatment method for deep partial thickness and full-thickness burns when there is no chance of spontaneous healing that would lead to poor functional and cosmetic results.

Pre-grafting wound infections were found to be present in all four cases at 100% with Pseudomonas, Staphylococcus and Klebsiella identified from cultures. It is clinically significant as it shows that there is an association between bacterial wound colonization and higher rates of graft failure. According to Wellkamp et al., there is an association between bacterial wound colonization and skin graft failure among burn victims; hence proper preoperative wound management should be done before performing a skin graft procedure. Despite being completely infected before surgery by 100%, all of them had a success rate of 90% for grafts. It might be because of this that excision/debridement before grafting helps lower bacteria levels enough for successful grafts. Nevertheless, the complete absence of any tissue damage (100%) from this specimen indicates that an existing infection might be responsible for partial loss despite good overall graft survival rates.

There was partial graft loss for all patients but there were no cases of complete graft failure, surgical site infections, hematomas, or seromas. High rate of partial loss but no complete failure indicates that grafting was largely successful in providing coverage, but not without minor losses. A partial loss could be due to several reasons such as pre-graft infections, poor wound bed condition, inadequate graft adherence, improper dressing techniques and lack of proper post-operative care. Small areas of partial loss usually heal by secondary intention without needing a graft according to our findings here where none were needed for regrafting.

There was no postoperative surgical site infection, hematoma, or seroma found on this specimen which is good news. This is an example of good operative technique, proper haemostasis management and suitable post-operative wound care. Nevertheless, because there is a very small sample size, its lack of complication does not mean that it has no risks at all. There is a need for more research on estimating actual complication rates.

Mean post-surgical hospitalization duration of 1.75 ± 0.50 days is relatively short. It might be due to early release from surgery on postoperative day 5, stable wound condition, and hospital discharge policies. A short post-graft stay might help reduce hospital costs and

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

workloads; however, proper monitoring is necessary for detecting late complications like delayed healing or donor site failure. All patients were discharged home with healed/closed wounds at last assessment, and follow-up was reported as completed.

Mean time between injuries and grafts is 19.25±14.17 days (range 8-39 days). Delayed grafting might be due to delayed diagnosis, need of wound care management, infections control and operating room availability. Although delayed grafting was unsuccessful for this case, early grafting following proper wound care tends to be better because it reduces infection rates, length of stay at the hospital, and scar formation. As per other studies on this topic, wound infections, high TBSA and electrical burns are predictors for graft failure.

5.2 Limitations

There are some limitations to this research paper. Firstly, there were few samples to work with so we had to present only descriptive statistics rather than an inference test. Secondly, there are some complications that were not recorded on this form (ND), especially regarding delayed wound healing, which limits a comprehensive evaluation of these issues. Thirdly, graft take was recorded as a single percentage value at postoperative day 5; however, long-term outcomes like scar quality, contracture, functional outcome and patient satisfaction were not evaluated. Fourth, it is an individual centre study conducted by us at Civil Hospital Hyderabad which might not represent what happens elsewhere.

5.3 Recommendations

According to these results, we suggest optimizing wound culture and infection control prior to grafting; ensuring comprehensive documentation of all complications such as delayed healing within the proforma; extending follow-up for evaluating long-term functional and cosmetic outcomes; and conducting more extensive research with a larger sample size and pre-calculated sample size for comparing outcomes based on TBSA, burn depth, infection status, and timing of grafting.

6. Conclusion

In this preliminary analysis of four burn patients, autologous split-thickness skin grafting was found to be effective, with a mean graft take of 90% and successful graft survival in all patients. Partial graft loss was common but did not lead to complete graft failure or need for regrafting. No surgical-site infection, hematoma, seroma, or unplanned return to theatre was documented. Pre-grafting wound infection was present in all patients, highlighting the importance of wound preparation and infection control. These findings support the continued use of STSG for burn wound coverage, while emphasizing the need for larger studies to confirm complication rates and identify predictors of graft loss.

References

Abdulmughni, L. A., Al-Sanabani, J. A., Gilan, W. M., Issa, M. A., & Jowah, H. M. (2025). Split-thickness skin graft outcomes and associated risk factors in patients with skin defects at Al-Gumhouri Hospital, Sana'a, Yemen: A prospective observational study. BMC Surgery, 25, 292. https://doi.org/10.1186/s12893-025-02867-9

academic.oup.comWorld Health Organization. (2023, October 13). Burns [Fact sheet]. https://www.who.int/news-room/fact-sheets/detail/burns who.intYeh, J.-P., & Lin, K.-C. (2025). Comparison between artificial dermis with split-thickness skin graft and full-thickness skin graft for reconstruction of joint-involved burn wounds: A retrospective review from a tertiary burn centre. International Wound Journal, 22(1), e70116. https://doi.org/10.1111/iwj.70116

Alsaif, A., Karam, M., Hayre, A., Abul, A., Aldubaikhi, A., & Kahlar, N. (2023). Full thickness skin graft versus split thickness skin graft in paediatric patients with hand burns: Systematic review and meta-analysis. Burns, 49(5), 1017–1027.

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

https://doi.org/10.1016/j.burns.2022.10.001

American Burn Association. (n.d.). Burn incidence and treatment in the U.S.: Fact sheet. https://ameriburn.org/who-we-are/media/burn-incidence-fact-sheetAsh, A., et al. (2024). Tumescent technique for split-thickness skin graft donor sites: A systematic review of randomized controlled trials. Journal of Plastic, Reconstructive & Aesthetic Surgery, 90, 292–304. https://doi.org/10.1016/j.bjps.2024.01.009

Awe, O. O. (2019). A prospective study comparing polyurethane film dressing with petroleum gauze dressing on split thickness skin graft donor sites in suburban hospital in Nigeria. Global Journal of Medical Research, 19(1), 1–8.

Burn Epidemiology — PakistanKausar, S., et al. (2024). A systematic review on epidemiology of burns in Pakistan. Journal of Islamabad Medical & Dental College, 13(2), 375–381. https://doi.org/10.35787/jimdc.v13i2.1049

Burn epidemiology and outcome disparities: A study of patients hospitalized with burns in Pakistan. (2026). Advances in Skin & Wound Care. https://doi.org/10.1097/ASW.0000000000000490

De La Tejera, G., Corona, K., Efejuku, T., et al. (2023). Early wound excision within three days decreases risks of wound infection and death in burned patients. Burns, 49(8), 1816–1822. https://doi.org/10.1016/j.burns.2023.06.003

Fabrini da Silva, J. P., et al. (2026). Risk factors for skin graft loss in burn patients: A six-year cohort study in non-intensive care unit settings. Burns, 52(5), 108002. https://doi.org/10.1016/j.burns.2026.108002

Farooq, U., Nasrullah, M., Bhatti, J. A., Majeed, M., Hanif, M., & Khan, J. S. (2011). Incidence of burns and factors associated with their hospitalisation in Rawalpindi, Pakistan. Burns, 37(3), 535–540. https://doi.org/10.1016/j.burns.2010.10.00914.

General Burn Care / OutcomesPham, T. N., Cancio, L. C., & Gibran, N. S. (2008). American Burn Association practice guidelines: Burn shock resuscitation. Journal of Burn Care & Research, 29(1), 257–266. https://doi.org/10.1097/BCR.0b013e31815f3876

Hanson-Viana, E., Rojas-Ortiz, J. A., Rendón-Medina, M. A., & Luna-Zepeda, B. L. (2024). Bacterial fluorescence imaging as a predictor of skin graft integration in burn wounds. Burns, 50(7), 1799–1811. https://doi.org/10.1016/j.burns.2024.04.003

Hasan, R. A. (2026). Early versus delayed excision and grafting in deep burns: Impact on healing time and hospital stay. Journal of Medical and Health Studies, 7(7), 129–134. https://doi.org/10.32996/jmhs.2027.7.7.1513.

Herndon, D. N. (Ed.). (2018). Total burn care (5th ed.). Elsevier.

Holm, S., et al. (2024). Is the preoperative wound culture necessary before skin grafting minor burns? A pilot study in a low resource setting burn service. Journal of Burn Care & Research, 45(5), 1281–1286. https://doi.org/10.1093/jbcr/irae04812.

Infection, Haematoma / Seroma, Donor SiteUnal, S., Ersoz, G., Demirkan, F., Arslan, E., Tütüncü, N., & Sari, A. (2005). Analysis of skin-graft loss due to infection: Infection-related graft loss. Annals of Plastic Surgery, 55(1), 102–106. https://doi.org/10.1097/01.sap.0000164530.39812.e6

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.

Jeschke, M. G., et al. (2020). Burn injury. Nature Reviews Disease Primers, 6, 11. https://doi.org/10.1038/s41572-020-0145-5

Khalid, K., Tarar, M. N., Mahmood, F., Malik, F. S., Mehrose, M. Y., & Ata-ul-Haq. (2008). Scalp as a donor site for split thickness skin grafts. Journal of Ayub Medical College Abbottabad, 20(1), 55–57.15.

Kinnunen, E., et al. (2026). Baseline risk factors for split-thickness skin graft failure: A retrospective cohort study. Scandinavian Journal of Surgery, 115(2), 194–202. https://doi.org/10.1177/14574969261416624

Memon, J. U. Q., et al. (2023). Medicolegal aspect analysis of burn cases in Liaquat University Hospital, Hyderabad. Journal of Islamabad Medical & Dental College, 12(1), 45–52. https://doi.org/10.35787/jimdc.v12i1.873

Pathak, K. R., Basnet, S. J., & Rai, S. M. (2023). Outcome of early excision versus delayed excision and grafting in burn less than twenty percent body surface area. Journal of Nobel Medical College, 12(2), 66–69. https://doi.org/10.3126/jonmc.v12i2.61347

Radzikowska-Büchner, E., Łopuszyńska, I., Flieger, W., Tobiasz, M., Maciejewski, R., & Flieger, J. (2023). An overview of recent developments in the management of burn injuries. International Journal of Molecular Sciences, 24(21), 16357. https://doi.org/10.3390/ijms242116357

Saaiq, M., Zaib, S., & Ahmad, S. (2012). Early excision and grafting versus delayed excision and grafting of deep thermal burns up to 40% total body surface area: A comparison of outcome. Annals of Burns and Fire Disasters, 25(3), 143–147.

Timing of Excision / GraftingOng, Y. S., Samuel, M., & Song, C. (2006). Meta-analysis of early excision of burns. Burns, 32(2), 145–150. https://doi.org/10.1016/j.burns.2005.09.005

Wellkamp, L., Obed, D., Enechukwu, A. O. M., Bingoel, A. S., Dastagir, K., & Vogt, P. M. (2023). Correlation between bacterial wound colonization and skin-graft loss in burn patients. Journal of Burn Care & Research, 44(3), 649–654. https://doi.org/10.1093/jbcr/irac129

Wong, L., Rajandram, R., et al. (2021). Systematic review of excision and grafting in burns: Comparing outcomes of early and late surgery in low and high-income countries. Burns, 47(6), 1245–1255. https://doi.org/10.1016/j.burns.2020.12.008

Yusuf, M., et al. (2024). Is the preoperative wound culture necessary before skin grafting minor burns? A pilot study in a low resource setting burn service. Journal of Burn Care & Research, 45(5), 1281–1286. https://doi.org/10.1093/jbcr/irae048

Zuo, K. J., et al. (2023). Incidence and risk factors associated with microbial colonization of burn wounds: An observational study. Plastic Surgery, 33(2), 269–275. https://doi.org/10.1177/22925503231214760

Copyright©2026. This work is licensed under a Creative Common Attribution 4.0 International License.