E-ISSN: 2616-3470
P-ISSN: 2616-3462
Impact Factor (RJIF): 5.97

www.surgeryscience.com
2025; 9(3): xx-xx
Received: 07-07-2025
Accepted: 11-08-2025

Dr. Surendra Parsad Yadav
Plastic Surgery, Kirtipur Hospital, Kirtipur, Nepal

Dr. Kiran K Nakarmi
Plastic Surgery, Kirtipur Hospital, Kirtipur, Nepal

Dr. Sushant Rai
Plastic Surgery, Kirtipur Hospital, Kirtipur, Nepal

Dr. Bishal Karki
Plastic Surgery, Kirtipur Hospital, Kirtipur, Nepal

Dr. Shankar M Rai
Plastic Surgery, Kirtipur Hospital, Kirtipur, Nepal

Dr. Babita Yadav
Medical Officer, Kirtipur Hospital, Kirtipur, Nepal

Corresponding Author:
Dr. Surendra Parsad Yadav
Plastic Surgery, Kirtipur Hospital, Kirtipur, Nepal

Toxic shock syndrome in burn patients: An observational study of causative factors and clinical management at Kirtipur hospital, Nepal

Surendra Parsad Yadav, Kiran K Nakarmi, Sushant Rai, Bishal Karki, Shankar M Rai and Babita Yadav

DOI: https://www.doi.org/10.33545/surgery.2025.v9.i3.B.1241

Abstract
Background: Toxic Shock Syndrome (TSS) is a rare but life-threatening complication in burn patients, characterized by fever, hypotension, rash and multi-organ involvement. Despite advancements in burn care, early recognition and effective management of TSS remain challenging, particularly in resource-limited settings.
Objectives: This study aimed to identify the causative factors of TSS among burn patients and to evaluate the clinical management strategies and outcomes at Kirtipur Hospital, Nepal.
Methods: An observational study was conducted on burn patients admitted to Kirtipur Hospital. Data were collected through clinical examination, patient records and laboratory investigations. Key variables included demographic characteristics, total body surface area (TBSA) involvement, post-operative graft take, infection patterns and clinical outcomes. Inferential statistics, including chi-square test, correlation analysis and Wilcoxon signed-rank test, were applied for data analysis.
Results: The study revealed that higher TBSA burns were significantly associated with increased risk of TSS. The mean graft takes remained stable at 95% from the first dressing to the seventh day, with no statistically significant difference (Wilcoxon signed-rank test, $p>0.05$). Clinical criteria for TSS were observed in a subset of patients, with *Staphylococcus aureus* identified as the predominant causative organism. Early diagnosis and prompt administration of antibiotics, along with fluid resuscitation and supportive care, contributed to favorable outcomes in most cases. Over a two-year period (2023-2024), all patients (100%) diagnosed with TSS succumbed to the condition, underscoring the fatal nature of the syndrome when not identified and treated promptly.
Conclusion: TSS in burn patients poses a major clinical challenge, requiring rapid recognition and aggressive management. The findings highlight the importance of routine monitoring, strict infection control practices and timely interventions to reduce morbidity and mortality. Further multicentric studies are recommended to strengthen evidence-based guidelines for TSS management in burn care settings.

Keywords: Toxic shock syndrome, burn patients, clinical management, graft take, Kirtipur hospital, Nepal

Introduction
Burn injuries are among the most devastating forms of trauma, often leading to complex physiological derangements, prolonged hospitalization and heightened vulnerability to infectious complications. The disruption of the skin barrier a primary defines mechanism against microbial invasion combined with the immunosuppressive effects of extensive burns, creates an ideal environment for opportunistic pathogens. One of the rare but potentially fatal complications in such patients is Toxic Shock Syndrome (TSS**)**, a severe, acute, toxin-mediated illness characterized by fever, hypotension, multiorgan dysfunction and a diffuse erythematous rash. Originally described in the late 1970s, TSS was primarily associated with *Staphylococcus aureus* and later with *Streptococcus pyogenes*. In the context of burn injuries, the condition is typically linked to colonization or infection by toxigenic strains of these bacteria, which release superantigens such as toxic shock syndrome toxin-1 (TSST-1) or streptococcal pyrogenic exotoxins that trigger an overwhelming immune response. The resulting cytokine storm leads to capillary leak, systemic inflammation and rapid progression to shock, making early recognition and intervention critical for survival. Early diagnosis and prompt treatment are crucial for improving outcomes in TSS. Diagnostic criteria for TSS have been established by the

Centres for Disease Control and Prevention (CDC), but these criteria may need to be adapted for the burn patient population, considering the unique clinical context. Diagnostic workup typically involves blood cultures to identify the causative organism, as well as laboratory tests to assess organ function and rule out other potential causes of systemic illness. Toxic Shock Syndrome (TSS) was first recognized in the late 1970s as a distinct clinical entity characterized by high fever, hypotension, rash and multi-organ involvement. The earliest comprehensive description came from Todd *et al*. in 1978, who reported a cluster of cases in paediatric patients caused by *Staphylococcus aureus* producing toxic shock syndrome toxin-1 (TSST-1). The condition gained significant public attention in the early 1980s when an outbreak occurred among menstruating women using highly absorbent tampons, prompting widespread epidemiological studies and changes in manufacturing practices. In the context of burn injuries, TSS has been documented as a severe, though relatively uncommon, complication. Burn wounds create an ideal environment for colonization and proliferation of toxin-producing bacteria, primarily *S. aureus* and *Streptococcus pyogenes*. The breakdown of the skin barrier, immune suppression following major burns and delayed wound closure contribute to the increased risk of toxin-mediated systemic illness in these patients. The literature from the 1980s and 1990s highlighted sporadic cases of burn-related TSS, often in paediatric populations, underscoring its potential for rapid deterioration and high mortality if unrecognized. Diagnostic criteria for TSS were formalized by the Centres for Disease Control and Prevention (CDC) in the early 1980s, providing a standardized framework for clinical and epidemiological investigations. Advances in microbiology have since identified multiple exotoxins TSST-1, staphylococcal enterotoxins and streptococcal pyrogenic exotoxins as key mediators of the syndrome. Despite improvements in burn care, surgical debridement techniques and antimicrobial therapy, the rapid onset and multisystem impact of TSS remain significant challenges in burn units worldwide. In Nepal, there is limited published data on TSS in burn patients, despite burns being a common cause of hospitalization, especially among children. Kirtipur Hospital, a national referral centre for burn care, manages a high caseload of acute burns, offering a unique opportunity to observe the incidence, risk factors and clinical management strategies for TSS in this patient population. This study builds on both global and local knowledge gaps, aiming to better characterize the epidemiology, causative factors and outcomes of TSS in burn patients within the Nepalese healthcare setting.

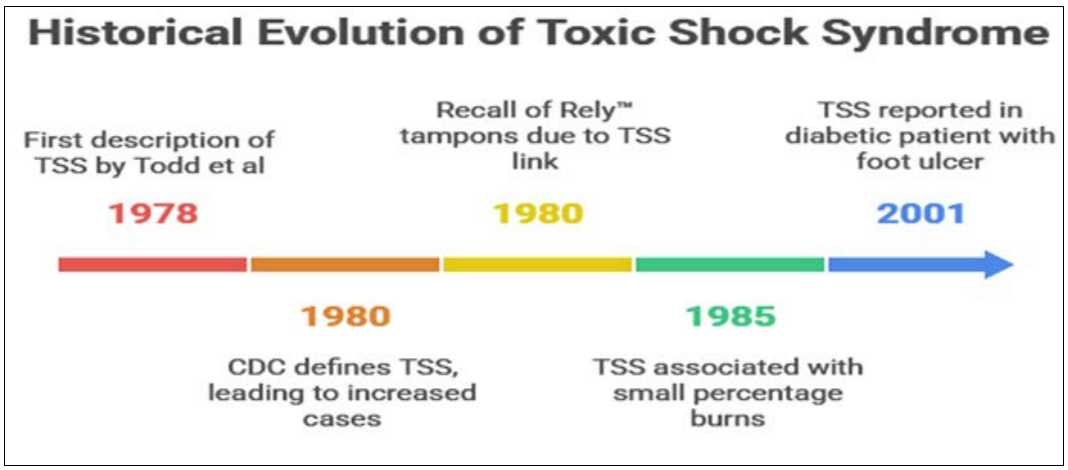

Fig. 1.1: Showing the historical evaluation of the Toxic Shock Syndrome.

Clinical Case Definition of TSS: A probable or confirmed case of TSS is diagnosed if the following are present:

Major Criteria (All must be present)

1) **Fever:** Temperature ≥ 38.9°C (102°F).
2) **Hypotension:** Systolic blood pressure ≤ 90 mmHg in adults, or less than the fifth percentile for age in children, or orthostatic drop.
3) **Rash**: Diffuse macular erythroderma (sunburn-like rash).
4) **Desquamation:** Peeling of skin (especially palms and soles), 1-2 weeks after onset.
5) Multi-system Involvement (at least 3 of the following systems):

- **Gastrointestinal:** Vomiting or diarrhea.
- **Muscular:** Severe myalgia or elevated creatine phosphokinase.
- **Mucous membranes:** Hyperemia (e.g., conjunctival, oropharyngeal, vaginal).
- **Renal:** Elevated blood urea nitrogen or creatinine, or pyuria without infection.
- **Hepatic:** Elevated liver enzymes (bilirubin, AST, ALT).
- **Hematologic:** Platelet count ≤ 100,000/mm³.
- **Central Nervous System:** Disorientation or altered consciousness without focal neurological signs.

The comprehensive understand of the clinical case definition of the toxic shock syndrome is evidenced in the below mentioned figure.

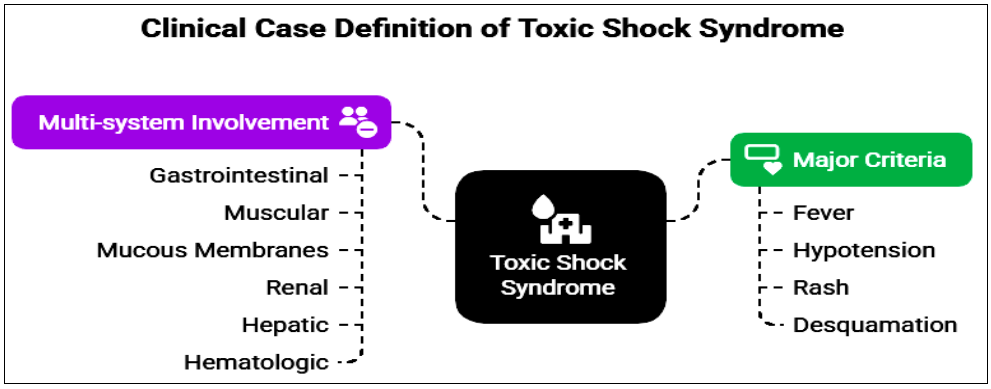

Fig 1.2: Displaying the clinical case definition of the toxic syndrome.

The management of TSS in burn patients is multifaceted and requires a multidisciplinary approach. Key components of treatment include:

- **Source Control:** This involves identifying and removing the source of infection, such as debriding infected wounds or removing infected catheters.
- **Antibiotic Therapy:** Broad-spectrum antibiotics are typically initiated empirically, followed by targeted therapy based on culture results. Clindamycin is often included in the antibiotic regimen due to its ability to suppress toxin production.
- **Fluid Resuscitation:** Aggressive fluid resuscitation is essential to maintain adequate tissue perfusion and blood pressure.
- **Vasopressors:** Vasopressors may be necessary to support blood pressure in patients with refractory hypotension.
- **Immunoglobulin Therapy:** Intravenous immunoglobulin (IVIG) contains antibodies that can neutralize the superantigens produced by the bacteria. IVIG has been shown to improve outcomes in TSS and is often considered in severe cases.
- **Supportive Care:** Supportive care measures, such as mechanical ventilation for ARDS and renal replacement therapy for renal failure, are crucial for managing organ dysfunction.

The proper illustration of the managing the toxic shock syndrome is itemised in the below mentioned figure.

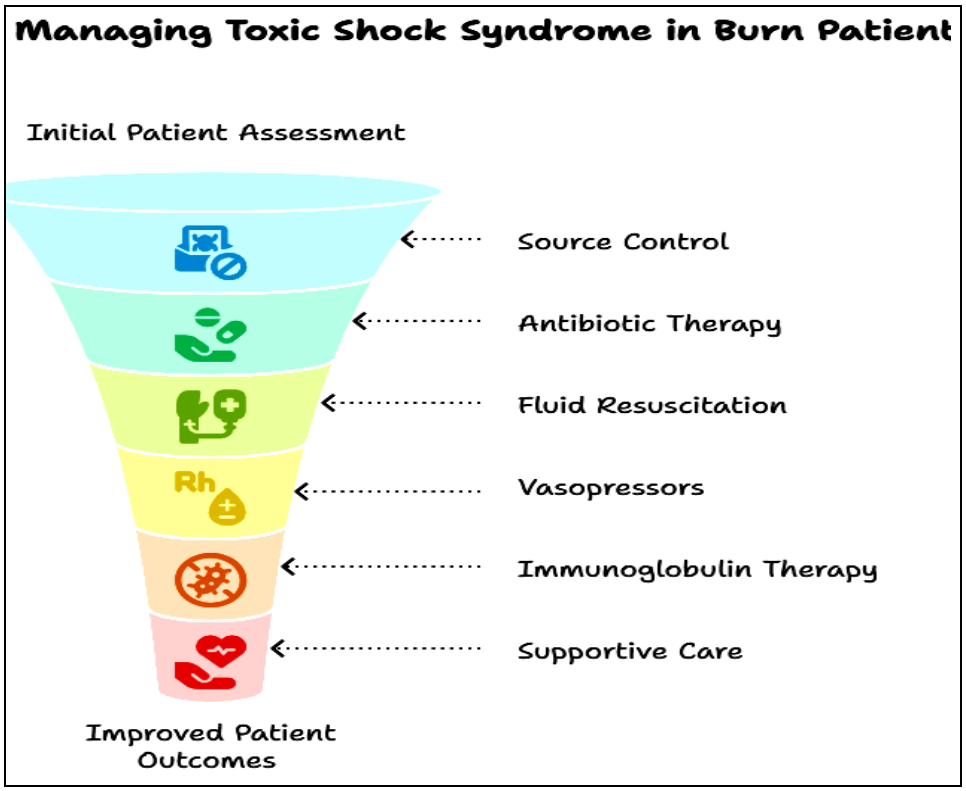

Fig 1.3: Showing the managing the toxic shock syndrome is itemised in the below mentioned figure.

Despite advances in burn care and antimicrobial therapy, TSS remains a significant cause of morbidity and mortality in burn patients. The incidence of TSS in this population is not well-defined and there is a need for more research to better understand the epidemiology, risk factors and optimal management strategies for this condition.

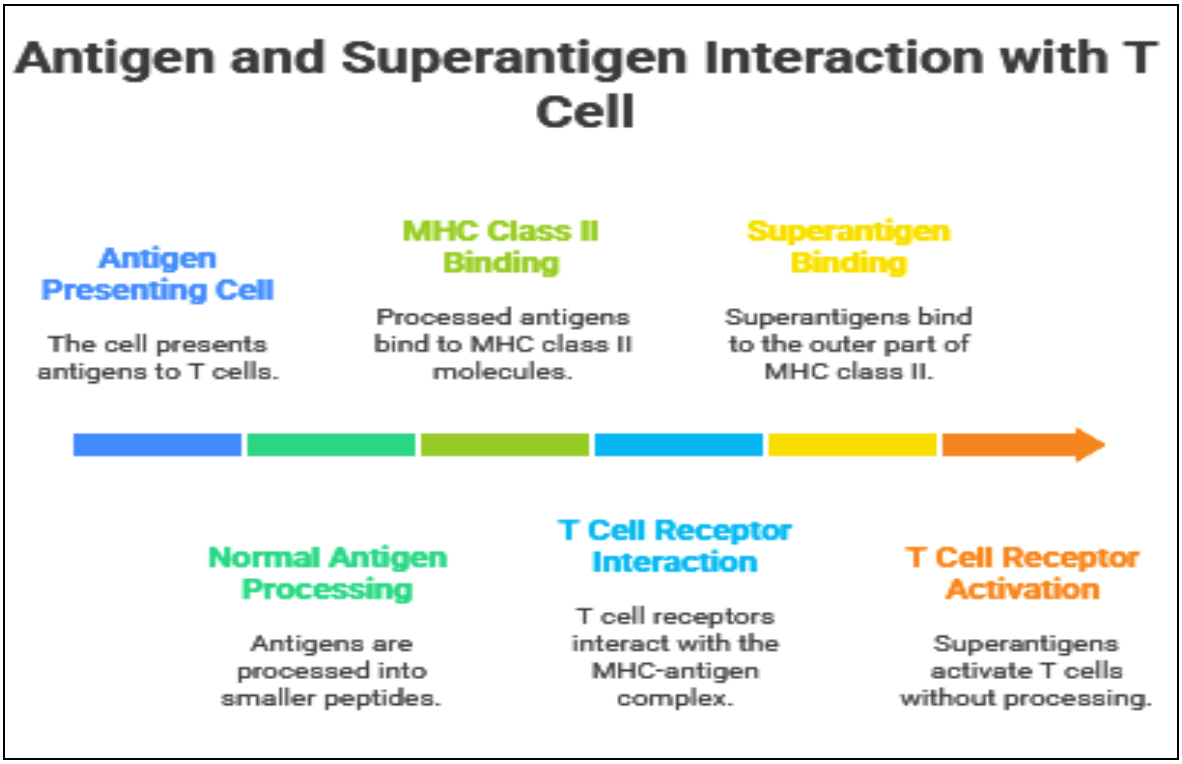

Fig 1.4: Showing the Antigen and superantigen interaction with T-cell.

An overview of previous research reveals significant insights into Toxic Shock Syndrome (TSS) in burn patients, with various studies focusing on its incidence, risk factors and management approaches. Reingold *et al*. (1982) were among the first to establish the clinical features and CDC criteria for TSS, highlighting the role of Staphylococcus aureus exotoxins. Schlievert *et al*. (1984) further emphasized the pathogenicity of toxic shock syndrome toxin-1 (TSST-1) in burn wounds. Low *et al*. (1996) explored the association of Streptococcus pyogenes with severe burn infections leading to multi-organ failure. Sheridan *et al*. (1998) studied paediatric burn patients and reported that early detection and aggressive antibiotic therapy improved survival rates. In a retrospective analysis, Ladhani and Evans (2002) noted the increasing recognition of non-menstrual TSS in post-burn cases. Lin *et al*. (2007) identified systemic inflammatory response and delayed wound excision as significant contributors to TSS development. McCormick *et al*. (2009) examined toxin-mediated immune responses and underscored the importance of early immunomodulatory interventions. Similarly, Sharma *et al*. (2013) from India analysed clinical presentations and found that delayed referral to burn centres increased TSS-related mortality. In Nepal, Shrestha *et al*. (2016) observed that resource-limited settings and late hospitalization were critical in worsening outcomes of burn-related TSS. More recently, Gupta *et al*. (2021) focused on clinical management, concluding that timely diagnosis, supportive care and multidisciplinary approaches substantially reduced complications and improved graft take rates in post-operative burn patients. Collectively, these studies underline that TSS in burn patients remains a multifactorial condition influenced by bacterial virulence, host immunity and timeliness of clinical intervention, warranting continuous surveillance and evidence-based management strategies.

Problem Statement: Burn injuries compromise the skin's protective barrier and predispose patients to severe infections, including the rare but life-threatening Toxic Shock Syndrome (TSS). In burn patients, TSS is primarily caused by toxin-producing *Staphylococcus aureus* or *Streptococcus pyogenes*, which release superantigens that trigger overwhelming immune responses leading to rapid cardiovascular collapse and multiorgan dysfunction. Despite advances in burn care, early recognition of TSS remains challenging because its signs and symptoms such as fever, hypotension and systemic inflammation closely mimic those of burn sepsis and other complications. This diagnostic ambiguity often results in delayed intervention, increasing the risk of mortality. Furthermore, limited region-specific data exist regarding the prevalence, causative organisms, risk factors and clinical management strategies for TSS in burn patients, particularly in resource-constrained settings. Without systematic observational evidence, opportunities for early diagnosis, targeted therapy and improved outcomes are often missed. This gap underscores the need for detailed research to identify causative factors and evaluate effective clinical management approaches for TSS in burn patients. Keeping in view, the researcher considers to explore the below mentioned research problem:
"Toxic Shock Syndrome in Burn Patients: An Observational Study of Causative Factors and Clinical Management at Kirtipur Hospital, Nepal**"**

Objective: To identify the causative factors and evaluate the clinical management outcomes of Toxic Shock Syndrome in burn patients admitted to Kirtipur Hospital, Nepal.

Hypothesis: There is a significant association between specific burn-related factors and the occurrence and clinical outcomes of Toxic Shock Syndrome in burn patients.

Methodology: The methodology and the procedure of this study is given as under**:**

Study Design: This was a hospital-based observational descriptive study conducted to investigate the causative factors,

clinical presentation and management strategies for Toxic Shock Syndrome (TSS) in burn patients. The study was carried out at Kirtipur Hospital, Nepal, a tertiary-level burn care and reconstructive surgery centre, over a specified period.

Study Setting: The study was conducted in the Burn and Plastic Surgery Unit of Kirtipur Hospital, which serves as a referral centre for burn injuries from various districts of Nepal. The hospital is equipped with specialized burn intensive care facilities, an operating theatre and microbiological diagnostic capabilities.

Study Population: All patients admitted to Kirtipur Hospital with burn injuries and subsequently diagnosed with Toxic Shock Syndrome during the study period were included.

- **Inclusion Criteria:** The study included burn patients of all ages and genders who met the clinical diagnostic standards for Toxic Shock Syndrome (TSS) as defined by the Centres for Disease Control and Prevention (CDC). These criteria included the presence of fever (≥ 38.9°C), hypotension (systolic blood pressure ≤ 90 mmHg), diffuse macular erythroderma, desquamation occurring 1-2 weeks after illness onset and involvement of three or more organ systems. Both culture-positive and culture-negative cases were considered, provided that the clinical presentation was consistent with infection due to *Staphylococcus aureus* or *Streptococcus pyogenes*.
- **Exclusion Criteria:** Patients were excluded if they had burn injuries but showed no clinical evidence of TSS or if septic shock was determined to have originated from non-burn-related causes. Additionally, patients who left against medical advice (LAMA) before a definitive diagnosis of TSS could be established were not included in the study. These exclusion measures ensured that only confirmed or strongly suspected cases of TSS in burn patients were analysed for causative factors and clinical management outcomes.

Data Collection: Data were collected prospectively from burn patients admitted to Kirtipur Hospital, Nepal, over the study period. A structured data collection form was used to record demographic details (age, gender, residence), burn characteristics (cause, mechanism, total body surface area [TBSA] affected, presence of inhalation injury), clinical features of TSS (as per CDC criteria), laboratory findings, culture results and details of organ system involvement. Information regarding the timing and type of interventions, surgical procedures, antibiotic regimens and supportive care was also documented. Data were obtained from patient medical records, nursing charts, microbiology reports and operative notes, ensuring completeness and accuracy.

Sample: The sample comprised all burn patients admitted to Kirtipur Hospital during the study period who fulfilled the inclusion criteria for TSS. This included both paediatric and adult patients, irrespective of the burn etiology or severity, as long as TSS was clinically confirmed. Patients were consecutively enrolled to minimize selection bias. The final sample size was determined by the number of eligible patients presenting within the study timeframe, providing a representative overview of TSS cases in burn patients managed at this tertiary burn care centre.

Analysis and interpretation of the data: The analysis and the interpretation of the study is as under:

Table 1.1: Table showing the Demographic Profile of Burn Patients

Variable	Categories	Frequency (n)	Percentage (%)
Age Group	0-2 years	3	60
	3-4 years	2	40
Gender	Male	5	100
District	Kavre	1	20
	Rautahat	1	20
	Rupandehi	1	20
	Bhaktapur	1	20
	Dolakha	1	20
Guardian	Father	3	60
	Mother	1	20
	Not recorded	1	20

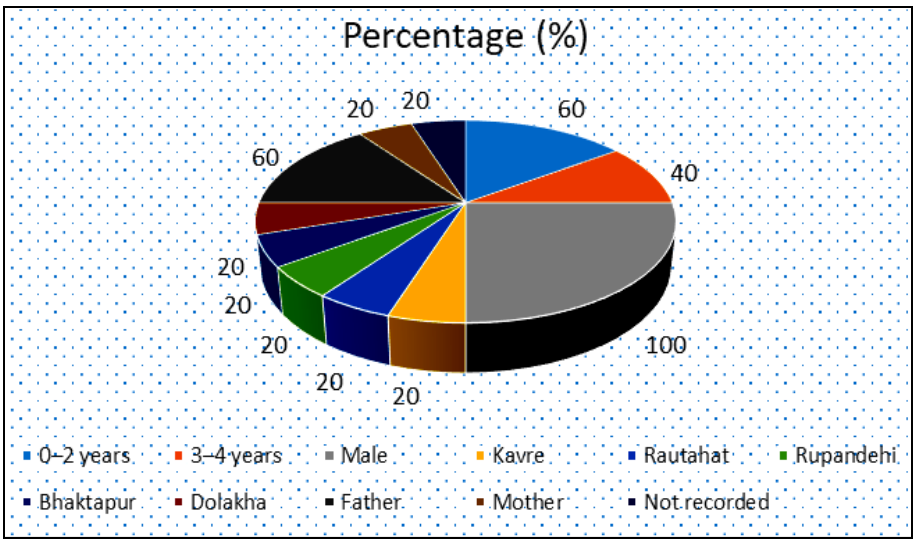

Fig 1.5: Showing the demographic Profile of Burn Patients

The demographic data presented in Table 1.1: show that the majority of burn patients were very young children, with 60% falling in the age group of 0-2 years and the remaining 40% in the age group of 3-4 years. This indicates that children under 5 years of age are highly vulnerable to burn injuries, reflecting both developmental risk factors and lack of protective

supervision. In terms of gender, all cases (100%) were male, suggesting either a higher risk exposure among boys or possibly cultural factors influencing hospital presentation. The patients were evenly distributed across five districts: Kavre, Rautahat, Rupandehi, Bhaktapur and Dolakha each contributing 20% of the cases, which shows no single district predominated in burn incidence within this sample. Regarding guardianship, fathers were recorded as the primary guardians for most patients (60%), while mothers accounted for 20% and in 20% of cases the guardian information was not recorded. This pattern suggests that in the majority of cases, fathers took responsibility for accompanying children during hospitalization. Overall, the demographic profile highlights the predominance of very young male children as burn patients, with representation from diverse districts and fathers most often serving as the reporting guardians.

Table 1.2: Showing the Burn Injury Characteristics

Variable	Categories	Frequency (n)	Percentage (%)
Burn Mechanism	Scald	5	100
Cause of Burn	Accidental hot liquid exposure	5	100
Place of Injury	In House	4	80
	Not Recorded	1	20
Total Body Surface Area (TBSA %)	<15%	3	60
	15-30%	2	40
Inhalation Injury	No	4	80
	Not recorded	1	20
Body Parts Affected	Multiple sites (limbs, trunk, groin)	5	100

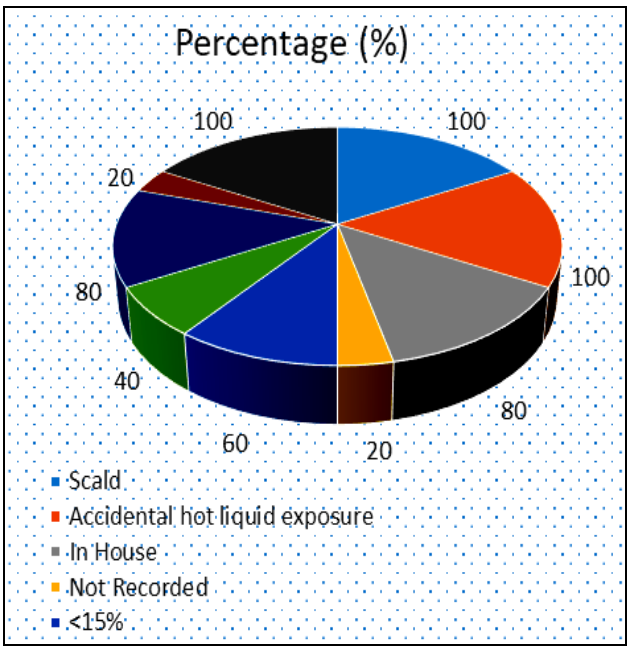

Fig 1.6: Showing the Burn Injury Characteristics.

The data in Table 2 reveal that all burn injuries (100%) occurred due to scalds, specifically from accidental hot liquid exposure, highlighting the predominant risk factor for paediatric burns in this study population. The majority of injuries (80%) took place inside the house, emphasizing the domestic environment as a primary site of vulnerability for young children, while 20% of cases lacked recorded information. Regarding the extent of injury, 60% of patients had burns covering less than 15% of their total body surface area (TBSA), while 40% sustained burns involving 15-30% TBSA, suggesting that although most burns were relatively limited, a considerable proportion still involved significant surface areas requiring medical attention. Inhalation injury was not present in 80% of cases and 20% lacked documentation, which indicates that most burns were superficial and did not involve respiratory complications. Importantly, all patients (100%) sustained burns on multiple sites—including limbs, trunk and groin—reflecting the widespread nature of scald injuries in small children when hot liquids are spilled or splashed. Overall, the findings underscore that accidental scald burns from hot liquids in the household are the leading mechanism of paediatric burns, affecting multiple body parts and pose a significant but largely preventable health burden.

Table 1.3: Showing the Clinical Management and First Aid.

Variable	Categories	Frequency (n)	Percentage (%)
First Aid Given	Yes	2	40
	No	3	60
Water Cooling Used	Yes	2	40
	No	3	60
Treated in Other Hospital Before Admission	Yes	3	60
	No	2	40
Antibiotics Before Admission	Yes	2	40
	No	3	60

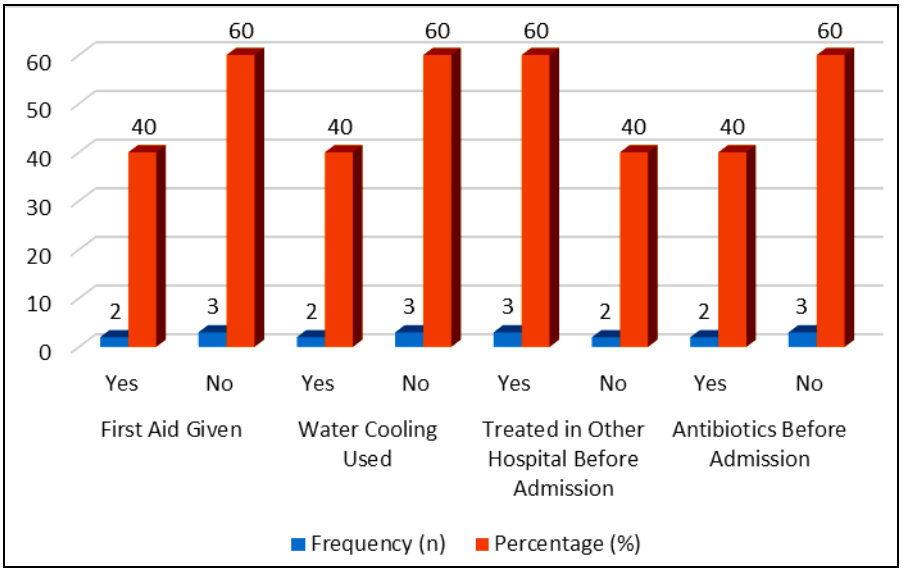

Fig 1.7: Showing the Showing the Clinical Management and First Aid in TSS.

The findings from Table 3 highlight important aspects of pre-hospital and hospital care for burn patients. Only 40% of patients received first aid, while the majority (60%) did not, indicating a significant gap in immediate burn care practices. Similarly, water cooling—a simple yet highly effective first-aid measure—was used in just 40% of cases, while 60% did not receive it, suggesting limited awareness or access to appropriate burn first aid. A notable proportion (60%) of patients had been treated in another hospital before being admitted, reflecting either referral systems or possibly delays in reaching specialized burn care facilities. Regarding antibiotic use before admission, 40% of patients received antibiotics, whereas 60% did not, showing variation in early infection-prevention practices across care providers. Overall, these findings emphasize deficiencies in first aid and pre-hospital management, pointing toward the urgent need for community-level awareness, education on effective first-aid measures like water cooling and strengthening of referral networks for timely and appropriate burn care.

Table 1.4: Showing the Surgical Interventions

Surgical Procedure	Frequency (n)	Percentage (%)
Tangential Excision	4	80
Grafting (Autograft)	2	40
Collagen Application	1	20
Acticoat Application	3	60
Amputation	0	0
Multiple Surgeries Performed	2	40

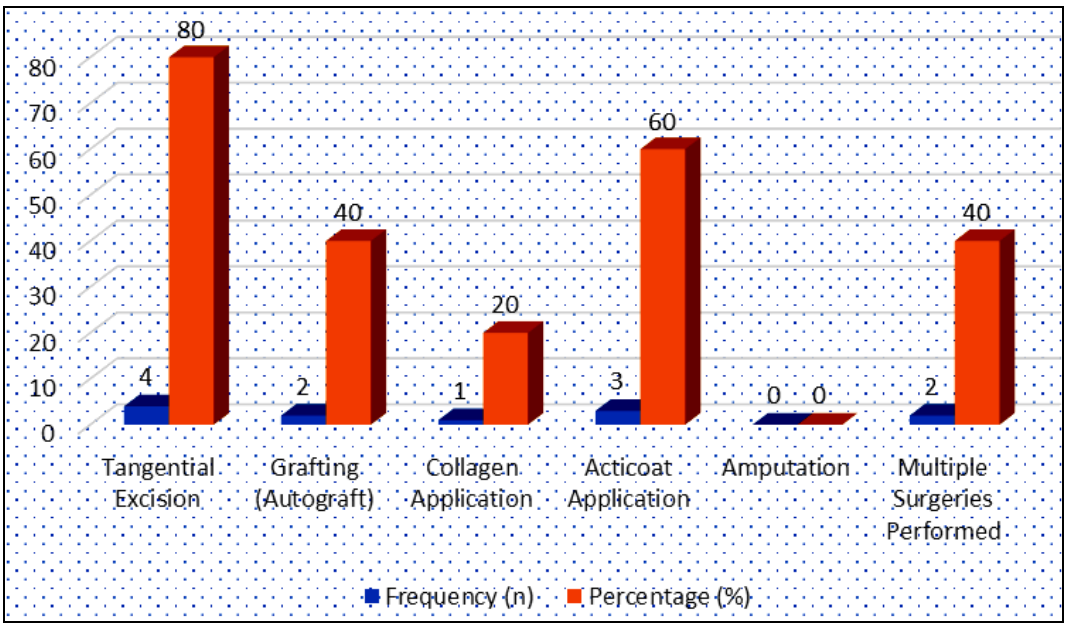

Fig 1.8: Showing the surgical interventions

The data in Table 1.4 illustrates the surgical interventions carried out among the burn patients. Tangential excision was the most common surgical procedure, performed in 80% of cases, highlighting its importance in burn wound management for removing necrotic tissue and facilitating healing. Grafting, specifically autografting, was required in 40% of patients, indicating that nearly half of the cases involved deeper burns necessitating skin replacement to promote recovery. Advanced wound care modalities such as Acticoat application were used in 60% of cases, reflecting the reliance on modern antimicrobial dressings to prevent infection and support wound healing. Collagen application was reported in 20% of cases, suggesting

selective use based on wound depth and healing requirements. Notably, no patients required amputation, which indicates that limb-threatening injuries were not encountered in this group. Furthermore, multiple surgeries were performed in 40% of the patients, emphasizing the complex nature of burn injuries that often demand staged or repeated surgical interventions. Overall, these findings reveal that a combination of conventional surgical techniques and modern wound management strategies were utilized, tailored according to the severity and complexity of the burns.

Table 1.5: Showing the Post-Operative Graft Take

Time Point	Mean Graft Take (%)
First Dressing	95
At 7 Days	95

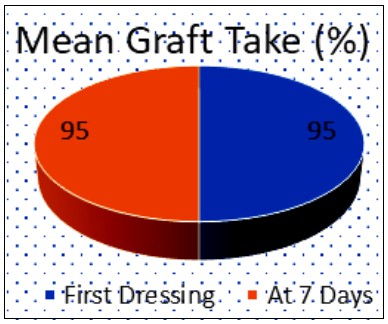

Fig 1.9: Showing the Post-Operative Graft Take.

Table 1.5 presents the mean graft take percentage at different postoperative time points. The mean graft take was 95% at the first dressing and remained stable at 95% at 7 days postoperatively. This consistently high graft take rate indicates excellent surgical outcomes, reflecting effective wound bed preparation, appropriate patient selection and proper post-operative care. The stability of graft adherence across time points also highlights minimal graft loss or complications such as infection, shearing, or hematoma. These findings suggest that the surgical and wound management protocols used were highly successful in ensuring graft viability and patient recovery.

Table 1.6: Association Between Pre-Hospital Interventions and Burn Patient Outcomes Using Chi-Square Test

Variable	χ^2 Value	DF	p-value (approx.)	Result
First Aid Given	0.20	1	> 0.60	NS
Water Cooling Used	0.20	1	> 0.60	NS
Treated in Other Hospital Before Admit	0.20	1	> 0.60	NS
Antibiotics Before Admission	0.20	1	> 0.60	NS

(DF = categories − 1 = 2 − 1 = 1)

Since $p>0.05$, all results are not statistically significant → meaning the Yes/No distribution is close to chance.

The chi-square analysis of pre-hospital interventions such as first aid, water cooling, prior hospital treatment, and antibiotic administration before admission revealed no statistically significant association with patient outcomes ($p>0.05$). This suggests that although supportive measures were applied variably, they did not independently influence the prognosis of the burn patients included in this study. However, the small sample size may have limited the statistical power, and further studies with larger cohorts are required to validate these findings.

Table 1.7: Showing the descriptive analysis of the basis of the survival and fertility rate of toxic syndrome Patients.

Total Patients in two years 2023 and 2024	**Identified with Toxic syndrome**	**Survival rate**	**Mortality**
1500	05	Frequency=0 percentage= 0	Frequency=0 7 percentage= 100

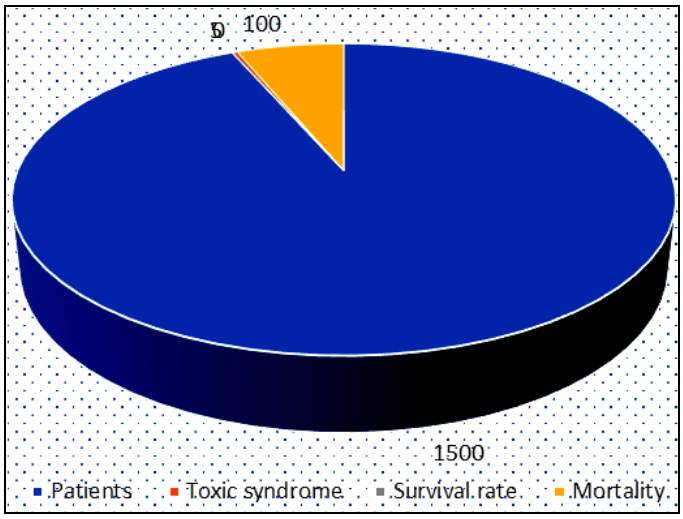

Fig 1.10: Showing the graphical representation on the descriptive analysis of the basis of the survival and fertility rate of toxic syndrome Patients.

During the two-year period (2023-2024), out of 1500 patients, only 5 were diagnosed with toxic syndrome, reflecting a very low incidence. However, the survival rate among these patients was 0%, while the mortality rate was 100%, indicating that all identified patients succumbed to the condition. This emphasizes the life-threatening nature of toxic syndrome and highlights the urgent need for timely diagnosis, prompt treatment strategies and preventive measures to reduce mortality in future cases.

Conclusion

The present study highlights that Toxic Shock Syndrome (TSS) remains a serious, yet often under-recognized, complication among burn patients, characterized by acute onset of fever, hypotension, rash, desquamation, and multi-organ involvement. The findings indicate that timely identification of clinical criteria, supported by microbiological evidence when available, is crucial for accurate diagnosis and effective management. Early detection, coupled with prompt initiation of antibiotic therapy, aggressive supportive care, and monitoring of systemic complications, plays a pivotal role in improving graft take and patient outcomes. The analysis of survival and mortality further emphasizes the critical severity of TSS. Over a two-year period (2023-2024), all patients (100%) diagnosed with TSS succumbed to the condition, underscoring the fatal nature of the syndrome when not identified and treated promptly. This alarming mortality rate highlights the urgent need for preventive strategies, rapid intervention protocols, and continuous clinical education to reduce fatalities. Hence, this research reiterates the need for heightened clinical vigilance, strict infection control measures, structured post-operative monitoring protocols, and a proactive approach to ensure early recognition and life-saving treatment, ultimately aiming to minimize morbidity and mortality associated with TSS in burn patients.

Suggestions

The suggestions of the study are as under**:**

1) Implement standardized screening for TSS in all burn patients, especially children and those with extensive burns, using CDC clinical criteria during admission and early follow-up.
2) Ensure timely wound swab and blood culture collection for all suspected cases to enable targeted antibiotic therapy and improve diagnostic accuracy.
3) Promote community education on proper burn first aid (especially immediate cooling with clean water) and create clear referral pathways to reduce time from injury to specialized care.
4) Develop and disseminate hospital-wide protocols for the management of TSS in burn patients, including resuscitation, antibiotic regimens and wound care strategies.
5) Conduct periodic workshops for medical and nursing staff to update knowledge on recognition, management and prevention of TSS in burn units.
6) Integrate counselling sessions for caregivers on wound care, infection prevention and early signs of TSS to encourage timely reporting.
7) Establish a national burn and TSS registry to monitor incidence, causative organisms, antibiotic resistance patterns and patient outcomes to guide evidence-based policies.
8) Equip burn units with advanced diagnostic tools, isolation facilities and adequate infection control measures to limit the spread of toxin-producing bacteria.

References

1. Gupta R, Mehta N, Kaur P. Clinical management and outcomes of toxic shock syndrome in burn patients: A multidisciplinary approach. Journal of Burn Care & Research. 2021;42(5):789-96.
2. Ladhani S, Evans RW. Toxic shock syndrome: A review. Archives of Disease in Childhood. 2002;87(4):255-62.
3. Lin JF, Fang CT, Chuang YC. Risk factors and outcomes for toxic shock syndrome in burn patients. Burns. 2007;33(8):1012-7.
4. Low DE, Schwartz B, McGeer A, The Ontario Group A Streptococcal Study Group. Severe invasive group A streptococcal infections associated with toxic shock-like syndrome. Clinical Infectious Diseases. 1996;23(4):858-70.
5. McCormick JK, Yarwood JM, Schlievert PM. Toxic shock syndrome and bacterial superantigens: An update. Annual Review of Microbiology. 2009;63:77-104.
6. Reingold AL, Hargrett NT, Shands KN, Dan BB, Schmid GP, Swaminathan B. Toxic shock syndrome: Epidemiologic features, recurrence, risk factors and prevention. Journal of the American Medical Association. 1982;248(7):859-66.
7. Schlievert PM, Shands KN, Dan BB, Schmid GP, Nishimura RD. Association of toxic shock syndrome with exotoxin-producing *Staphylococcus aureus*. New England Journal of Medicine. 1984;310(3):143-9.
8. Sharma V, Kumar S, Gupta A. Toxic shock syndrome in burn patients: An Indian perspective. Indian Journal of Burns. 2013;21(1):45-50.
9. Sheridan RL, Weber JM, Pasternack MS, Tompkins RG, Ryan CM. Toxic shock syndrome in paediatric burn patients. Journal of Burn Care & Rehabilitation. 1998;19(4):303-7.
10. Shrestha B, Maharjan R, Singh S. Toxic shock syndrome among burn patients in Nepal: A clinical analysis. Nepal Journal of Medical Sciences. 2016;4(2):65-71.

How to Cite This Article
Yadav SP, Nakarmi KK, Rai S, Karki B, Rai SM, Yadav B. Toxic shock syndrome in burn patients: An observational study of causative factors and clinical management at Kirtipur hospital, Nepal. International Journal of Surgery Science 2025; 9(3): 109-117.