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Retrospective Analysis of Risk Factors and Mortality of Suicide Related Burn Injury in a Johannesburg Hospital: A 9-Year Audit

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ABSTRACT

Background: Suicide-related burns present a significant challenge in burns units as these patients have higher mortality and morbidities compared to assault or accidental burns. Burns causes significant morbidity and mortality due to sepsis and tissue injury. Burns lead to morbidity and disfigurement which further leads to social economic challenges and higher chances of re-attempted self-harm.

Aims: This study describes the epidemiology and mortality of suicide-related burn injuries to improve patient assessment and management strategies.

Methods: A cross-sectional retrospective analysis of 2383 patients identified 69 patient records of patients who had attempted suicide and were admitted to Chris Hani Baragwaneth Academic Hospital Adult Burns Unit over a period of 9 years between 2015 and 2024.

Results: This study found that the patients admitted were predominantly female (n= 40; 58%) with a mean age of 33.37 ± 11.91. The mean TBSA involved was 30.62 ± 16.26 with the most common areas involved being the face and arms (n=47, 72%). The average duration of admission was 23 days. A correlation between patient outcomes and TBSA% showed statistical significance $t(54.99) = 4.48$, $p = <.001$, 95% confidence interval [8.69, 22.74]. It was found that suicide related burns carry a 15% higher mortality compared to non-suicide related burns.

Conclusion: There is a greater need for psychiatric screening and care in our primary care facilities and further in burn units to decrease the risk that these conditions leading to cases of self-immolation or self-harm. Psychiatric support is paramount through the treatment of the patient's burns and afterwards to prevent re-attempted self-harm.

KEYWORDS: Suicide-related burns, Self-immolation, Epidemiology, Mortality.

INTRODUCTION

Burn injury is a severe and often debilitating injury cause by intentional or unintentional exposure to substances of high temperatures or corrosive in nature. Burn injuries are characterized by tissue damage at different levels of skin depending on the type of agent used to cause the injury, severity and associated risk factors. Furthermore, certain determinants such as gender, age, mode of injury and provision of initial aid, may influence the clinical outcomes and projected prognosis. Suicide attempts may occur in the forms of self-immolation, acid or corrosive substance ingestion with limited data available regarding hot water related suicide attempts. These corrosive ingestions are usually associated with gastric perforation, and both flame and corrosive ingestion are associated with multi-organ system failure and sepsis. These injuries present a significant public health challenge globally with worsened expected outcomes in low- and middle-income countries due to the severity of the injury and systemic effects. These injuries often result in long-term disability including scarring, contractures, deformities, functional impairments and psychological conditions.

Suicide attempts globally is the 15th leading cause of death with 80% of occurrences in middle to low-income countries. The circumstances under which suicide attempts occur usually includes attempts after interpersonal conflicts, religious pressures, marital conflicts, increasing socio-economic pressures and familial pressures. These circumstances are reported more often in middle to low- income countries compared to high income countries. Studies conducted globally showed that patients were more prone to attempted suicide using burns as the method where there were underlying conditions such as a history of substance abuse, previous suicide attempts and underlying psychiatric conditions.

The incidence of burns related to suicide is increasing across the world in all economies recently and presents a significant burden to healthcare systems and economic development. Studies completed in developing countries have a female predisposition as well as a younger population group affected, compared to developed countries which have a male predominance with a higher burn surface involvement. Studies with smaller sample sizes in developed countries have shown an 81% male predominance and of which 44% of these patients have shown a TBSA% involved in excess of 80% and was found to be related to substance use. Similar studies have found that the most commonly involved body areas are those of the head and neck, with deeper burns reported in those areas.[1,2] Further studies in regions with a history of war related violence and religious persecution have shown a mean age of participants of 20-47 years of age with a higher rate of self-immolation in females and young adults with a fatality rate of 61,89% with a threefold higher risk in people with a previous history of suicide attempts.[3] This trend shows the varying economic and political pressures found in developed versus developing countries.

Lotta et al in Finland in 2015 found that two-thirds of patients admitted for attempted suicide related burn injuries had prior psychiatric conditions, of which a further one third of those patients had previous self-harm attempts.[4] A meta-analysis of studies completed in 2016 showed that 19% of self-immolation patient suffered from psychiatric disorders with the most common conditions being major depressive disorder and adjustment disorders. Further review of available literature found that a female predilection was present with a tendency towards household cleaning product ingestion in cases of acid burns. The substances most often utilized were readily available and easily accessible acidic or corrosive chemicals.[5]

Another trend noticed internationally in clinics throughout the world, is a tendency towards higher total body percentages involved in suicide related burns compared to accidental and assault related burns with an average of 20% TBSA involved. This in turn will increase the mortality rate associated with suicide related burns as a higher TBSA% increases the risk of infection of the burn sites and related systemic effects. A study completed in Nepal in 2013 found that intentional burns carried a threefold higher mortality compared to accidental burns.[6]

South Africa faces significant challenges in that no organized system for burn care, nor a national register for burn related injuries exists, therefore available data is mainly found in individual burn centers. A retrospective study of burn fatalities in Pretoria in 2015 showed 3.8% of burn related patient deaths were due to suicide.[6] The same trend was found in Durban in 2008 where 5.8% of mortalities related to burn injuries were found to be due to suicide, where attempted self-immolation was again found to be 3.8% similarly to the study conducted in Pretoria.[7]

Self-harm induced burn management in many burns centres includes psychiatric evaluation and management as many patients experience a decrease in overall quality of life after attempted self-harm and therefore are at greater risk of repeated self-harm attempts. This is a prudent course of treatment as studies globally have found that up to 40% of burn patients attempt to commit suicide subsequent to their first attempt and in those cases may be successful.[8] Patients require both psychiatric and social support with intensified and improved social contacts and continued psychologic support with individuals trained in post-traumatic stress disorders and substance related disorders.[9]

The aim of this study is to describe the risk factors and mortality amongst suicide-related burn patients at a specialized burn center in Soweto, Johannesburg, South Africa.

METHODS

We conducted a retrospective descriptive study of all patients admitted to Chris Hani Baragwaneth Hospital Adult Burns Unit from March 2015 to March 2024. Patients admitted to other units and those under the age of 10 years, were excluded. Data was collected using convenience sampling of records available to the researchers. Patient details were entered into a database which captured all admissions from 2015 to 2024. These records included 2383 patients, of which 2317 patients were excluded. This resulted in 69 patients identified with suicide related burns and patient records were consulted regarding treatments and patient outcomes. The study variables included sex, age, total body surface area percentage involved, body surfaces involved, method of injury of the burn, causative substance of the burn, length of stay and final outcome of the patient.

Anonymised data was exported into R (RStudio Version 2023.12.0+369). Shapiro-Wilk tests were performed to assess for normality. Descriptive statistics were used to summarise data. Non-parametric continuous variables were summarised as median with interquartile range (IQR), while categorical variables were expressed as frequencies and percentages. Continuous variables were compared using Wilcoxon rank-sum test for non-parametric data and categorical variables were compared with chi-squared or Fisher's exact test. All tests were two-tailed and a p-value of <0.05 was interpreted as statistically significant.

RESULTS

Our study found that the average age of admission was 33.37 ± 11.91 years of age with a higher female frequency of 57.97% compared to 42.03% males. Suicide related burns made up 2,89% of patient cases admitted to Chris Hani Baragwaneth Adult Burns Unit. The average duration of stay was calculated as 21.38 ± 27.64 with a higher female predilection 23.18 ± 25.61 compared to males 18.97 ± 30.47. The highest number of suicide related cases occurred in 2015 (n=12), with the least cases occurring in 2018 (n=4).

Our study found that the mean TBSA% involved was 30.62 ± 16.26 (IQR 22) involved being the face and arms (n=47, 72%). Mortality was calculated as 42,05% of suicide related admissions. No deaths occurred when the TBSA% was less than 15%. However, when the TBSA% >15% patient mortality increases with the greatest mortality when TBSA% >25%. Of the 69 patients admitted for suicide related burns, 60,87% suffered burns with TBSA% >25%, of which a further 57,14% of these patients demised. This is significant as 33,48% of all patients admitted to CHBAH ABU with a TBSA >25%, had a mortality of 45,24%. This shows that overall suicide related burns carry a 15% higher mortality compared to non-suicide related burns.

A point-biserial correlation was run to determine the relationship between outcome and TBSA%. There was a correlation between outcome and TBSA%, which was statistically significant (n = 69, p = <.001). A two tailed t-test for independent samples (equal variances not assumed) showed that the difference between demised and discharged patients with respect to the dependent variable TBSA% was statistically significant, t(54.99) = 4.48, p = <.001, 95% confidence interval [8.69, 22.74]. Chi-square test was performed between patient genders and patient outcomes. All expected cell frequencies were greater than 5, thus the assumptions for the Chi-square test were met. There was no statistically significant relationship between patient genders and outcomes, $\chi^2(1) = 0.23$, p = .634, Cramér's V = 0.06.

Table 1. Number of suicide related cases.

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Number of suicide related cases	12	6	9	4	7	6	9	7	4	3

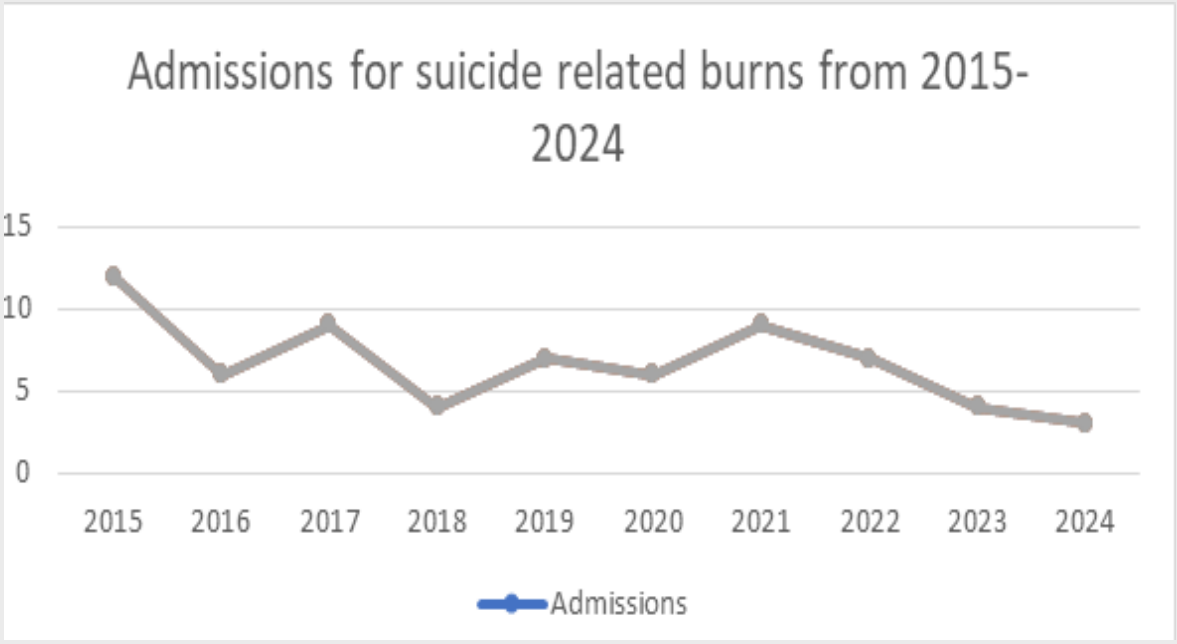

Figure 1. Admissions for suicide related burns from 2015-2024..

Table 2. Mortality related to Total body surface area percentage involved in burns

	TBSA <5%	TBSA 5-<10%	TBSA 10-<15%	TBSA 15-<20%	TBSA 20-<25%	TBSA >25%
N	2	1	9	8	7	42
Average duration in days	24.5	6	14.33	17.88	16.14	22.57
Ventilated	0	0	5	1	4	31
Demised	0	0	0	1	4	24

DISCUSSION

Our study found a higher female to male ratio of suicide related burns admissions which is consistent with other studies from developing countries. Furthermore, this study found the average TBSA% involved to be 30,62% which is consistent with studies done globally showing that the TBSA% involved in suicide related burn cases were on average higher compared to other causes of burns (8). The overall percentage is also higher in South Africa at 10% higher than those in other lower income countries such as Iran. The average age of admission was found to be 33.37 ± 11.91 years with the majority of admissions occurring between the ages of 30-39 years of age, which is consistent with studies globally in developing countries.

However, our study has found that suicide related burns carry a 15% higher mortality compared to non-suicide related burns. This is in part due to the higher TBSA% involved in these burns which has been found to be a global phenomenon. Another aspect to consider is that in most cases of suicide related the burns the burn is self-inflicted which the most commonly involved sites being the head and arms which frequently results in the need for intubation. Our study found a mortality rate of 42,05% which was lower than mortality rates in higher income countries (9). A further contributing factor may be due to a time delay in finding the patient as patients may self-medicate prior to the attempt. Globally studies have shown that underlying psychiatric conditions have been identified in these patients which are significant contributing factors in the patient attempting suicide. Unfortunately, we have limited notes on the patient's psychiatric conditions who are admitted CHBAH ABU as many patients were too severely burnt or demised prior to be able to have a psychiatric evaluation. Therefore, limited data is available regarding the underlying psychiatric causes in our setting.

CONCLUSION

Suicide related burns present a significant global health challenge as these cases have higher morbidity and mortality compared to assault or accident-related burns. Furthermore, the underlying psychiatric cause is potentially reversible through early psychiatric intervention prior to the event. Identifying at risk individuals is key to decrease the overall incidence of these cases. The need for access to mental health professionals is greater now than ever before with greater social and economic pressures. Continued psychiatric care after initial admission, treatment and after discharge is an essential aspect in the management of suicide-related burns care.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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