

Relationship Between Nutritional Status, Burn Degree, And Treatment with Burn Injury Healing Process in Patients at Mayo Hospital Lahore

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DOI: 10.5281/zenodo.14029032

ABSTRACT

A burn is a form of injury or tissue damage that results from coming into touch with things that are extremely hot, such as fire, hot water, chemicals, electricity, radiation, or other inadequate substances. To investigate the impact of wound care, burn severity, and nutritional state on the healing process of burn patients at Mayo Hospitals in Lahore City. The study used a correlational methodology and was quantitative. Sixty individuals were chosen using a convenient sampling technique to participate in the study, representing patients with first, second, and third-degree burns (Grades II and III). Using Pearson's statistical processing, it was discovered that the p-value for the three variables—nutritional status, burn severity, and burn to heal—was less than 0.005. By using logistic regression analysis, it was discovered that nutritional status had the greatest influence on the burn healing process, with a r value of 0.739 and a p-value of 0.02, burn treatment had a r value of 0.81 and a p-value of 0.01, and the effect of burn degree on wound healing was found to be 0.789. Additionally, this study discovered a strong relationship between burn severity, nutritional state, and burn therapy in connection to burn recovery. The process of wound healing and nutritional status were found to be linearly related. In addition to the degree of burn and SOP treatment having a positive impact on the wound healing process, patients with adequate nutritional state also have a good healing process.

Keywords: Nutritional Status, Burn Degree, Burn Injury, Healing Process, Skin Infection, Treatment.

Cite as: Farah Iqbal, Samina Riasat, Imrana Khan, Muhammad Yasin, & Afsha Bibi. (2024). Relationship Between Nutritional Status, Burn Degree, And Treatment with Burn Injury Healing Process in Patients at Mayo Hospital Lahore. *Mader E Milat International Journal of Nursing and Allied Sciences (MINAS)*, 2(3), 22–32. <https://doi.org/10.5281/zenodo.14029032>

INTRODUCTION

A burn is a form of injury or tissue damage that results from coming into touch with things that are extremely hot, such as fire, hot water, chemicals, electricity, radiation, or inadequate substances. 265,000 people worldwide lose their lives to burns each year. The annual cost of burn injuries to the US health system is estimated to be \$486,000; of this total, 3275 thousand are related to fires and 2745

result in the victim's death. One million Brazilians are thought to sustain burns annually, with children being the most vulnerable. These kinds of statistics show that burns are a significant public health issue, particularly in low- and middle-income nations. Furthermore, burns are a major contributor to morbidities, which include extended hospital stays and protracted healing periods (Scapin et al., 2018). Burn injury is an important yet under-researched area in Pakistan. The Global Burden of Disease 2010 study estimates that the age-standardized mortality rate for injury caused by fire, heat, and hot substances is 5.8 per 100,000 population in Pakistan [2]. A burn facility-based study from Karachi estimated burn-associated mortality rate among adults between 15 - 55 years to be even higher at 10.2 per 100,000 population [3]. Some risk factors reported to be associated with admission and mortality include female gender, age >50 years, fire burn, inhalational injury, and total body surface area (TBSA) of >40% [4,5]. However, most of the existing knowledge regarding burn injuries in Pakistan is from single-center studies in specialized burn hospitals found in major cities [4,6]. There is a high annual incidence of burns in Pakistan approximately 1388/100,000 compared to an estimated global annual incidence of 110/100,000 [7].

Effective prevention and management strategies are crucial to mitigate the impact of burn injuries. Public awareness campaigns can educate individuals on safety measures, such as proper electrical handling and fire safety. In Pakistan, policymakers and healthcare professionals must prioritize burn injury prevention and care, allocating resources to address this pressing public health concern.

Burn care in Pakistan faces numerous challenges, including inadequate infrastructure, limited specialized burn units, and insufficient trained healthcare professionals. Addressing these gaps requires collaborative efforts between government agencies, healthcare institutions, and international organizations. Investing in burn prevention programs, emergency services, and research initiatives can significantly improve outcomes.

Research on burn injuries in Pakistan should focus on epidemiology, risk factors, and treatment outcomes. Studies can investigate the impact of socioeconomic factors, such as education and income, on burn incidence and mortality. Furthermore, research should explore innovative treatments and rehabilitation strategies to enhance patient recovery.

Healthcare providers in Pakistan must stay updated on evidence-based burn care practices. This includes wound management, infection control, and nutritional support. Continuous professional development programs and workshops can facilitate knowledge sharing and skill enhancement.

In conclusion, burn injuries pose a significant public health burden globally, with Pakistan experiencing disproportionately high rates. Addressing this issue requires a multi-faceted approach, encompassing prevention, education, research, and healthcare infrastructure development. By prioritizing burn injury prevention and care, Pakistan can reduce morbidity and mortality, improving the quality of life for its citizens.

Globally, burn injuries are the major cause of death and disability. Its traumatic nature is considered to have adverse effects not only physically but also psychologically (Stavrou et al., 2014). Almost three hundred thousand deaths around the globe are due to burns, so it is considered the main public health problem (Norman et al., 2017). The annual rate of burn cases worldwide is approximately 2.4 million, of which 0.65 million people are treated. A handsome number of 75000 patients are hospitalized and the death rate is 8000 to 12000 persons per year (Abd Elalem, Shehata, & Shattla, 2018). Moreover, burns are ignored at public sector hospitals in developing countries like Pakistan. The Global Burden of Disease study of 2010 states that 5.8 per 100,000 in Pakistan die from thermal injuries. According

to a study in Karachi, up to 10.2 annual deaths per 100,000 are reported from burns injuries among people between the ages of 15 and 55 (Tasleem et al., 2023).

Data from the US Public Health Department shows different kinds of burns are one of the main causes of death accounting for 3200 casualties per annum (Hotel, 2015). Burn injuries cause a lot of other physical problems including face scars, deformations, changes in skin color, and severe loss of body parts which hinders the performance of physical activities by the patients. Patients often go into social isolation which is a menace itself (do Amaral Zorita, Blanes, da Silva Augusto, & Ferreira, 2016). After a burn injury, the nutritional requirements increase to manifolds. The level of nutrition needed is directly linked to the size of the burn. A high protein and calorie diet plays an important role in decreasing the risk of infection. It aids speedy healing. It also caters to weight problems. (Porter et al., 2016). There are generally two nutrition routes for burn patients: enteral (EN) and parenteral (PN). In several studies, it was found that the PN method was more dangerous for burn patients of overfeeding and other ailments like liver dysfunction, increased chance of mortality, etc. In modern research, it has been found that a combination of both routes to administer the nutrition requirements has been more fruitful than applied in isolation (Grammatikopoulou et al., 2019).

Accurate and quick handling and treatment of wounds is necessary failing which may result in serious consequences like skin infection, physical and psychological shocks, and stress with fear of disability and burn scars (Suza & Asrizal, 2019). In low- and middle-income countries, where there are few burn facilities, fires account for more than 95% of burn-related fatalities¹². Healthcare personnel at basic-level facilities need to be trained to prevent burns from causing death or injury. This is particularly crucial in hostile and resource-poor settings, like conflict zones, low- and middle-income countries, and catastrophic events with large casualties (Jeschke et al., 2020; Price et al., 2021).

The severity and impact of burn injuries vary across different regions, with low- and middle-income countries facing disproportionate burdens. Limited access to quality healthcare, inadequate emergency services, and insufficient prevention measures exacerbate the problem (Peck & Pressman, 2015). In Pakistan, the lack of specialized burn units and trained healthcare professionals further complicates the situation. Effective prevention strategies, such as public awareness campaigns and safety education, are crucial to reducing the incidence of burn injuries.

In addition to physical harm, burn injuries also have significant psychological and socio-economic consequences. Survivors often experience anxiety, depression, and post-traumatic stress disorder (PTSD), which can persist long after physical recovery (Stavrou et al., 2014). The economic burden of burn injuries is substantial, with costly medical treatments, lost productivity, and long-term care requirements. In Pakistan, where many families rely on breadwinners, burn injuries can push households into poverty. Addressing the psychological and socio-economic aspects of burn injuries is essential to providing comprehensive care and support.

To combat the growing issue of burn injuries, a multi-faceted approach is necessary. Governments, healthcare providers, and communities must collaborate to establish specialized burn units, enhance emergency services, and implement prevention programs. Public awareness campaigns can educate individuals about safety measures, such as proper electrical handling and fire safety. Furthermore, research initiatives should focus on developing effective treatments and rehabilitation strategies. In Pakistan, policy makers and healthcare professionals must prioritize burn injury prevention and care, allocating resources to address this pressing public health concern.

A critical component of this multi-faceted approach is enhancing emergency services. Timely and appropriate care significantly impacts burn injury outcomes. In Pakistan, strengthening emergency medical services (EMS) and pre-hospital care can vastly improve response times and treatment quality. This can be achieved through EMS training programs, infrastructure development, and community outreach initiatives.

Effective prevention programs are also vital in reducing burn injuries. Public awareness campaigns can target high-risk populations, such as children and low-income communities, with tailored education on burn prevention and safety measures. Collaborations between government agencies, non-profit organizations, and community groups can amplify the impact of these initiatives. Furthermore, policymakers can advocate for and implement legislation promoting fire safety standards in buildings and workplaces.

In Pakistan, addressing burn injuries requires a sustained commitment to research and development. Investigating the epidemiology of burns, developing innovative treatments, and evaluating rehabilitation strategies can inform evidence-based practices. Partnerships between healthcare institutions, research centers, and international organizations can facilitate knowledge sharing and resource mobilization. By prioritizing burn injury prevention and care, Pakistan can mitigate the physical, emotional, and economic burdens associated with these injuries, ultimately improving the quality of life for its citizens.

Study Aim:

To investigate the impact of wound care, burn severity, and nutritional state on the healing process of burn patients.

MATERIAL AND METHODS

The study setting was the burn unit of Mayo Hospital Lahore. The study was taken approximately six months from February 2024 to July 2024. The study took sixty patients as its sample.

Convenient sampling techniques were used in this research. After informed consent, data is collected by the researcher with the questionnaire.

The primary informational tool was used questionnaire given by my research supervisor that was verified by senior registrar of plastic surgery, college principle and research supervisor.

The questionnaire's validity was further reinforced through a comprehensive review of existing literature on burn injuries and wound care. This ensured that the tool captured essential information pertinent to the research objectives. The survey instrument consisted of multiple sections, encompassing demographic data, burn characteristics, treatment modalities, and patient outcomes.

To ensure data accuracy, the questionnaire was pilot-tested among a small group of participants. Feedback from this pilot study informed revisions to the questionnaire, enhancing its clarity and effectiveness. Subsequently, the refined questionnaire was administered to the target population, comprising patients with burn injuries admitted to the hospital.

Data analysis involved descriptive statistics and inferential statistics to identify significant relationships between variables. The results provided valuable insights into burn injury patterns, treatment efficacy,

and patient recovery trajectories. These findings have implications for healthcare policy, clinical practice, and future research in burn care.

This study's methodology demonstrates the importance of rigorous research design and validation processes. By leveraging expert input and evidence-based practices, researchers can develop reliable data collection tools, ultimately informing improved patient care and outcomes. Future studies can build upon this research, exploring innovative treatments and rehabilitation strategies to enhance the lives of individuals affected by burn injuries.

The subjective global assessment was used to evaluate the patient's nutritional status (SGA). One type of clinical instrument that healthcare providers use to assess a patient's nutritional condition is the Subjective Global Assessment (SGA). The Bates-Jensen Wound Assessment Tool, which includes 15 features of wound tracking and healing instruments, was used to evaluate the wound healing progress. The main objective of employing this tool is to track and evaluate the progress in wound healing. A total number of 15 assessments are made for wound observation and measurement. Out of these 15 items, 13 are scored based on severity, etc. Size, depth, edges, undermining, type and quantity of necrotic tissue, type and amount of exudate, skin color surrounding the wound, edema, and induration of the peripheral tissue, granulation tissue, and epithelialization are the 13 scored items.

Accurate assessment of nutritional status and wound healing is crucial for effective patient care. The SGA enables healthcare providers to identify patients at risk of malnutrition, while the Bates-Jensen Wound Assessment Tool facilitates timely interventions to promote wound healing. By monitoring nutritional status and wound progression, healthcare professionals can tailor treatment plans to address specific patient needs, enhancing overall outcomes.

The Bates-Jensen Wound Assessment Tool's comprehensive evaluation criteria ensure a thorough assessment of wound healing. The 13 scored items provide a detailed understanding of wound severity, enabling targeted interventions. For instance, assessing the type and quantity of necrotic tissue informs debridement decisions, while evaluating granulation tissue and epithelialization helps determine the effectiveness of topical treatments. By leveraging this tool, healthcare providers can optimize wound care strategies, reducing the risk of complications and promoting faster recovery.

In conjunction with the SGA and Bates-Jensen Wound Assessment Tool, healthcare providers should consider other factors influencing wound healing, such as comorbidities, medication, and lifestyle. A holistic approach ensures individualized care, addressing the complex interplay between nutritional statuses, wound healing, and overall health. By integrating these assessments into routine practice, healthcare professionals can enhance patient outcomes, reduce healthcare costs, and improve quality of life.

The location and shape of the wound are the two non-scored items. Using SPSS version 20 for data analysis and Pearson statistical computation, it was discovered that the p-value for nutritional status, burn severity, and burn to heal was less than 0.005. Logistic regression research revealed that nutritional status, burn therapy, and burn degree were the factors that had the most influence on the healing process of burns, ranked from least to most dominant. The study approval was taken from the relevant institute with reference number DOC/NACON/DC-L/24/001.

The study's findings underscore the critical role of nutritional status in burn recovery. Adequate nutrition provides essential nutrients for wound healing, tissue repair, and immune function. Healthcare

providers should prioritize nutritional assessments and develop personalized dietary plans to support burn patients.

The significant correlation between burn severity and healing time highlights the importance of timely and effective treatment interventions. Specialized burn care, including wound debridement, grafting, and infection management, can substantially improve patient outcomes. Future research should focus on developing innovative treatments and rehabilitation strategies.

This study obtained approval from the relevant institute (Reference number: DOC/NACON/DC-L/24/001), ensuring adherence to ethical standards and regulatory guidelines. The research protocol was designed to minimize potential biases and ensure data integrity.

The study's results have implications for healthcare policy and practice. Hospitals and healthcare systems should allocate resources to support burn care and nutrition services. Public health initiatives should prioritize burn prevention and education, targeting high-risk populations and promoting safety measures.

RESULTS

Table 1 shows strong and statistically significant relationship between nutritional status, treatment, and burn degree with the burn healing process. Nutritional status ($R = 0.739$, $p = 0.02$), treatment type ($R = 0.81$, $p = 0.01$), and burn degree ($R = 0.789$, $p = 0.00$) all have strong positive correlations with healing outcomes. This indicates that better nutrition, effective treatment, and the severity of the burn are closely linked to the healing process, with better management of these factors leading to improved recovery.

The strong correlation between nutritional status and burn healing underscores the importance of adequate nutrition in supporting the recovery process. A well-balanced diet provides essential nutrients, such as proteins, vitamins, and minerals, necessary for wound healing. Healthcare providers should prioritize nutritional assessments and develop personalized dietary plans to ensure optimal nutrition.

Effective treatment also plays a critical role in burn healing. The significant correlation between treatment type and healing outcomes highlights the need for evidence-based treatment protocols. This may include wound dressings, topical antibiotics, and surgical interventions. Healthcare providers should stay updated on the latest treatment guidelines and best practices to ensure optimal care.

The relationship between burn degree and healing outcomes is intuitive, as more severe burns require longer recovery times and more intensive treatment. However, the strong correlation observed in this study emphasizes the importance of accurate burn assessment and classification. By understanding the severity of the burn, healthcare providers can develop targeted treatment plans, manage patient expectations, and optimize resource allocation.

Accurate burn assessment enables healthcare providers to identify patients requiring specialized care, such as surgical interventions or advanced wound management. This targeted approach ensures that resources are allocated efficiently, reducing the risk of complications and promoting optimal recovery. Furthermore, precise burn classification facilitates communication among healthcare teams, ensuring consistency in treatment decisions.

Burn classification systems, such as the American Burn Association's classification, provide a standardized framework for assessing burn severity. This system considers factors like total body surface area (TBSA) affected, depth, and location to categorize burns as minor, moderate, or severe. By adopting this framework, healthcare providers can ensure consistency in burn assessment and classification.

Effective burn management requires an interdisciplinary approach, incorporating expertise from surgeons, nurses, dietitians, and rehabilitation specialists. Accurate burn assessment and classification facilitate this collaborative approach, ensuring that patients receive comprehensive care addressing their physical, emotional, and psychological needs. Ongoing research should focus on refining burn assessment tools and developing innovative treatments to improve patient outcomes.

In conclusion, the strong correlation between burn degree and healing outcomes highlights the critical importance of accurate burn assessment and classification. By adopting standardized classification systems and leveraging interdisciplinary expertise, healthcare providers can optimize burn care, improve patient outcomes, and reduce healthcare costs. Future studies should investigate the impact of burn severity on long-term health outcomes, informing evidence-based practices and policy decisions.

Table no 1: Relationship between Nutritional Status, Burn Degree and Burn Healing Process

Variables	N	R	P value
Relationship between nutritional status and burn healing process	60	0.739	0.02
Association between treatment and burn healing process	60	0.81	0.01
Relationship between burn degree and burn healing process	60	0.789	0.00

Table 2 shows the result of demographic data. Out of 60 participants, 40% were aged 11-20 years, 25% were 21-30 years, 20% were 31-40 years, and 15% were 41-50 years. In terms of gender, 60% were male and 40% were female. Regarding education, 45% had a Primary education, 18.3% had Junior High, 23.3% had Senior High, and 13.3% had College education.

Table 2 Demographic data n=60

Category	Group	Frequency (%)
Age Group	11-20 years	24 40%
	21-30 years	15 25%
	31-40 years	12 20%
	41-50 years	9 15%
Gender	Male	36 60%
	Female	24 40%
Education Level	Primary	27 45%
	Junior High	11 18.3%
	Senior High	14 23.3%
	College	8 13.3%

DISCUSSION

Good nutritional status of patients can rapid the healing process of patient burn injuries and help to get good health outcomes (Russell, 2001). The current result found that there was a significant correlation between patient nutritional status and the burn healing process at Mayo Hospital Lahore with a p-value of 0.02 or $p < 0.05$, and the r was value was 0.739, indicating that there was a strong positive correlation between the two variables. This strong positive correlation illustrates that the better the nutritional status, the faster the burn healing process and vice versa. In this regard, another previous study shows the results of the present study were parallel in that the mild malnutrition status of the patients inhibits the healing process of the burns wound that finds a positive relationship between nutritional status and the healing process of wound (Prins, 2009). Another study claimed that a healthy nutritional state is essential for skin wounds during the hemostasis phase (Palmieri, Vadalà, & Laurino, 2019). While another study shows that there has been an acknowledged connection between wound healing and nutrition (Grada & Phillips, 2022).

Current findings revealed the p-value for the relationship between nutritional status and the burn healing process is 0.02. while another study revealed the same result with p value of 0.00 (Suza & Asrizal, 2019). In addition, the current findings show the p-value for the relationship between burn degree and burn healing process is 0.00. Another study shows the same result with p p-value of 0.00 (Suza & Asrizal, 2019).

The results of the present study were compatible with one previous study that the degree of wound affects the healing process as the results of the present study indicate that a moderate relationship between the degree of wound and wound healing process was found (Gould et al., 2015). In a separate study, 72 burn patients' negative perceptions of their injuries were found to significantly predict the time it would take for the wound to heal, even after accounting for medical conditions (McAleavey, Wyka, Peskin, & Difede, 2018). Another study found that burn injury positive relationship with quality of life (Jeschke et al., 2020). According to another study, the quality of life for almost half of the burn survivors was bad in terms of their health (Tibebu et al., 2021).

Regarding this significant burn injuries can have catastrophic consequences for victims and their families, including long-term functional impairment, psychosocial morbidity, and crude mortality (Udy, Roberts, Lipman, & Blot, 2018). Another study stated that if someone has a burn, they are stigmatized, which has a detrimental effect on their body image or affect and lowers their level of life satisfaction. Resilience only mitigates the relationship between stigma and affect in the case of affect (Watson & Perrin, 2022). Moreover, a study found malnutrition is a factor associated with the outcome of burn injury (Alemayehu, Afera, Kidanu, & Belete, 2020).

CONCLUSION AND RECOMMENDARION

It was concluded in this study that a positive correlation was found between nutritional status, burn degree, and treatment with the burn healing process. The patients who were moderately and sever malnourished had poor healing of the wound while the patients who had mild or no malnourishment had a good process of wound healing.

The study's results emphasize the importance of prompt nutritional assessments and interventions for burn patients. Healthcare providers should prioritize identifying malnourished patients and developing

personalized nutritional plans to support wound healing. This may involve collaborating with registered dietitians or nutritionists to ensure optimal nutrient intake.

The correlation between burn degree and healing outcomes highlights the need for specialized burn care. Patients with severe burns require timely and targeted interventions, including wound debridement, grafting, and infection management. Furthermore, research should focus on developing innovative treatments and rehabilitation strategies to improve outcomes for patients with extensive burns.

These findings have significant implications for healthcare policy and practice. Hospitals and healthcare systems should allocate resources to support burn care and nutrition services. Additionally, public health initiatives should prioritize burn prevention and education, targeting high-risk populations and promoting safety measures. By addressing the complex interplay between nutrition, burn severity, and treatment, healthcare providers can enhance patient outcomes and reduce the morbidity and mortality associated with burn injuries.

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