

FREQUENCY OF SQUAMOUS CELL CARCINOMA IN POST BURN PATIENTS

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Abstract: Burn injuries, particularly those leading to chronic scars, can predispose individuals to the development of squamous cell carcinoma (SCC). The risk of malignant transformation increases with burn severity and long-term scarring. Understanding the prevalence of SCC in post-burn patients is crucial for implementing preventive and management strategies. **Objective:** To assess the frequency of squamous cell carcinoma (SCC) in patients with post-burn scars and evaluate associations between demographic and burn-related factors with the development of SCC. **Methods:** A prospective descriptive study was conducted on 70 patients with a history of burn injuries and resulting scars. The study was carried out over a defined period at a tertiary care hospital. Patient demographic variables such as age, gender, socioeconomic background, and education level were collected. The severity of burns was categorized as partial-thickness or full-thickness, and the aetiology of burns was classified as thermal, chemical, or electrical. Burn locations were also documented. Histopathological examination of biopsy specimens from suspicious scars confirmed SCC diagnosis. Statistical analysis using chi-square tests was employed to identify associations between categorical variables and SCC occurrence. **Results:** Of the 70 patients included, 53 were males (75.7%) and 17 females (24.3%), with a mean age of 53.97 ± 4.91 years. Full-thickness burns were observed in 57.1% of the patients, while 42.9% had partial-thickness burns. The most common burn cause was thermal (45.7%), with the lower extremities being the most affected region (57.1%). SCC developed in 8.6% (6 out of 70) of the patients. The latency period for SCC ranged between 28 and 37 years, with an average of 31.5 years. Full-thickness burns were more commonly associated with SCC development compared to partial-thickness burns. **Conclusion:** The study reported a frequency of 8.6% for squamous cell carcinoma in patients with post-burn scars. Full-thickness burns were associated with a higher risk of SCC development. Long-term surveillance and proactive management of burn scars are critical in preventing malignant transformations.

Keywords: Squamous cell carcinoma, post-burn scars, burn injuries, burn severity.

Introduction

Squamous cell carcinoma is a serious problem, especially for people who have had severe burn injuries in the past. Squamous cells, which are flat cells found in the skin's outermost layer, are the source of this kind of skin cancer. Although squamous cell carcinoma can occur in a variety of contexts, post-burn individuals are significantly more likely to acquire it because of several factors related to their particular medical history and skin problems. In addition to enhancing patient outcomes, an understanding of this link is essential for creating care and preventative plans that work for this susceptible group (1-3).

In addition to causing immediate physical trauma, burn injuries can have long-term psychological and emotional effects. The degree of skin damage and the healing process that follows are greatly influenced by the severity of the burn, whether it is classified as first, second, or third-degree (4, 5). The long-term effects of severe burns sometimes include problems like scarring, infection, and most importantly increased risk of malignancy, specifically squamous cell carcinoma, even if the first therapy concentrates on wound care and pain control. Numerous factors, such as persistent inflammation, alterations in the integrity of the skin, and the existence of scar tissue, might raise the chance of developing malignant cells (6-8).

The skin experiences a protracted healing process following a severe burn that is marked by inflammation and the

generation of growth factors that may encourage cell proliferation. This mechanism can foster a milieu that is favourable to carcinogenesis, even though it is essential for wound healing. Repeated cycles of injury and repair may occur in chronic wounds and scars, increasing the likelihood of malignant changes (9-11). Burns that cover a sizable portion of the body are linked to an increased risk of squamous cell carcinoma, especially in regions where the skin has undergone multiple surgical procedures or has been grafted (12, 13).

The rationale for studying squamous cell carcinoma in post-burn patients lies in the unique pathophysiological changes that occur following severe burn injuries, which significantly elevate the risk of skin malignancies. By focusing on the mechanisms underlying SCC in this vulnerable population, the study aims to inform prevention strategies, enhance screening protocols, and ultimately guide the clinical management of post-burn patients to reduce the burden of skin cancer and improve quality of life.

Methodology

The study was designed as a prospective descriptive study conducted from July 2023 to January 2024 at the Radiology Department of Burn and Plastic Surgery Unit, Hayatabad Medical Complex, Peshawar after obtaining ethical approval from the hospital. The study included 70 patients



aged ≥ 45 years who had previously sustained burn injuries and developed burn scars. Data collection was performed prospectively during routine clinical visits, where each patient's demographic information, such as age, gender, education level, and socioeconomic status, was documented. Socioeconomic status was classified into lower, middle, or high based on income, occupation, and access to healthcare services. The severity of burns was categorized as either partial-thickness or full-thickness, based on clinical examination. Full-thickness burns were defined as those involving destruction of both the epidermis and dermis, while partial-thickness burns involved only the epidermis and part of the dermis. The causes of burns were identified as thermal, chemical, or electrical, and the body regions affected by the burns were classified as lower extremities, upper extremities, head and neck, and trunk. The diagnosis of SCC was made based on clinical examination and confirmed by histopathological evaluation of biopsy specimens taken from suspicious burn scars. The time interval between the initial burn injury and the appearance of SCC (latent period) was calculated for each patient.

SPSS 24 was used for the analysis of data, we used the Chi-Square test for assessing the association of SSC with demographic and clinical variables keeping the P value significant at < 0.05 .

Results

The study included 70 patients with a mean age of 53.97 ± 4.91 years. The mean Body Mass Index (BMI) was 24.86 ± 2.17 kg/m². The gender distribution showed that 53 patients (75.7%) were male and 17 (24.3%) were female. Residence distribution indicated that 36 patients (51.4%) were from urban areas and 34 (48.6%) from rural areas. In terms of education status, thirty-one patients (44.3%) were educated, and 39 (55.7%) were uneducated. Socioeconomic status revealed that 30 patients (42.9%) were from a lower

socioeconomic background, thirty-two (45.7%) were from a middle socioeconomic background, and 8 (11.4%) were from a high socioeconomic background. (Table 1)

The latent period for the development of squamous cell carcinoma (SCC) was assessed in 6 patients, ranging from 28 to 37 years, with a mean of 31.50 ± 3.62 years.

Regarding the characteristics of burn injuries, thirty patients (42.9%) experienced partial-thickness burns, while 40 patients (57.1%) had full-thickness burns. The causes of burns included thermal burns in 32 patients (45.7%), chemical burns in 29 patients (41.4%), and electrical burns in 9 patients (12.9%). The most commonly affected areas were the lower extremities, which accounted for 40 patients (57.1%), followed by the upper extremities in 21 patients (30%), the head and neck in 5 patients (7.1%), and the trunk in 4 patients (5.7%). (Table 2)

Out of the total sample, 6 patients (8.6%) developed SCC, while 64 (91.4%) did not. (Table 3)

When stratifying SCC by demographics, five out of the 6 patients who developed SCC were male (83.3%) while among the females, one patient (16.7%) developed SCC ($p = 0.64$). Regarding socioeconomic background, four patients (66.7%) with SCC came from a lower socioeconomic background, while 1 patient (16.7%) was from a middle socioeconomic background, and 1 (16.7%) was from a high socioeconomic background ($p = 0.32$). (Table 4)

Stratifying SCC by burn injury characteristics, two patients with SCC (33.3%) had partial-thickness burns, while 4 (66.7%) had full-thickness burns ($p = 0.62$). The causes of burns in SCC patients were evenly distributed, with 2 patients (33.3%) each experiencing thermal, chemical, and electrical burns ($p = 0.29$). In terms of affected areas, three patients with SCC (50.0%) had burns on the lower extremities, one patient (16.7%) on the upper extremities, one (16.7%) on the head and neck, and one (16.7%) on the trunk ($p = 0.44$). (Table 5)

Table 1 Demographics of the patients

Demographics		N	%
Gender	Male	53	75.7%
	Female	17	24.3%
Residence	Urban	36	51.4%
	Rural	34	48.6%
Education status	Educated	31	44.3%
	Uneducated	39	55.7%
Socioeconomic background	Lower socioeconomic background	30	42.9%
	Middle socioeconomic background	32	45.7%
	High socioeconomic background	8	11.4%

Table 2 Characteristics of burn injuries

Characteristics of burn injuries		N	%
Severity of burn	Partial thickness	30	42.9%
	Full thickness	40	57.1%
Causes of burn	Thermal burn	32	45.7%
	Chemical burn	29	41.4%
	Electrical burn	9	12.9%
Affected areas of burn	Lower extremities	40	57.1%
	Upper extremities	21	30.0%
	Head and neck	5	7.1%
	Trunk	4	5.7%

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Table 3 Frequency of squamous cell carcinoma

Squamous cell carcinoma	Frequency	Per cent
Yes	6	8.6
No	64	91.4
Total	70	100.0

Table 4 Stratification of squamous cell carcinoma with demographics

Demographics	Squamous cell carcinoma				P value	
	Yes		No			
	N	%	N	%		
Gender	Male	5	83.3%	48	75.0%	0.64
	Female	1	16.7%	16	25.0%	
Residence	Urban	3	50.0%	33	51.6%	0.94
	Rural	3	50.0%	31	48.4%	
Education status	Educated	2	33.3%	29	45.3%	0.57
	Uneducated	4	66.7%	35	54.7%	
Socioeconomic background	Lower socioeconomic background	4	66.7%	26	40.6%	0.32
	Middle socioeconomic background	1	16.7%	31	48.4%	
	High socioeconomic background	1	16.7%	7	10.9%	

Table 5 Stratification of squamous cell carcinoma with characteristics of burn injury

Characteristics of burn injury	Squamous cell carcinoma				P value	
	Yes		No			
	N	%	N	%		
Severity of burn	Partial thickness	2	33.3%	28	43.8%	0.62
	Full thickness	4	66.7%	36	56.2%	
Causes of burn	Thermal burn	2	33.3%	30	46.9%	0.29
	Chemical burn	2	33.3%	27	42.2%	
	Electrical burn	2	33.3%	7	10.9%	
Affected areas of burn	Lower extremities	3	50.0%	37	57.8%	0.44
	Upper extremities	1	16.7%	20	31.2%	
	Head and neck	1	16.7%	4	6.2%	
	Trunk	1	16.7%	3	4.7%	

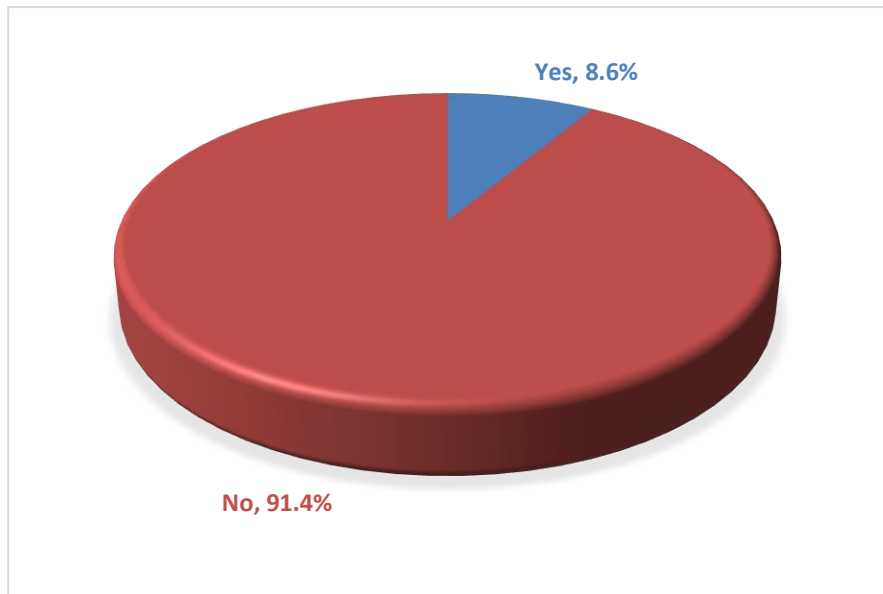


FIGURE 1 Squamous cell carcinoma

Discussion

The mean age of the patients in this study was 53.97 years, with a standard deviation of 4.91 years. This finding aligns with prior studies, such as those by Ozek C et al., which reported an average age of 46.5 years for SCC development in burn scars. (14) The slightly higher mean age in the present study may reflect the inclusion of older patients with longer latency periods before the onset of SCC, as SCC often manifests several decades after the initial burn injury. Kowal-Vern et al., similarly found that the mean age of patients developing SCC in burn scars was 50 years, with a latent period of approximately 31 years. (15) This long latency period underscores the importance of long-term follow-up in patients with chronic burn scars, which may become prone to malignant transformation over time. In terms of gender distribution, 75.7% of the patients in this study were male, while 24.3% were female. This male predominance is consistent with previous research, which often finds that males are more frequently affected by SCC in burn scars due to greater occupational exposure to burns and trauma. For instance, Sharquie KE et al. reported a higher prevalence of SCC in males, which they attributed to increased burn injuries in men, particularly in industrial settings where exposure to fire and chemicals is more common (16).

In the current study, the frequency of squamous cell carcinoma (SCC) development in burn scars was observed in 8.6%. This frequency is consistent with the upper range of findings from other studies but slightly higher than the more commonly reported range of 6.97% to 7.05%. (14-17) The study also assessed the latent period for SCC development, with a mean latency of 31.5 years, ranging from 28 to 37 years. This finding is in line with previous research, which generally reports a latency period of 30 to 35 years for SCC arising from burn scars. (15) The prolonged nature of this latent period emphasizes the need for sustained surveillance of patients with burn scars, particularly those who experience chronic ulceration or trauma to the scarred areas, which may exacerbate the risk of malignant transformation.

Regarding burn characteristics, 57.1% of the patients had full-thickness burns, while 42.9% had partial-thickness burns. Full-thickness burns, which destroy both the epidermis and dermis, are known to carry a higher risk of SCC development due to the more extensive scarring and greater potential for chronic ulceration. This is supported by studies such as those by Ozek C et al., who found that full-thickness burns were more likely to result in SCC compared to less severe burns. (14) The current study's findings are also consistent with Sharquie KE et al., who observed a higher incidence of SCC in patients with deep burns that healed poorly and developed long-standing scars. (16)

The most commonly affected areas in this study were the lower extremities (57.1%), followed by the upper extremities (30%), head and neck (7.1%), and trunk (5.7%). This distribution is typical of SCC arising from burn scars, with the lower extremities being the most vulnerable due to their exposure to repeated trauma and friction, particularly around joints like the knees. Ozek C et al., reported a similar pattern, with the lower limbs being the most frequently affected area, accounting for 62.5% of cases. (14)

Conclusion

With an incidence of 8.6% squamous cell carcinoma in burn injury patients, the findings highlight the importance of early intervention and vigilant long-term follow-up to prevent malignant transformations, especially in patients with full thickness burn injuries. Effective scar management and increased awareness among healthcare providers are crucial in reducing SCC development in burn scars.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

Approved by the department concerned. (IRBEC-TCH-34/23)

Consent for publication

Approved

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Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

QURRAT-UL-AIN IHSAN (Assistant Professor)

Data Analysis, Concept & Design of Study

KAMRAN ALI KHAN (Principal medical officer)

Drafting, Revisiting Critically & Final Approval of version

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