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Incidence of Hypertrophic Scar in Burn Patients

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Abstract

Hypertrophic scarring represents an aberrant response to burn injuriese result of excess collagen deposition. It maps present for months while keloid scars, which may never regress over time. This is a cross-sectional study that was performed at AlNasiriya Teaching Hospital in Thi-Qar Province during the period from November 1, 2024, to February 1, 2025. The goal was to determine the incidence and functional characteristics of hypertrophic scars in burn patients. Structured interviews and a questionnaire-based form were used for data collection, including demographic data and evaluation of burn injuries (burn cause, burn severity, location, signs and symptoms, hypertrophic scar formation, and treatment interventions). A total of 20 subjects were included in the study, with 10 subjects per age range (15–30 years and 31–50 years). 60% of the sample was male, and 55% of participants were from rural regions. The most frequent injury was a thermal burn (70%), followed by oil burns (20%) and chemical burns (10%). The most common site for scars was the lower limb (30%). These findings illustrate the clinical features and demographic variables of burn injuries in the study population. The majority were second-degree burns. The most frequent site of scarring was the lower limb and pruritus developed as the most frequent symptom.
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Introductions

Hypertrophic scarring represents an aberrant response to burn injuries and is the result of excess collagen deposition, persistent inflammatory mediators, and excessive proliferation of fibroblasts. They form distinctive, raised, thickened, and erythematous tissue that remains within the borders of the original wound, but can lead to considerable aesthetic and functional morbidities. If wound healing is delayed or poorly managed, hypertrophic scars may persist for months or even years unlike keloid scars, which may never regress over time[1].

Hypertrophic scars can develop in burn patients with an incidence rate ranging widely based on the severity of the burn, the depth of the damage, and the quality of the wound care received, as well as each patient's genetic predisposition to developing those types of scars[2].

Thickened or hypertrophic scarring is reported to occur in 30–90% of deep dermal burns, especially those that take longer than three weeks to heal. In this study, the most common site of hypertrophic scars was the lower limb (30%), while the left arm , upper trunk , and upper limb were equally predominant (20% each). The most commonly reported symptom was itching (70%), but pain (20%) and movement limitations (10–20%) were also common, especially when scars formed across joints[3].

There are multiple contributing factors to hypertrophic scar formation in burn patients. Burn severity and depth are particularly critical, as second and third-degree burns are now a major shock of human trafficking due to their destruction of deep skin layers and their long-lasting wound healing. With delayed closure of wounds (>3 weeks), there is increased fibroblast activity and collagen synthesis , resulting in hypertrophic scars[4].

Wound infections, repeated irritation, or improper burn care can cause chronic inflammation, which additionally promotes the proliferation of fibroblasts and thereby

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ontributes to the formation of hypertrophic scars. A genetic predisposition also plays a major role, with those who have a darker skin tone or family members with a history of hypertrophic scarring being more prone. In highly mobile areas such as the joint (elbow, wrist, knee), neck and shoulders, mechanical tension on the wound site can cause excessive collagen production and scar hypertrophy[5].
Location, size, and duration determine the symptoms of hypertrophic scars. in clinical examination, hypertrophic scars appear as tight, elevated, and erythematous lesions that are confined to the same area of the burn. These scars are typically characterized by persistent erythema, increased vascularization, and thick fibrotic tissue leading to restriction and stiffness over time[6].
Itching (pruritus) and discomfort are common complaints . one of the results of excess collagen deposition and persistent inflammation is the irritation of nerves. There may be pain and tenderness, especially if internal tissues are tested against external pressure or are moved. Hypertrophic scar formation over joints can lead to a restricted range of motion resulting in functional impairment and contractures as seen in 10% of wrist and 20% of elbow-involved scars in this study[7].
Hypertrophic scars are diagnosed mainly by clinical features , including patient history, time to wound healing, and physical examination. This includes assessment of the scar for thickness, texture, color, vascularity, and symptoms (itching, pain, stiffness). Hypertrophic scars usually arise within 4–8 weeks after burn wound closure, whereas keloid scars may occur later and extend beyond the boundaries of the original wound. Scar assessment scales such as the Vancouver Scar Scale (VSS) , can be utilized to objectively assess scar height, pliability, pigmentation, and vascularity[8].
Hypertrophic scars are an inevitable consequence of burns, and they can lead to significant morbidity for patients. Their management requires a multimodal approach to scar thickness reduction, functional restoration, and improved cosmetic

2outcomes. Scar treatment and prevention have also relied on non-pharmacological interventions. The use of compression garments (pressure therapy) can prevent fibroblasts from being overactive and collagen from being overproduced, which helps to reduce scar thickness. These silicone gel sheets keep the wound hydrated thus preventing scar proliferation. Physical therapy and stretching exercises help to prevent scar contractures, especially in areas at higher risk such as the elbows, knees, and hands, and to maintain joint mobility[9].
Pharmacological options include topical corticosteroids to decrease inflammation and fibroblast stimulation as well as antihistamines for itch relief. Intralesional corticosteroid injections are commonly employed in moderate-to-severe hypertrophic scars to soften the tissue and reduce the production of collagen. In more serious cases, or where scarring causes appreciable loss of function, more advanced therapies like laser treatment (fractional CO_2 laser), cryotherapy (liquid nitrogen freezing) and surgical excision can be necessary. However , surgical excision may pose a risk of scar recurrence if not accompanied by postoperative pressure therapy or intralesional steroid injection[10].
Untreated hypertrophic scars can lead to complications that greatly diminish a patient's quality of life, mobility , and psychological well-being. Scar contractures occur when thick fibrotic tissue limits movement, especially in joints , causing functional impairment. An ongoing itch and pain disrupt daily activities and sleep quality, influencing the patient's general physical and mental well-being. Another significant issue is psychosocial distress: visible scarring, especially on exposed body parts such as the face, neck , and hands, can cause self-consciousness, anxiety , and depression. Furthermore, hypertrophic scars are susceptible to ulceration and breakdown, which may lead to secondary infections and chronic wounds[11].
This study aims to assess the incidence of Hypertrophic Scars in Burn Patients.

Method and Materials

Study Design

cross-sectional study to assess the incidence and characteristics of hypertrophic scars in burn patients at Al-Nasiriya Teaching Hospital in Thi- Qar Province, which receives patients from all over the region. The date range of the study periods was from November 1, 2024 to February 1, 2025.

Sampling Technique

The study involved 20 subjects who were randomly recruited from the hospital's burn unit. The study population included both males and females who were burn victims receiving treatment or follow-up for previous burn injuries.

Data Collection

Data were obtained using structured interviews performed by the investigator. A standardized form, comprising two sections in a questionnaire format, was utilized.
The first section collected demographic data such as age, sex, occupation, residence, medical history and medication history.

- the second section focused on Burn injury evaluation including the cause of burn , burn severity, burn site, and associated symptoms, as well as the presence of hypertrophic scars (if any) and prior treatment interventions.

The assessment comprised details on burn wound healing, scar formation, and complications associated with the healing process, like itching, pain, and movement restrictions.

Ethical Approval

No personally identifying or sensitive patient data were collected in conducting this study. Anonymity and confidentiality were ensured throughout the research process.

Statistical Analysis

Data were organized and analyzed using Microsoft excel 2013 and SPSS statistics v21 . descriptive statistics , in term of frequency and percentage were used to summarize variables

Results

Table 1: Demographic and Clinical Characteristics of the Study Sample (n=20) In terms of age, the participants were distributed into two equal classes: half (50%) were in the 15–30 years age range and half (50%) were in the 31–50-year range. As for sex status, 60% of participants were male while 40% were female. In terms of occupation, the majority of participants were employees (70%), while students represented the remaining 30% of cases. Of the participants, 55% lived in rural areas and 45% lived in urban areas for residency. As far as comorbidities are concerned, 85% of the subjects did not have any comorbidity while 15% had comorbidity . As for medical and surgical history, 90% had no prior medical or surgical history, while 10% had such a history. The history of drug use indicated that 5% of the patients had a history of drug abuse. The timing of burn injuries was as follows: 90% occurred within 7 months to 1 year , and 10% occurred within 1 to 6 months. Finally, 85% of the patients developed scars 3 to 6 months post procedure and 15% of the patients developed scars 7 to 10 months post- procedure.

Table 1: Distribution of the Study Sample by Demographic Data n= 20

Variable	Ranking and Intervals	Frequency	Percent
Age group	15-30	10	**50.0**
	31-50	10	**50.0**
	Total	20	**100.0**
Gender	Female	8	**40.0**
	Male	12	**60.0**
	Total	20	**100.0**
Occupation	Employee	14	**70.0**
	student	6	**30.0**
	Total	20	**100.0**
Address	Rural	11	**55.0**
	Urban	9	**45.0**
	Total	20	**100.0**
Comorbidities	Doesn't have	17	**85.0**
	Have	3	**15.0**
	Total	20	**100.0**
Medical history	Doesn't have	18	**90.0**
	Have	2	**10.0**
	Total	20	**100.0**
Surgical history	Doesn't have	18	**90.0**
	Have	2	**10.0**
	Total	20	**100.0**
Drug history	Doesn't have	19	**95.0**
	Have	1	**5.0**
	Total	20	**100.0**
Burn date	1 m -6 m	2	**10.0**
	7 m-1y	18	**90.0**
	Total	20	**100.0**
Scar onset	3- 6 months	17	**85.0**
	7-10 months	**3**	**15.0**
	Total	20	100.0

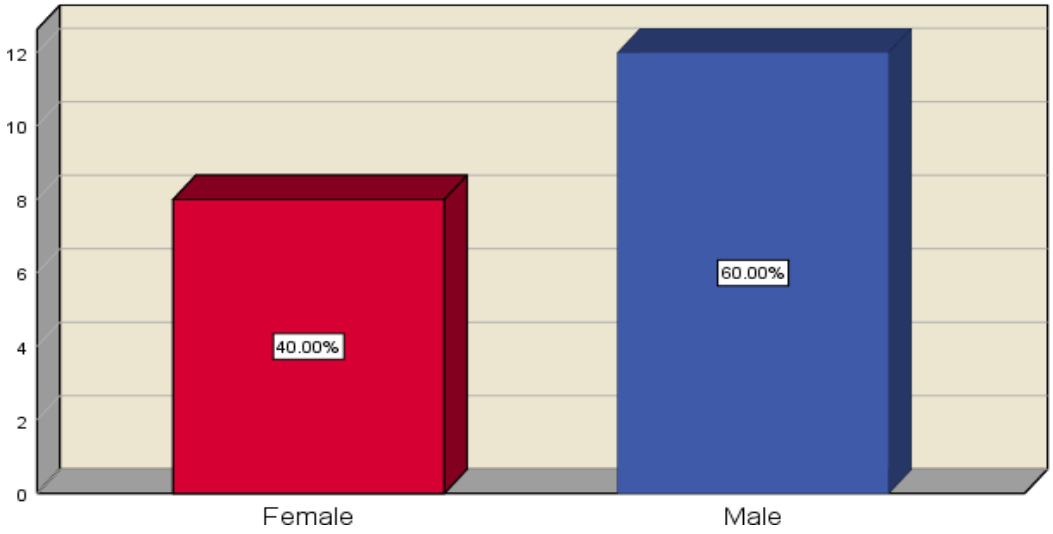

Figure 1: the demographic characteristic of the study according to gender, n=20

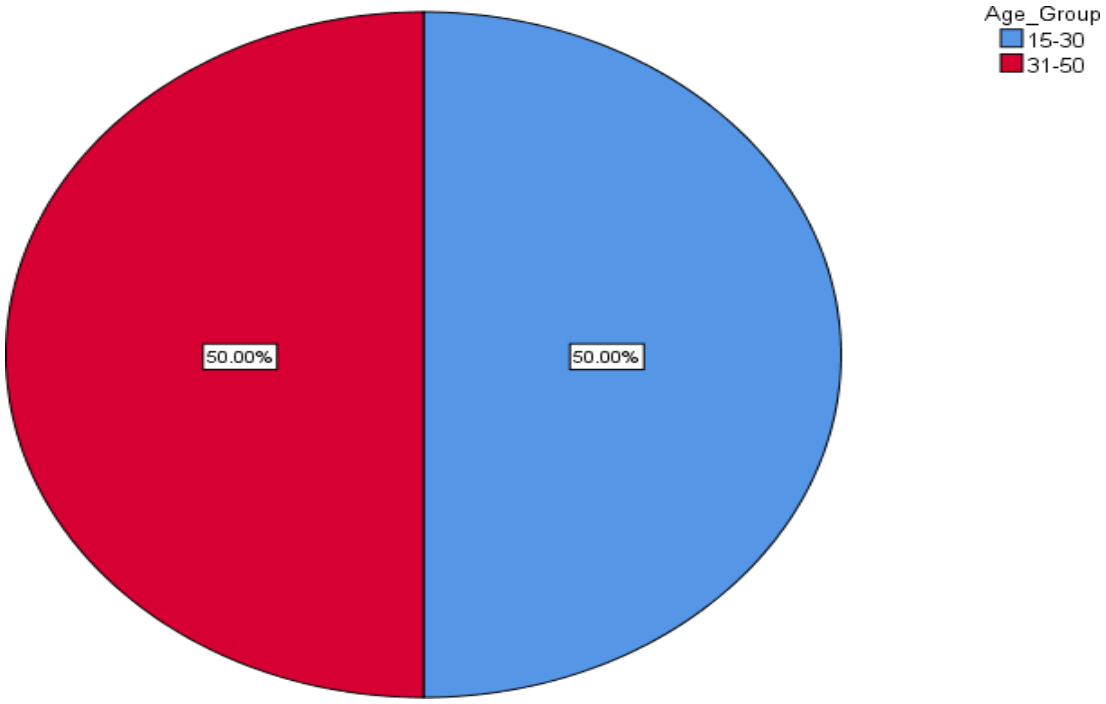

Figure 2: the demographic characteristic of the study according to Age, n=20

Table 2 : shows the burn injury history and characteristics of 20 study participants. Thermal injury was the most common cause of burn injury (70%), followed by oil burns (20%) and chemical burns (10%). Second- degree burns (70%) were predominant in severity, while (30%) had third- degree burns. Relatedly, 75% of participants reported blisters , while 25% did not develop blisters. Burns varied in appearance, with 50% of subjects presenting with burn lines that were pink or red, 25% having white burns, 20% having black burns, and 5% having pink burns only. 65% percent of participants retained sensation at the burn site, but 35% showed loss of sensation.

Table 2: Distribution of the Study Sample by History of Burn, n= 20

variable	Ranking and Intervals	Frequency	Percent
Burn causes	Chemical	2	**10.0**
	oil burn	4	**20.0**
	thermal	14	**70.0**
	Total	20	**100.0**
Burn severity	second degree	14	**70.0**
	third degree	6	**30.0**
	Total	20	**100.0**
Blister	don't have	5	**25.0**
	have	15	**75.0**
	Total	20	**100.0**
Color of burn	black	4	**20.0**
	pink	1	**5.0**
	pink , red	10	**50.0**
	white	5	**25.0**
	Total	20	**100.0**
Sensate	intact	13	**65.0**
	lost	7	**35.0**
	Total	**20**	**100.0**

Table 3 : shows the history of complications in the study sample of 20 participants, including scar location and associated symptoms. In terms of scar location, the lower limb was the most commonly involved site (30%),

followed by the left arm (20%), upper trunk (20%), and upper limb (20%), with hand scars being the rarest at 10%. Symptomatically, itching was the most common symptom affecting 70% of participants . Elbow pain & limited motion of the elbow were present in 20% of the cases, while limited motion of the wrist was found to be the least common occurring in 10% of cases.

Table 3: History of complications of samples, n= 20

variable	Ranking and Intervals	Frequency	Percent
scar location	hand	2	**10.0**
	left arm	4	**20.0**
	lower limb	6	**30.0**
	upper limb	4	**20.0**
	upper trunk	4	**20.0**
	Total	20	**100.0**
symptoms	itching	14	**70.0**
	limitation of wrist movement	2	**10.0**
	pain and limitation in elbow	4	**20.0**
	Total	**20**	**100.0**

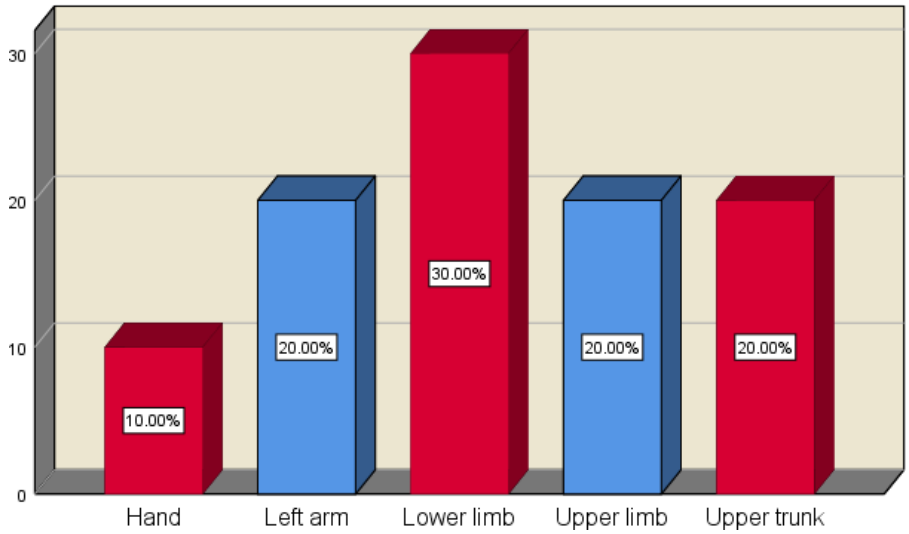

Figure 3 : scar location

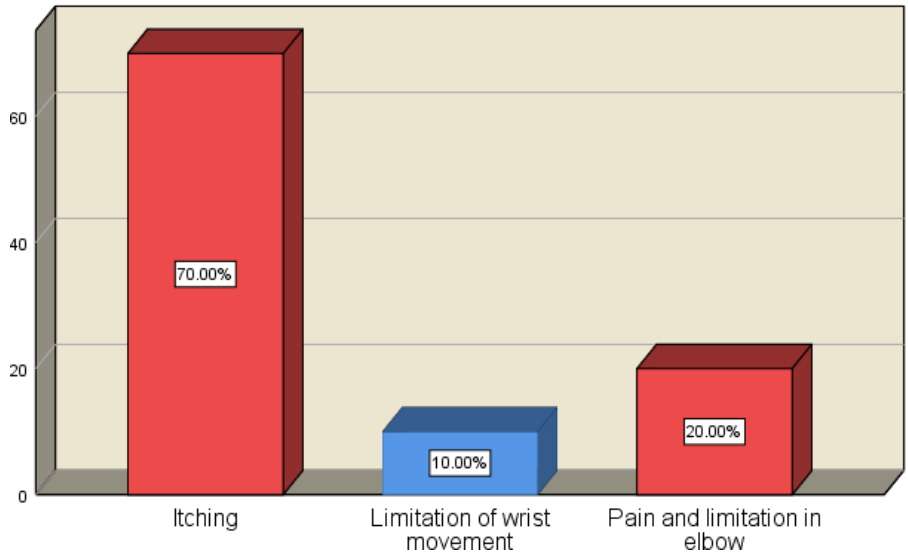

Figure 4: symptoms

Table 4 presents the management and prevention practices implemented for a total of 20 participants in this study. The treatment modalities included steroid injection which was the most commonly administered modality (35%) , followed by daily dressing changes (25%). Interestingly, 30% of the patients had not received treatment for the disease before, and 10% of the cases were treated using the excision graft approach. From the perspective of scar prevention, the data show that patients did not use specific preventive measures for scars, and 100% stated that no defined scar prevention strategy was used.

Table 4: Management and prevention of samples, n= 20

Variable	Ranking and Intervals	Frequency	Percent
Treatment received	daily dressing change	5	**25.0**
	excision graft	2	**10.0**
	not treated previously	6	**30.0**
	steroid injection	7	**35.0**
	Total	20	**100.0**
scar prevention	**not specific**	**20**	**100.0**

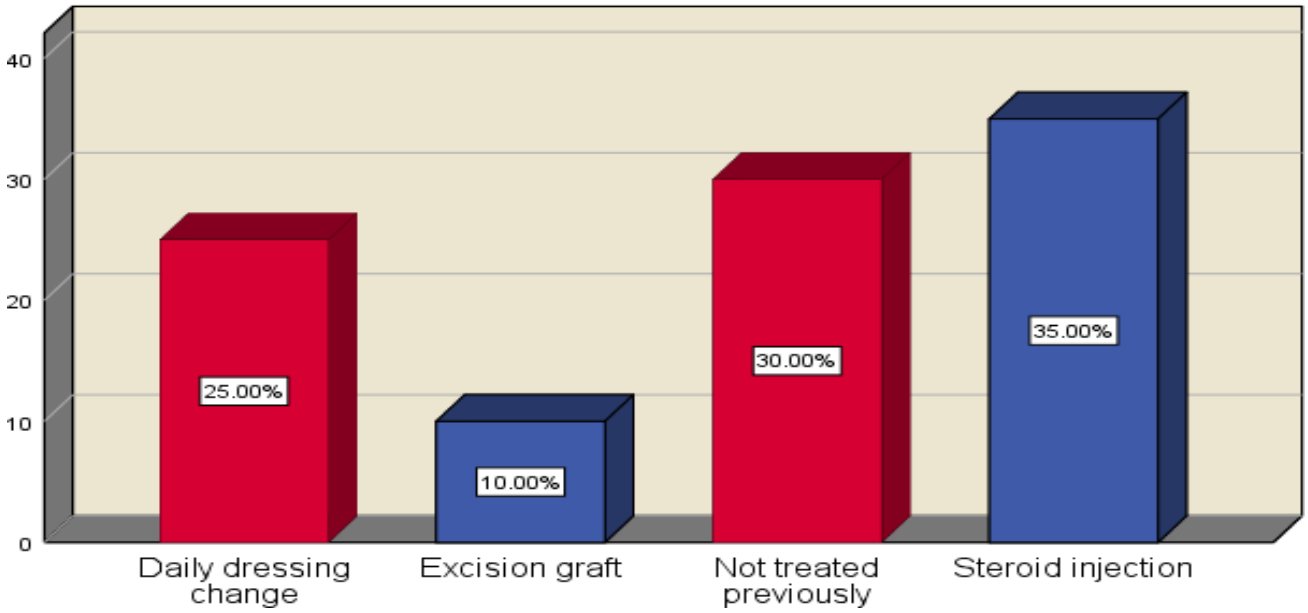

Figure 5 : Treatment received

Picture (1) : shows female , 16 years old , scaled burn on limbs , photos shows keloid scar 7 months after burn (third degree burn) , main symptom is itching and treatment is daily dressing .

Picture (1)

Picture (2) : shows oil burn on lower limb, 4 months after burn , still resistance to steroid injection sessions.

Picture (3) : shows trauma to the lower limb duo to RTA 1 year ago , hypertrophic scar appear 3 months after trauma .

Picture (3)

Picture (4) : old age diabetic male , history of burn of upper limb (7 months ago) , hypertrophic scar about 6 months after burn , good response to steroid injection after 3 sessions.

picture (5) : history of scald burn (third degree) 30-40% of upper limb , hypertrophic scar developed after 3-6months after burn , photos show post resection of hypertrophic scar due to limitation of wrist movement , the result is after 2-3months after the surgery (excision and graft) .

picture (5)

Discussion

This study examined the incidence of hypertrophic scars among burn patients with concerning demographic, burn degree, complications, infection types, and management.

50% of the patients were in the age group of 15–30 years and the other half were between 31–50 years. Also, 60% of patients were male , and 40% were female which is comparable to that of Gauglitz et al. (2011)[12], which showed that male patients experience more burn injuries than females because of their focus on professional availability and risk-taking behaviors. In common with the findings by Zuo et al,.(2017)[13] , the study also identified that 55% of patients came from rural areas highlighting that burn injuries are prevalent in rural populations with limited healthcare access and increased exposure to these dangerous conditions. In fact, 85% of patients had no comorbidities and 15% reported underlying medical conditions, which also highlights the conclusion by Finnerty et al. (2016)[14], it is known that some comorbid conditions, including diabetes, and hypertension can hinder wound healing and result in the formation of hypertrophic scars.

The characteristics of burn injury in this study showed a frequency of thermal burns (70%), oil burns (20%) , and chemical burns (10%) which align with Bloemen et al. (2009) [15] ,which concluded that flame and scald burns are the leading cause of burn injuries worldwide. Burn grading revealed second-degree burns in 70% of patients and third-degree burns in 30%, consistent with Zuo et al. (2017) [13] , which reported that second- degree burns are more likely to develop hypertrophic scarring because the healing process can be prolonged, and fibroblasts are active at the site for
longer. The color of admission burns were pink, red, or white, and blanching

was observed in 10% of patients only, which is similar to the findings of Finnerty et al. (2016)[14] which stated that non-blanching burns are often indicative of deeper tissue damage and delayed healing. This also confirm research by Bloemen et al(2009)[15]. in 25% of the cases, blisters were observed, emphasizing that blistering indicates deep dermal burns and greater potential for hypertrophic scarring. Sensation assessment revealed intact sensation in 65% of cases , while 35% had a loss of sensation (similar to Gauglitz et al. (2011)[12], which reported that deeper burns that damage nerve endings frequently result in sensory deficits and prolonged inflammation.

Similarly, the study also identified 30% of patients developed hypertrophic scars and reported that itching was the most common symptom (70%), followed by pain (20%), and limited movement of the wrist (10%) and elbow (20%) . this is in accordance with Zuo et al. (2017)[13] , which made the same the conclusion that itch is the most common symptom of hypertrophic scars as a result of the excessive activity of mast cells and histamine release. Scars in tension rich areas like lower extremities and upper trunk , were also seen to have a higher propensity for developing hypertrophic scars , which adds credence to the study conducted by Bloemen et al. (2009)[15] , showing that mechanical force on the healing tissue drives excessive collagen deposition and scar maturation.

Burn treatment showed that 35% of patients received steroid injections, 25% underwent daily dressing changes, 30% were untreated in the past, and 10% received excision grafting . this is consistent with Finnerty et al. (2016)[14], who noted that steroid injections are a good treatment for hypertrophic scars because steroid injections inhibit fibroblast proliferation.

However, early excision and grafting have been shown to be critical modifiable interventions in improving outcomes by reducing prolonged inflammatory phases ; yet , this was performed in only 10% of cases – indeed lower than in other studies. Furthermore , 30% of patients were untreated and the risk from Gauglitz et al. (2011)[12] found that untreated burns are at a much higher risk of developing serious hypertrophic scars.

Conclusion

These findings illustrate the clinical features and demographic variables of burns injuries in the study population. The most common categories were thermal burns and the majority were second-degree burns. The most frequent site of scarring was the lower limb and pruritus developed as the most frequent symptom. However, the use of topical treatments , such as steroid injections and daily dressing changes, as well as the fact that a substantial proportion of participants had received no prior treatment followed a structured scar prevention strategy.

Recommendation

1. Management of Burn Wounds: Following a standard for treatments can minimize the risk of hypertrophic scars through adequate cleansing, a well-fitted dressing, and early intervention.
2. Strategies to Prevent Scarring in Burn Patients: Introduction of Pressure Therapy, Silicone Gel Sheeting , and Hydration Techniques.
3. Patient Education: Educate burn patients about adequate wound care, early scar management , and the importance of follow-up treatment to optimize outcomes.

Longitudinal Studies: Design and execute more perspective , larger- scale studies addressing the risk factors and long-term outcomes of hypertrophic scars occurring in burn patients

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