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CLINICAL PROFILE AND MANAGEMENT OF HYPERTROPHICSCARS AT DR. SOETOMO GENERAL ACADEMIC HOSPITAL SURABAYA, INDONESIA

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ABSTRACT

Introduction: Hypertrophic scars are a common clinical issue that occurs following skin injury or trauma, characterized by excessive deposition of connective tissue. These scars can cause cosmetic and functional problems. Proper management is essential to prevent complications. However, data on the clinical profile and management of hypertrophic scars in Indonesia is still limited. This study aims to fill this gap by exploring both the clinical profile and management strategies for hypertrophic scars at Dr. Soetomo General Academic Hospital, Surabaya.
Methods: This study is a retrospective descriptive analysis utilizing secondary data from medical records of patients with hypertrophic scars treated at Dr. Soetomo General Academic Hospital during the 2019-2020 period. Variables analyzed include age, gender, occupation, scar causes, anatomical locations, scar sizes, and treatment methods.
Results: A total of 68 patients with hypertrophic scars were recorded during the study period. Of these, 11 patients were from the inpatient clinic, and 57 from the outpatient clinic. In the outpatient clinic, the majority were female, aged 17-25 years, with trauma, burns, and postoperative wounds as the leading causes. The most common scar locations were the face and hands, with the majority measuring between 1-5 cm^2. Surgical techniques were the most common treatment approach.
Conclusion: Hypertrophic scars are most prevalent in patients aged 17-25 years, predominantly female, with burns being the primary cause. Surgical techniques were the most widely used treatment. Early intervention is crucial for improving clinical outcomes, underscoring the importance of personalized management strategies in treating hypertrophic scars.

Highlights:

1. Most hypertrophic scar patients were aged 17 to 25, mainly female, and the scars were mostly caused by burns on the face and upper extremities.
2. Surgical techniques were the most common treatment, with most scars measuring 1 to 5 cm^2.

INTRODUCTION

Scars are a prevalent clinical concern that is often more complex than commonly perceived. When an injury occurs, the skin repairs itself to maintain the body's defense system and forms scars in the form of scar tissue.[1]

Scar formation is a part of the wound healing process that occurs when body tissue is damaged by physical injury. Hypertrophic and keloid scars result from atypical wound healing responses following trauma, characterized by excessive deposition of connective tissue.[2]

The pathophysiology of keloid and hypertrophic scars is still unknown.[3] However, based on incidence rates, the formation of hypertrophic scar tissue occurs in 40-70% of cases after surgery and in 91% of cases due to burn injuries. It is also noted that 50% of hypertrophic scar patients have a family history of hypertrophic scarring.[4] The parts of the body that most frequently experience hypertrophic scarring are the shoulders, neck, knees, presternum, and ankles.[5] Various treatment options are available for hypertrophic scars, including surgical and non-surgical therapies. According to Ogawa et al., the most effective approach is a combination of radiation therapy and steroid tape.[6]

This study aims to address the gap in data regarding hypertrophic scars at Dr. Soetomo General Academic Hospital in Surabaya, Indonesia. By systematically examining various clinical variables, including age, gender, cause, anatomical location, and treatment options, this research intends to provide valuable insights into the management of hypertrophic scars, ultimately improving clinical outcomes for patients.

METHODS

This research used a descriptive study design. Data were collected retrospectively from the medical records of hypertrophic scar patients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. The research instrument was the patients' medical records, which contained observation form data for hypertrophic scar patients obtained from the hospital. The population consisted of all hypertrophic scar patients treated at the hospital from 2019 to 2020. A total sampling technique (saturated sampling) was applied, including all patients with hypertrophic scars during that period. The research variables included: 1) age, 2) gender, 3) occupation, 4) causes of hypertrophic scars, 5) location, 6) size, and 7) therapy used.

RESULTS

During the study period, there were 68 patients, consisting of 11 from the Inpatient Clinic and 57 from the Outpatient Clinic at Dr. Soetomo General Academic Hospital, Surabaya. This research was conducted at the medical record section of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, from September 2021 to March 2022. Data collection was carried out using medical records and data collection sheets, conducted on working days during regular hours. Of the 68 patients with hypertrophic scars, only 63 met the inclusion criteria, so the final sample for this study consisted of 63 patients.

The age distribution of inpatients with hypertrophic scars at Dr. Soetomo General Academic Hospital, Surabaya, during the 2019-2020 period reveals that the majority of patients are in the younger age groups. The highest number of cases was found in children aged 6-11 years (37.5%), with 3 patients, as shown in Table 1.

This age group had the highest prevalence of hypertrophic scarring. Additionally, 37.5% of patients were aged 17-25 years, representing another significant portion of the sample. Interestingly, there were no patients in the 12-16 years, 26-35 years, or 36-45 years age ranges, indicating that hypertrophic scars are less common in these age groups. There were also no cases in individuals aged over 64 years. This suggests that hypertrophic scars are more prevalent

in children and young adults, possibly due to higher rates of trauma or burns in these age groups.

Table 1. Age distribution of inpatients with hypertrophic scars at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, during the period from 2019 to 2020.

Age (years)	Number of Samples	Percentage (%)
0-5	1	12.5
6-11	**3**	**37.5**
12-16	0	0
17-25	3	3.5
26-35	0	0
36-45	0	0
46-55	1	12.5
>64	0	0

Table 2. Age Distribution of Outpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, 2019-2020.

Age (years)	Number of Samples	Percentage (%)
0-5	7	12.7
6-11	8	14
12-16	8	14
17-25	**14**	**25**
26-35	3	5
36-45	5	9
46-55	3	5
>64	1	1

From the results presented in Table 2, the highest number of hypertrophic scar cases in the outpatient clinic at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia occurred in the 17-25 years age group, accounting for 25% of the total cases. This is followed by the 6-11 years and 12-16 years age groups, which each represented 14% of the cases. The 36-45 years age group had 9% of the cases, while 26-35 years and 46-55 years age groups each represented 5%. The smallest percentage of cases was found in the >64 years age group, with just 1% of the total.

This suggests that hypertrophic scarring is most common among younger individuals, particularly in the 17-25 years age range, which may be associated with higher exposure to risk factors like trauma or burns.

Table 3. Gender Distribution of Inpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital Surabaya, Indonesia, 2019-2020.

Gender	Number of Samples	Percentage (%)
Women	4	50.0
Men	4	50.0

Table 4. Gender Distribution of Outpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital Surabaya, Indonesia, 2019-2020.

Gender	Number of Samples	Percentage (%)
Women	**28**	**50.9**
Men	27	49.1

Based on the data from Table 3 and Table 4, the gender distribution of hypertrophic scar patients at Dr. Soetomo General Academic Hospital was fairly balanced. In the inpatient clinic (Table 3), the number of female patients was equal to the number of male patients, with each gender representing 50% of the cases. In contrast, in the outpatient clinic (Table 4), the gender distribution slightly favored females, with 28 female patients (50.9%) compared to 27 male patients (49.1%). This indicates a near-equal gender distribution across both inpatient and outpatient settings, with a very slight female predominance in the outpatient clinic.

Table 5. Occupational Distribution of Inpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital Surabaya, Indonesia, 2019-2020.

Occupation	Number of Samples	Percentage (%)
Unemployed	**3**	**37.5**
Self-employed	2	25.0
Etc	2	25.0
Student	1	12.5
Housewife	0	0.0
No data	0	0.0

Based on the data from Table 5, the largest group of inpatient patients with hypertrophic scarring at Dr. Soetomo General Academic Hospital were those who were unemployed, comprising 37.5% of the cases (3 patients). These patients were typically underage or children who are not working. The second largest groups were self-employed and "other" occupations, each contributing 25% of the cases. A small percentage of patients (12.5%) were students, and no patients identified as housewives or with missing data in this category.

Table 6. Occupational Distribution of Outpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, 2019-2020.

Occupation	Number of Samples	Percentage (%)
Student	**24**	**43.0**
Unemployed	17	30.0
No data	12	21.0
Housewife	2	3.0
Self-employed	0	0.0
Etc	0	0.0

In Table 6, the majority of outpatients with hypertrophic scarring at Dr. Soetomo General Academic Hospital were students, accounting for 43% of the cases (24 patients). This is consistent with the theory that individuals aged 10 to 30 years, especially students, are more prone to trauma due to higher skin tension and greater collagen synthesis[34]. The second largest group were unemployed individuals, representing 30% of the cases (17 patients). Other smaller groups included housewives (3%) and a considerable portion of patients (21%) had missing data regarding their occupations. There were no cases of self-employed or other occupational categories in the outpatient clinic.

Table 7. Causes Distribution of Inpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital Surabaya, Indonesia, 2019-2020.

Cause	Number of Samples	Percentage (%)
Burns	**3**	**37.5**
Post Surgery	2	25.0
Trauma	1	12.5
Enlarged Lump	1	12.5
No data	1	12.5
Post Excision	0	0.0
Congenital Abnormalities	0	0.0
Insect Bite Marks	0	0.0
Combustio	0	0.0
Multifactor	0	0.0
Wound Healing Disorders	0	0.0
Accident	0	0.0
Scratches	0	0.0

In Table 7, the most common cause of hypertrophic scarring in the inpatient clinic at Dr. Soetomo General Academic Hospital was burns, which affected 3 patients (37.5%). This was followed by post-surgery scarring, with 2 patients (25%). Other causes such as trauma, enlarged lumps, and "no data" each accounted for 12.5%. There were no reported cases of conditions such as congenital abnormalities, insect bite marks, or other specific causes like post-excision and wound healing issues.

Table 8. Causes Distribution of Outpatients with Hypertrophic Scarring at Dr. Soetomo General Academic Hospital Surabaya, Indonesia, 2019-2020.

Cause	Number of Samples	Percentage (%)
Burns	12	25.0
Trauma	12	25.0
Post Surgery	5	10.0
Combustio	5	10.0
Wound Healing Disorders	4	8.0
Multifactor	3	6.0
Scratches	2	4.0
No data	2	4.0
Insect Bite Marks	1	2.0
Congenital Abnormalities	1	2.0
Accident	1	2.0
Post Excision	0	0.0
Enlarged Lump	0	0.0

Table 8 shows that the most common causes of hypertrophic scarring in the outpatient clinic were burns and trauma, each accounting for 25% of the cases (12 patients each). Post-surgery and combustio (burns) were also significant causes, each representing 10% (5 patients). Wound healing disorders affected 8% (4 patients), and other causes, such as multifactor, scratches, and insect bite marks, contributed to a smaller portion of the cases. Notably, 4% of patients had missing data regarding their causes of hypertrophic scarring.

In both the inpatient and outpatient clinics at Dr. Soetomo General Academic Hospital, the most common cause of hypertrophic scarring was burns. Inpatients had a higher percentage of burn-related scarring (37.5%) compared to outpatients (25%). Other causes varied between the inpatient and outpatient groups, with trauma, surgery, and other factors contributing in differing proportions. These findings emphasize the significant impact of burns as a leading cause of hypertrophic scars in this setting.

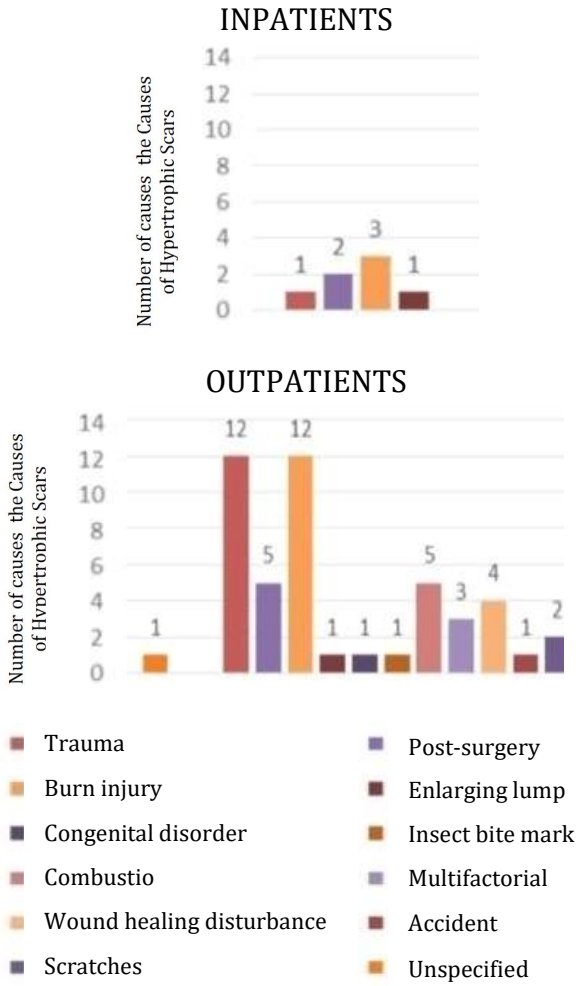

Figure 1. Diagram of the Causes of Hypertrophic Scars of inpatients and outpatients in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

Table 9. Distribution of Hypertrophic Scar Locations in Inpatients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, during the Period 2019 – 2020

Location	Number of Samples	Percentage (%)
Face	3	25
Palm of Hand	3	25
Mouth	2	16
Ear	1	8
Nose	1	8
Hand	1	8
Gluteus	1	8
Neck	0	0
Chest	0	0
Stomach	0	0
Dorsal	0	0

Thigh	0	0
Knee	0	0
Foot	0	0
Sole	0	0

Table 10. Distribution of Hypertrophic Scar Locations in Outpatients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia during the Period 2019 – 2020

Location	Number of Samples	Percentage (%)
Hand	14	18
Face	10	13
Chest	8	10
Foot	8	10
Palm of Hand	7	8
Ear	5	6
Thigh	5	5
Neck	4	5
Sole	4	5
Dorsal	4	5
Gluteus	4	5
Stomach	2	2
Knee	1	1
Mouth	1	1
Nose	0	0

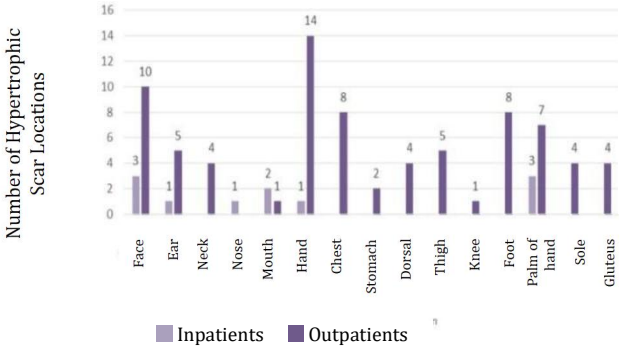

Figure 2. Diagram of the Hypertrophic Scar Locationsof inpatients and outpatients in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia

Based on Table 9 (inpatients) and Table 10 (outpatients), the location of hypertrophic scars in both inpatient and outpatient settings at Dr. Soetomo General Academic Hospital in Surabaya predominantly affects the upper extremities and face.

In inpatients, the most common locations for hypertrophic scars were the face and palm of the hand, each accounting for 25% of the cases. Other locations with scars included the mouth (16%) and various other areas such as the ear, nose, hand, and gluteus (each with 8%). No cases were reported for the neck, chest, stomach, dorsal area, thigh, knee, foot, or sole.

In outpatients, the most common locations for hypertrophic scars were the hands (18%), followed by the face (13%), chest, and foot (both 10%). Other locations included the palm of the hand (8%), ear (6%), and thigh (5%). Smaller percentages were found in areas such as the neck, sole, dorsal, gluteus, stomach, and knee, with no cases in the nose.

Figure 2 visually represents these differences in the distribution of hypertrophic scar locations between inpatients and outpatients during the 2019 – 2020 period. It clearly shows that scars are more commonly found on the hands and face, with a higher percentage of upper extremity involvement in outpatients compared to inpatients.

Table 11. Distribution of Scar Size in Inpatients with Hypertrophic Scars at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, 2019–2020

Measure	Number of Samples	Percentage (%)
< 0.5 cm^2	0	0
0.6 – 1 cm^2	0	0
1 – 5 cm^2	0	0
6 – 9 cm^2	0	0
10 – 20 cm^2	0	0
> 20 cm^2	0	0
No data	8	100

According to Table 11, there was no data recorded for the size of hypertrophic scars in any of the inpatients at Dr. Soetomo General Academic Hospital during the 2019–2020 period. All 8 patients (100%) in this group did not have information regarding their scar sizes.

Table 12. Distribution of Scar Size in Outpatients with Hypertrophic Scars at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia,2019–2020

Measure	Number of Samples	Percentage (%)
< 0.5 cm^2	4	4
0.6 – 1 cm^2	0	0
1 – 5 cm^2	21	25
6 – 9 cm^2	4	4
10 – 20 cm^2	12	14
> 20 cm^2	14	16
No data	29	34

Table 12 shows the distribution of hypertrophic scar sizes among outpatients at Dr. Soetomo General Academic Hospital. The majority of patients had no recorded data on their scar size, with 29 patients (34%) missing this information. However, for those who had recorded scar sizes, the most common category was scars ranging from 1 to 5 cm^2, which accounted for 25% of the patients. This was followed by scars greater than 20 cm^2 (16%). The other scar size categories were less represented, with smaller proportions of patients in each group.

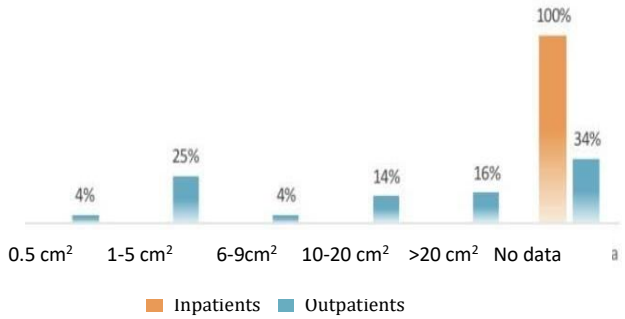

Figure 3. Diagram of the Scar Size Distribution in Inpatients and Outpatients with Hypertrophic Scars at Dr. Soetomo General Academic Hospital,Surabaya, Indonesia.

Figure 3 visualizes the data from Table 11 and Table 12, showing the difference in the distribution of hypertrophic scar sizes between inpatients and outpatients. The outpatient group has more varied scar sizes, with the most common size being between 1 and 5 cm^2, whereas the inpatient group lacks data on scar size entirely.

The data from the 2019–2020 period at Dr. Soetomo General Academic Hospital reveals that, for inpatients, no scar size data was available. In contrast, outpatients showed a more diverse distribution, with most patients having scars ranging from 1 to 5 cm^2. However, a significant portion of outpatient data (34%) was also missing. This suggests that better documentation of scar measurements is needed to improve the accuracy of assessments and treatments in both inpatient and outpatient settings.

Table 13. Distribution of Hypertrophic Scar Therapy in Inpatients at Dr. Soetomo General Academic Hospital, Surabaya,Indonesia, 2019–2020

Therapy	Number of Samples	Percentage (%)
Surgery	8	80
Non-surgical: Injection (Triamcinolone Acetonide)	2 10	20

According to Table 13, surgical therapy was the most frequently used treatment for hypertrophic scars in inpatients, with 8 patients (80%) undergoing surgery. In contrast, 2 patients (20%) received non-surgical treatment in the form of an injection of triamcinolone acetonide.

Table 14. Distribution of Hypertrophic Scar Therapy in Outpatients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, 2019–2020

Measure	Number of Samples	Percentage (%)
Surgery	27	48
Non-surgical: Injection (Triamcinolone Acetonide)	15	26
Laser	2	3
Radiotherapy	1	1
Silicon Gel Sheet	5	8
No description	6	10

Table 14 shows the distribution of therapies used for hypertrophic scars in outpatients. The most common treatment was surgery, performed on 27 patients (48%). The second most common therapy was the injection of triamcinolone acetonide, used for 15 patients (26%). Other therapies, such as laser treatment (3%), radiotherapy (1%), and silicon gel sheets (8%), were used less frequently. Additionally, there were 6 cases (10%) where no description of the treatment was available.

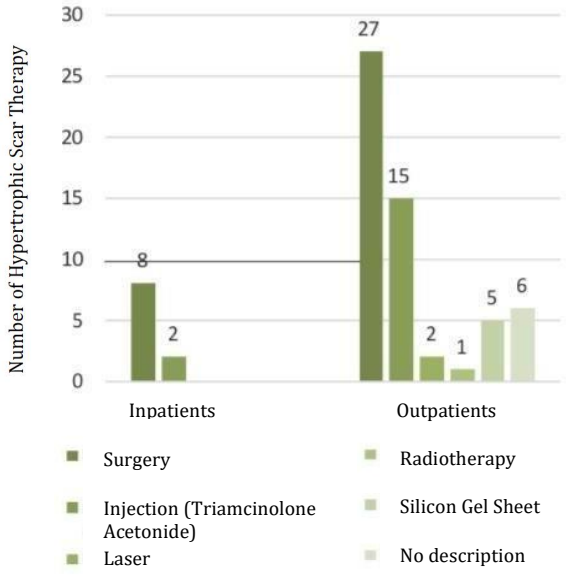

Figure 4. Diagram of Hypertrophic Scar Therapy in Inpatients and Outpatients at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.

Figure 4 provides a visual representation of the therapies used in both inpatient and outpatient settings at Dr. Soetomo Hospital. As indicated by the diagram, the most commonly administered therapies for hypertrophic scars in both groups were surgical operations and triamcinolone acetonide injections. The least commonly used treatment was radiotherapy, which had the lowest frequency of administration.

From the data in Tables 13 and 14, it is clear that surgery is the most frequently used therapy for hypertrophic scars, especially in inpatients (80%), while in outpatients, 48% also received surgical treatment. Non-surgical treatments, such as the injection of triamcinolone acetonide, were commonly used in both inpatient (20%) and outpatient (26%) groups. Other treatments like laser, radiotherapy, and silicon gel sheets were much less frequently used. Radiotherapy was the least utilized therapy across both inpatient and outpatient settings.

DISCUSSION

Scarring can have significant long-term physical and psychosocial effects, particularly for those with deep second- and third-degree burns, which are prone to developing hypertrophic scars.[7] Hypertrophic scars are marked by chronic inflammation and excess capillaries, making them red. A burn that heals in less than 10 days has a 4% chance of developing hypertrophic scars, while one that takes over 21 days has a 70% chance. This indicates that local wound conditions play a key role in hypertrophic scar formation. In contrast, keloids are more genetically influenced. Although similar, hypertrophic scars respond better to 1064 nm Nd:YAG laser treatment, but keloids can recur if any redness or hardening persists.[8, 9]

These scars, including keloids, can cause cosmetic disfigurement and lead to issues such as sleep disturbances, anxiety, depression, and social avoidance. Recent research has begun to explore the biochemical pathways involved in scar formation.[7] Hypertrophic and keloid scars are fibroproliferative disorders with distinct histological features, making them different from other types of scars.

There are different treatment options for keloids and hypertrophic scars, such as standard treatments, medications, excision, radiation, cryotherapy, and phototherapy. Lasers play an important role in managing a variety of scars in our practice. While no single method is considered the best, using a combination of treatments usually works better. The combination of bleomycin, triamcinolone acetonide, and pulsed dye laser seems to be the most effective for

treating both keloids and hypertrophic scars.[8-12]

Accurate identification is crucial for proper management and treatment.[13,14] Understanding clinical signs, patient characteristics, and treatment approaches, such as age, gender, cause, location, and therapy, is crucial for improving the management and outcomes of hypertrophic scars.

This research was conducted retrospectively using secondary data in the form of medical records of hypertrophic scar patients from both the inpatient and outpatient clinics at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, covering the period from 2019 to 2020.

Based on the data obtained from Dr. Soetomo General Academic Hospital, Surabaya, Indonesia for the period of 2019-2020, a total of 11 medical records were collected for patients undergoing treatment in the inpatient unit and 57 records for patients in the outpatient unit. The variables discussed in this study include age distribution, gender, occupation, causes of scars, location of scar tissue, size, and therapy.

The age distribution of hypertrophic scar patients in both inpatient and outpatient settings showed a similar trend, with the highest number of cases found in patients aged 6–11 years and 17–25 years. In the inpatient unit, both age groups had 3 patients each, representing 37.5% of the inpatient sample. Similarly, in the outpatient unit, the highest number of cases was observed in patients aged 17–25 years, with 14 patients (25%), followed by patients aged 6–11 years, with 8 patients (14%).

This finding supports the theory that the incidence of hypertrophic scars is lower in older patients. Patients under the age of 30 are more likely to develop hypertrophic scars due to higher skin tension and greater collagen content.[15] Additionally, younger individuals have more elastic and fibrous skin, which makes them more susceptible to trauma and subsequent scarring.[2]

In the inpatient unit of Dr. Soetomo General Academic Hospital Surabaya for the period 2019–2020, there was a balanced gender distribution, with 50% male and 50% female patients. In the outpatient unit, however, female patients were more predominant, making up 50.9% of the sample with a total of 28 patients. This finding is consistent with previous research by Goldsmith et al. (2012), which noted that female patients tend to visit clinics more frequently due to their greater attention to the aesthetic aspects of their bodies compared to men.[16] Women and girls with a predisposition to keloid scarring should be made aware of this potential risk. In the event of its occurrence, it is crucial to seek the consultation of a specialist for appropriate assessment and management.[17]

Regarding occupation, the highest number of patients in the inpatient unit were those not working, with 3 patients (37.5%) in this category. All of these patients were minors/children. This observation aligns with research by Cai JH et al. (2017), which found that many cases of hypertrophic scars in minors were observed following burn treatment in hospitals. This trend can likely be attributed to the higher levels of activity and curiosity in children, which increases the risk of burns and other injuries. Additionally, the lack of parental supervision may contribute to a higher likelihood of these injuries occurring.[18]

In the outpatient unit, 24 patients (43%) were students, a group with frequent daily activities. This is in line with the theory that individuals between the ages of 10 and 30 are more susceptible to trauma due to higher skin tension and an increased level of collagen synthesis, which contributes to their vulnerability to hypertrophic scarring.[2]

Burns were identified as the most common cause of hypertrophic scarring in both the inpatient and outpatient clinics at Dr. Soetomo General Academic Hospital Surabaya for the period 2019–2020. In the inpatient clinic, 3 patients (37.5%) had hypertrophic scars due to burns, 2 patients

(25%) had scars postoperatively, and 1 patient (12.5%) developed scars due to trauma. In the outpatient clinic, burns were also the leading cause, with 12 patients (25%) affected. A study conducted by Gauglitz et al. found that 90% of hypertrophic scars resulting from burns were caused by hot water. In addition to burns, postoperative scarring is another leading cause of hypertrophic scars, accounting for 40% to 70% of cases. [19]

The most common locations for hypertrophic scars were found on the face and upper extremities. In the inpatient clinic, 3 cases (25% of the total scar locations) were observed on these areas, while in the outpatient clinic, 14 cases (18%) were found on the hands, and 10 cases (13%) on the face. Hypertrophic scarring on the face often results from trauma, acne scars, and ear piercings, all of which increase the potential for scar formation. Inflammation may be a key initiating factor in hypertrophic scar formation, distinguishing it from keloid scars, which are often linked with sustained inflammatory processes.[14] The face is also the area where patients are most concerned about cosmetic appearance, which may explain why many patients seek treatment for hypertrophic scarring in this region.

The least common location for hypertrophic scars was the nose, with only 1 case (1%) reported. This finding contrasts with observations made by Gauglitz et al. (2011), who identified the most common anatomical locations for hypertrophic scars as the shoulder, neck, knee, and ankle. [19]

Regarding scar size, the areas of hypertrophic scarring observed in this study varied widely, ranging from less than 0.5 cm^2 to greater than 20 cm^2. In the inpatient clinic, a large number of patients had no recorded data on scar size, with 8 patients (100%) lacking this information. Similarly, in the outpatient clinic, 29 patients (34%) had no documented scar size. However, among those with recorded data, the most common scar sizes were in the 1–5 cm^2 range, followed by scars greater than 20 cm^2.

Research by Rabello et al. has shown a correlation between scar size and the causative factors that initiate hypertrophic scarring. These scars can develop on any part of the body, but certain factors, such as burn injuries, are associated with a higher likelihood of hypertrophic scarring. Several studies also suggest that burn wounds have twice the risk of developing hypertrophic scars compared to other types of injuries.[2]

The most common therapy for hypertrophic scars in both the inpatient and outpatient clinics at Dr. Soetomo General Academic Hospital Surabaya was surgical rehabilitation. This was observed in 8 patients (80%) in the inpatient clinic and 27 patients (48%) in the outpatient clinic. The second most common therapy was the injection of triamcinolone acetonide, which was administered to 20% of inpatients and 26% of outpatients. Radiotherapy had the lowest usage, with only 1% of patients receiving this treatment.

Over the last decade, hypertrophic scars have increasingly been recognized as treatable conditions, and numerous treatment options are now available. According to Ogawa et al., the most reliable approach for treating hypertrophic scars is a combination of three therapies: radiation therapy, steroid plasters or tape, and surgical excision. Surgical treatment alone can result in scars that are often larger than the original lesion, and to minimize the risk of recurrence, certain surgical techniques such as Z-plasty, W-plasty, and subcutaneous or facial tension-reduction sutures are recommended. Steroid injection therapy is commonly effective for hypertrophic scars that range in size from 1 to 5 cm^2.[6]

In the inpatient clinic at Dr. Soetomo General Academic Hospital Surabaya, surgical excision of hypertrophic scars was the most common treatment. Similarly, in the outpatient clinic, surgical excision was also the dominant therapy. However, this finding is not entirely consistent with the recorded scar sizes. The data indicated that most outpatient cases had scars smaller than 10

cm^2, but this was influenced by the 29 patients (34%) for whom no scar size data was available.

Steroid injections, particularly with triamcinolone acetonide, were commonly used in both inpatient and outpatient clinics. This therapy was typically administered for scars in the 1–5 cm^2 range, which accounted for 25% of cases. According to Gauglitz et al., triamcinolone acetonide is the most frequently used corticosteroid for treating hypertrophic scars. It is typically administered in doses ranging from 10–40 mg/ml, with injections given every 3-4 weeks for several months until satisfactory results are achieved. In some cases, additional sessions may be required.[19]

The use of silicone gel sheets ranks third in terms of frequency of administration in the outpatient clinic at Dr. Soetomo General Academic Hospital Surabaya, with a percentage of 8%. The mechanism of action for silicone gel sheeting in hypertrophic scar therapy is that the silicone sheet allows oxygen to reach the skin surface, which helps in scar healing without blocking this essential function.[20] Some studies suggest that silicone gel and silicone gel sheets are more effective than a placebo for treating hypertrophic scars. When combined with PG, silicone gel and sheets show better results than PG alone, according to the POSAS assessment. A new silicone gel with hypochlorous acid has also been developed for scar treatment. Hypochlorous acid works as a biocide and anti-inflammatory, making it useful for post-procedure care, recent traumatic scars, or non-epithelialized skin.[21,22]

Radiotherapy is the least commonly used therapy for hypertrophic scars due to its controversial nature. Radiotherapy involves the application of superficial X-rays, which have a radiation effect on keloids and result in decreased collagen production. The total therapeutic dose of radiotherapy is typically limited to 40 Gy to minimize the risk of post-treatment side effects, such as hypo- and hyperpigmentationis revision provides better readability and a more formal tone, while ensuring the content is clear and accurately conveys the mechanism of silicone gel sheeting and the potential concerns regarding radiotherapy.[5] While some studies suggest that early postoperative radiotherapy may increase the risk of infection and wound dehiscence, others propose starting radiotherapy between 24–48 hours and 5–10 days after surgery. The present study did not show an increase in postoperative infection, possibly due to radiotherapy's effect on small blood vessel occlusion and reduced inflammatory mediators. Additionally, combining surgical resection with radiotherapy produced optimal results when administered within 24 hours after surgery. [23-25]

The novelty and strength of this study lie in its comprehensive analysis of hypertrophic scar patients at Dr. Soetomo General Academic Hospital Surabaya during the 2019-2020 period, encompassing both inpatient and outpatient populations. This study provides valuable insights into various factors such as age distribution, gender, occupation, causes, scar locations, size, and therapeutic approaches, particularly within an Indonesian context, where data on hypertrophic scars are limited. A key strength of the study is its use of real-world, retrospective data from medical records, ensuring high relevance and applicability. Additionally, the study's comprehensive dataset, which includes a robust sample size of 68 patients, allows for a thorough examination of clinical characteristics and treatment modalities. By focusing on specific causes like burns, trauma, and post-surgical wounds, as well as detailing scar size and location, the study contributes significantly to understanding hypertrophic scarring and provides practical insights for clinical decision-making and future research. The exploration of varied therapeutic options, from surgical excision to corticosteroid injections, adds further depth to the findings, making this study a valuable resource for advancing knowledge and treatment

strategies for hypertrophic scars in similar settings.

This research has several limitations that can affect this research a little hampered, such as the presence of the covid pandemic which resulted in a long data collection process and incomplete secondary data (medical records) so that some data tends to be difficult to conclude, also does not rule out the existence of some misspelled words or data.

CONCLUSION

The study findings show that hypertrophic scars are most commonly found in patients aged 17-25 years, with the majority being female. Burns are the leading cause, and the scars are most frequently located on the face and hands. Surgical techniques are the most commonly used therapy for managing hypertrophic scars. Early intervention is crucial to improving treatment outcomes, and a personalized management approach should be applied to enhance clinical results for patients at Dr. Soetomo General Academic Hospital, Surabaya. These findings also highlight the importance of developing more effective management strategies based on the clinical profile and characteristics of each patient.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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No funding was received for this study.

AUTHOR CONTRIBUTION

ARP was responsible for the conceptualization of the research, drafting of the manuscript. Data collection and analyzing data was carried out by ARP and EE. ARP, IDS, and EE, who also participated in its critical revision. All authors reviewed and approved the final version of the manuscript, ensuring its accuracy and completeness before submission for publication.

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