

**PREVALENCE OF POST MAJOR BURN COMPLICATIONS,
POSTTRAUMATIC STRESS DISORDER AND DEPRESSION AMONG HUSM
PATIENTS TREATED FOR MAJOR BURN BETWEEN 2006 AND 2016**

BY

DR SITI FATIMAH NOOR BT MAT JOHAR

**DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR THE DEGREE OF MASTER OF MEDICINE
(PLASTIC SURGERY)**



UNIVERSITI SAINS MALAYSIA

2017

Table of Contents

Acknowledgement	iv
Abstrak.....	v
Abstract	vii
Abbreviations.....	ix
List of Figures	x
List of Tables	xi
1.0 Introduction.....	2
1.1 Background of the study	2
1.1.1 Prevalence of major burn cases in HUSM.....	2
1.1.2 Complications of burn injuries.....	3
1.1.3 Psychological impairments.....	4
1.2 Justification for the study	5
1.2.1 Lack of contemporary information on post major burn complications.....	6
1.2.2 Burn sequelae.....	7
1.2.3 Post burn quality of life.....	8
1.3 Definition of key terms	8
1.3.1 Major burns.....	9
1.3.2 Burn depth.....	9
1.3.3 Burn severity.....	10
1.3.4 Complications of burn injuries.....	11
1.3.5 Psychological impairments.....	12
2.0 Study Protocol	15
2.1 Documents Submitted for Ethical Approval	16
2.2 Ethical Approval Letter.....	94
2.3 Amendment of approved study protocol.....	97
3.0 Manuscript.....	99
3.1 Title page.....	100
3.2 Abstract	101
3.3 Introduction	103

3.4 Methods.....	105
3.5 Results.....	107
3.6 Discussion.....	113
3.7 References.....	119
4.0 Appendices.....	124
4.1 Additional tables & figures.....	125
4.2 Selected journal format.....	132

Acknowledgement

First and foremost I would like to express my gratitude to the Almighty, the Sole Creator and the Most Merciful, thank you for giving me constant sustenance and blessings through my son's birth (as mentioned in Al-Israa verse number 31 the sustenance is given through the child). Despite many trials and tribulations, I managed to get through everything. This is because I believe the Almighty will pull me through all rough tides (as mentioned in Al-Baqarah verse number 286, Allah does not burden a soul beyond that it can bear).

To Mr Othman A.R (my kindred soul) and Madam Fahizah Idris (Queen of my heart), thank you for holding my hand every time I stumbled and fell. To the gentleman whom I inherited his sense of humor, your name is in my every prayer, may Allah bless your soul Mr Mat Johar. To my brothers Mr Jeffry and Mr Adha, thank you for sheltering me with your prayers. To my high spirited supervisors, Assoc. Prof. Wan Azman Wan Sulaiman, Dr Arman Zaharil Mat Saad and Dr Geshina Ayu Mat Saat, thank you for fuelling me up with knowledge and energy to shine and be the brightest star possible. To my supporting staff in HUSM and HKL, thank you for the endless support and knowledge sharing. Last but not least, thank you to those who did not believe in my study, you have made me more curious than ever and determined to prove you wrong. After all, if it is destined, it will happen (At-Talaaq verse number 3).

Abstrak

Pengenalan

Tujuan kajian ini adalah untuk mengenal pasti komplikasi luka terbakar awal dan komplikasi jangka panjang di kalangan pesakit luka terbakar teruk. Kajian ini juga menilai kesan jumlah luas permukaan badan (*TBSA*) yang mengalami luka terbakar terhadap gangguan tekanan pasca trauma (*PTSD*) dan kemurungan. Kaitan di antara *TBSA* dan kualiti hidup (*QoL*) juga akan dikaji.

Kaedah

Kajian ini adalah satu kajian keratan rentas yang melibatkan pesakit dewasa luka terbakar yang teruk dari tahun 2006 sehingga 2016. Borang soal selidik psikometrik yang telah disahkan, iaitu *Malay PTSD Checklist for Civilians* (MPCL-C), *Trauma Symptom Inventory-2* (TSITM-2), *Beck Depression Inventory-Malay* (BDI-Malay) dan *Center for Epidemiological Study – Depression scale* (CES-D) digunakan untuk menyaring *PTSD* dan kemurungan pada pesakit pasca luka kebakaran teruk. Terjemahan bahasa Malaysia *Burn Specific Health Scale – B* telah digunakan untuk menilai *QoL* pesakit-pesakit. Perbezaan purata *TBSA* dan *PTSD* serta *TBSA* dan kemurungan telah dikaji dengan menggunakan ujian *Independent t-test*. Kaitan di antara *TBSA* dan *QoL* ditentukan menggunakan *linear regression*.

Keputusan

Seramai 55 pesakit secara sukarela telah mengambil bahagian dalam menjawab bateri psikometrik. Komplikasi awal yang telah dikenal pasti di kalangan pesakit kebakaran teruk adalah gangguan tekanan akut (0.72%), kegagalan buah pinggang (0.72%), kegagalan jantung (1.08%), kegagalan pernafasan dan jangkitan (1.44%), Sindrom Tindak balas Radang sistemik (2.16%), sepsis (2.52%) dan jangkitan luka (2.88%). Komplikasi lewat yang telah dikenal pasti adalah, kecacatan kornea (0.36%), kebutakan

(0.72%), *keloid* (0.72%), kecacatan telinga (1.08%), kontraktur (5.04%) dan parut timbul (10.1%). Tiada perbezaan yang ketara bagi purata *TBSA* antara pesakit yang mempunyai *PTSD* dan tiada *PTSD* untuk kedua-dua soal selidik (*MPCL-C* dan *TSI-2*), *MPCL-C*, $p > 0.05$ dan *TSI-2*, $p > 0.05$. Walau bagaimanapun, terdapat perbezaan yang ketara purata *TBSA* antara pesakit yang mempunyai kemurungan dan tiada kemurungan untuk kedua-dua soal selidik (*BDI* dan *CES-D*). Bagi pesakit yang mengalami kemurungan berdasarkan *BDI*, purata *TBSA* adalah 17.1%, $p < 0.05$. Bagi pesakit yang mengalami kemurungan berdasarkan *CES-D*, purata *TBSA* ialah 14.7%, $p < 0.05$. Hasil kajian ini juga telah membuktikan terdapat hubungan yang ketara antara *TBSA* luka terbakar teruk dan *QoL* dengan $p < 0.05$. Berdasarkan “output” ringkasan model, variabel *TBSA* menerangkan 37.2% kepelbagaian dalam *QoL*. Ini menunjukkan, tahap *TBSA* 25% keatas mengarah kepada kualiti hidup yang rendah. Dilaporkan bahawa *TBSA* melebihi 25% mempunyai *QoL* 45.67 lebih rendah berbanding dengan *TBSA* dibawah 15%.

Kesimpulan

Kajian ini mengenal pasti komplikasi luka terbakar awal dan akhir di kalangan pesakit luka terbakar teruk melalui pangkalan data dan proforma luka terbakar dari tahun 2006 hingga 2016. Kajian ini telah menemukan dampak signifikan *TBSA* terhadap kemurungan, manakala tidak terbukti sebarang dampak terhadap *PTSD*. Penemuan kajian ini juga telah membuktikan bahawa terjadinya dampak negatif terhadap *QoL* pasca luka bakar teruk. Dicadangkan semua pesakit luka terbakar teruk disaring untuk *PTSD* dan kemurungan kerana saiz sampel asal kecil dan ia membawa kesan yang besar ke arah kesejahteraan pesakit. Kualiti kesihatan semua pesakit luka bakar teruk perlu dinilai juga, kerana ia mencerminkan hasil akhir penyembuhan secara holistik.

Abstract

Introduction

The goal of this study is to identify early and late burn complications among major burn patients. This study also evaluated the effect of total body surface area (TBSA) of burn towards posttraumatic stress disorder (PTSD) and depression. Association between TBSA and quality of life (QoL) was also identified.

Methods

This study was a cross-sectional study involving adult major burn patients from 2006 until 2016. Validated psychometric questionnaires that were used to screen for PTSD and depression in post major burn patients are, Malay PTSD Checklist for Civilians (MPCL-C), Trauma Symptom Inventory-2 (TSITM-2), Beck Depression Inventory-Malay (BDI-Malay) and Center for Epidemiological Study – Depression scale (CES-D). A Malay translated Burn Specific Health Scale – B was used to evaluate post major burn QoL. The difference of mean TBSA and PTSD as well as TBSA and depression were addressed using Independent t-test. The association between TBSA and QoL was addressed using simple linear regression.

Results

A total number of 55 patients voluntarily participated in answering the psychometric battery. Early complications that were identified among the major burn patients were acute stress disorder (0.72%), renal failure (0.72%), heart failure (1.08%), respiratory failure and infection (1.44%), Systemic Inflammatory Response Syndrome (2.16%), sepsis (2.52%) and infected wound (2.88%). Late complications that were identified include, corneal defect (0.36%), alopecia (0.72%), keloid (0.72%), ear deformity (1.08%), contracture (5.04%) and hypertrophic scar (10.1%). Results based on the MPCL-C and TSI-2, indicated that there were no significant difference of mean TBSA

between patients who has PTSD and no PTSD, MPCL-C, $p > 0.05$ and TSI-2, $p > 0.05$. However, when the results of BDI and CES-D were compared, there were significant difference of mean TBSA between patient who has depression and those who dont have depression. Based on BDI, for patients with depression; the average mean TBSA is 17.1%, $p < 0.05$. Based on CES-D, for patients with depression; the average mean TBSA is 14.7%, $p < 0.05$. There is a significant association between major burns TBSA and QoL with $p < 0.05$. Based on the model summary output, the variable TBSA explains 37.2% of the variability in QoL. This indicates, the higher level of TBSA leads to poor quality of life. For TBSA more than 25% it was reported that the QoL was 45.67 lesser when compared with TBSA less than 15%.

Conclusion

This study identified early and late burn complications among major burn patient through a burn database and burn proforma from 2006 until 2016. This study has found significant effect of TBSA towards depression, while no significant effect towards PTSD. Findings provide some evidence for poor QoL post major burn in a negative direction. It is suggested all major burn patients be screened for PTSD and depression as original sample size was small and it carries a significant impact towards patient's well being beyond physical recovery from burn. All major burn patients' quality of life should be evaluated as well, as it reflects the final outcome of healing holistically.

Abbreviations

HUSM	Hospital Universiti Sains Malaysia
HKL	Hospital Kuala Lumpur
MOH	Ministry of Health
TBSA	Total Body Surface Area
PTSD	Posttraumatic Stress Disorder
QoL	Quality of Life
MPCL-C	Malay PTSD Checklist for Civilians
CES-D	Center for Epidemiological Study – Depression scale
BDI-Malay	Beck Depression Inventory-Malay
TSI TM -2	Trauma Symptom Inventory-2
BSHS-B	Burn Specific Health Scale – Brief

List of Figures

Fig. 1. Types and number of early complications.....	110
Fig. 2. Types and number of late complications.....	111
Fig. 3. PTSD and depressions screening.....	112
Fig. 4. Trends of early complications of major burns.....	125
Fig. 5. Trends of late complications of major burns.....	125
Fig. 6. Trends of major burn causes.....	126
Fig. 7. Distribution of burn TBSA.....	126
Fig. 8. Gender distribution of major burn patients.....	127
Fig. 9. Age distribution of major burn patients.....	127
Fig. 10. Ethnic distribution of major burn patients.....	128
Fig. 11. Location of burn events.....	128
Fig. 12. Source of referral of major burn cases.....	129
Fig. 13. Cause of burn injuries in major burn cases.....	129
Fig. 14. The distribution of burn TBSA.....	130
Fig. 15. The anatomical distribution of major burn cases.....	130
Fig. 16. The distribution of burn depth.....	131

List of Tables

Table 1. Socio-demographic data and burn characters (n=278).....	108
Table 2. Association between TBSA and QoL using simple linear regression.....	113

1.0 INTRODUCTION

1.0 Introduction

This chapter highlights several preliminary information to this study. The information includes the background of the study, justification of the study and definition of terms. These subtopics are elaborated to emphasize the need and focus of the study.

1.1 Background of the study

As this study focuses on post major burn complications in HUSM, some pertinent background information and situations are described. The key background information and situations explained here are the 1) prevalence of major burn cases in HUSM, 2) complications of major burn injuries and 3) psychological impairments. It is mentioned here that all burn cases that fall into inclusion criteria regardless of being inpatient or outpatient, are included in this study.

1.1.1 Prevalence of major burn cases in HUSM

For the purpose of this study, all major burn cases were screened accordingly to inclusion criteria (section 4.1). Prevalence rates of burn etiologies presented to HUSM between the year 2006 and 2016 were plotted in the form of a trend analysis (Fig. 6 - Fig. 9 are referred). This presents an eleven year analysis of major burn cases due to mainly mishaps that occurred in Kelantan. These mishaps are largely accidental in nature, occurring in the home environment, work environment or during journeys.

Burn etiologies are divided into thermal injuries which include flame, scald and contact burn. Other than thermal injuries, there are electrical burn, chemical burn, radiation burn, laser burns and friction burns to be considered (1).

In the local setting, burn causes are categorized into scald injury, flame injury, thermal injury, chemical injury, electrical injuries and others based on the existing burn proforma.

The current HUSM burn database shows that burn cases are predominantly caused by scald injuries, followed by flame injuries. This information was extracted from the database dated between 2006 and 2016. A previous study (2) , reported that burn frequencies are as follows: 61% scald injury, followed by thermal injury 27%, electrical 10% and chemical burn 2%. This information is pertinent as it depicts the seriousness of the problem in terms of both range and degree of harm suffered. This information also indicates a need to appropriately manage cases beyond what is currently available.

1.1.2 Complications of burn injuries

Body surface burn injury, have a complex pathological course which influence various body functions (3). The burned body region will release vasoactive mediators such as kinins, glucocorticoids, prostaglandins and catecholamines (3). The outcome of these vasoactive mediators depends on which end organ was effected.

Burn injuries complications can be divided into early or late complication. The most frequent early complications of burn injuries are (3):

- lung infection or pneumonia (4.6%)
- septicaemia (2.7%)
- lung failure (2.5%)
- infected wound (2.2%)

- acute respiratory distress syndrome (ARDS) (1.2%)

Late complications also known as post burn sequelae; which come after the wound healing process is completed. As for burn scars such as hypertrophic and keloid, it is a resultant of unabated healing process also known as excess healing (4). Post burn sequelae are as listed below (1):

- Post burn scars
- Post burn contractures
- Post burn losses
- Chronic unhealed areas
- Bone and joint deformities
- Development of malignancy
- Psychological disorders

However the scope of this study only includes patients suffering from post burn scars (hypertrophic scar/keloid), contractures and psychological distress. The reason for this limited scope is that these cases are commonly encountered during clinic visits. Once late complications are identified, a patient will be treated accordingly.

1.1.3 Psychological impairments

Over the past decades, burn management has improved tremendously that survival rates increased significantly. During the postburn follow up, while assessing their physical recovery; it is also vital for the burn team to evaluate the mental and affective states of patients (5). Burn injury does not only change a person physically, but invariably causes

mental distress or psychological impairment, that may have profound long-term consequences (5).

One of the most prevalent psychological impairment in burn injuries is posttraumatic stress disorder (PTSD) (6). In 2016, Anna Giannoni-Pastor et al, revealed that PTSD prevalence at one month post injury ranged from 3% to 35%, while post injury between three and six months of injury ranged 2% to 40%, in the year of post injury itself ranged 9% to 45% and more than two years post injury ranged 7% to 25% (6). Therefore, it is crucial for the managing team to identify PTSD symptoms as it could lead to social withdrawal and lack of self-esteem which leads to poor quality of life and requiring longer medical attention.

Another psychological impairment commonly experienced by major burn victims is depression. Wiechman et al reported depression rate in burn patients as high as 54% at one month and 43% at two years (7). The current practice in Malaysia does not include screening for post-burn psychological distress, and possibly contributing to a non-holistic approach to case management. Therefore there is a need for psychosocial welfare and rehabilitation to be further developed and improved for patients (8). It is the burn team's responsibility to evaluate and to assist a patient in receiving psychological or psychiatric aid as necessary (5).

1.2 Justification for the study

Based on the above background information and situation, three justifications for the need for the study have been identified. Firstly, there is insufficient and obsolete information on local burn database, and this current study reflects upon an eleven year

trend analysis of post major burn complications in HUSM. The second justification is a lack of burn sequelae investigation beyond diagnosis of major burn physical recovery. The third justification is a need to evaluate the quality of life post major burns

1.2.1 Lack of contemporary information on post major burn complications

As evidenced from a literature search, the local epidemiology data of burns is still limited. Nine accessible materials were found for the years between 1997 and 2016 using GoogleScholar. Of these materials, the foci were on microorganism, drug-resistant genes, drug-resistant Staphylococcus. Only three articles focused on epidemiology data of burns in Malaysia (9-11).

A review on management of burn patients admitted to the Burn Units of Hospital Raja Permaisuri Bainun, Ipoh (HRPB) between 1 January and 31 December 2011, reported that burn injuries were more likely to occur in homes (66.7%) compared to industrial areas or on roads (11). Scalding due to hot liquid was the most common cause (49.6%). This was followed by flames (41.5%). Two cases of mortality were reported due to sepsis (11).

A study of burn patients' admission to Hospital Universiti Kebangsaan Malaysia from 1999 to 2001, reported that the death rate was 6.3% . Complications that were listed as contributing factors to death were inhalational injury 86%, septicemia 86%, pneumonia 57%, acute respiratory distress syndrome 57%, disseminated intravascular coagulation 40%, acute renal failure 40%, myocardial infarction 7%, cerebral vascular accident 7% and infected wound 7% . The results of the above studies are not recent. For the purpose of epidemiological monitoring and case management, contemporary

information regarding post major burn complications is definitely needed. With this current study, there will be an eleven year trend analysis of post major burn complications from 2006 until 2016.

1.2.2 Burn sequelae

Burn sequelae or late complications that are discussed here are post burn scars, contractures and psychological distress. Mirastschijski et al reported that post burn scar incidence varies between 30% and 91% depending on the predictors for severe scarring such as wound depth and total body surface area burned (TBSA) (12) . Most mutilating scarring requires secondary surgical interventions which is the scar release, with or without plastic-surgical reconstruction.

Psychological distress that are included in this study are the posttraumatic stress disorder (PTSD) and depression. In 2016, Anna Giannoni-Pastor et al, revealed that PTSD prevalence at one month post injury ranged from 3% to 35%, while post injury between three and six months ranged 2% to 40%, in the year of post injury itself ranged 9% to 45% and more than two years post injury ranged 7% to 25% (6).

Wiechman et al reported the depression rate in burn patients as high as 54% at one month and 43% at two years (7). Buja Z. et al found post burn contractures as high as 73.9%, which requires physiotherapy and surgical intervention (13). Contemporary local data regarding burn sequelae is currently unavailable, and as such with this study, there will be local data regarding burn sequelae.

1.2.3 Post burn quality of life

Physical or psychological status have been key predictors for post burn quality of life (11). Pertinent to this, an injury-specific tool has been developed by Willebrand and Kildal in order to assess burn patients' quality of life based on physical, mental, social, and general aspects, which is called Burn Specific Health Scale – B (BSHS-B) (14). If a patient has poor quality of life due to: post burn due to physical restriction, social withdrawal or psychological distress; financial burden will arise.

This is because a patient is unable to perform in society like he or she used to be able to. The end spectrum of burn management is to prepare a patient to return back to society and good functioning. Therefore, it is vital to address patients' burn sequelae concerns, in order to give the patient a good quality of life.

1.3 Definition of key terms

This section is concerned with the definition of key terms. Definition of major burns, including depth and extent of burn are elaborated. In addition, major burn complications and psychological impairments are explained further in this section.

In handling burn cases, depth and extent of burn injuries are the paramount aspect that needs to be established, via clinical judgement. The required amount of the fluid resuscitation is determined by the extent of the burn injuries itself. As described by Baxter, Parkland resuscitation formula ($4 \text{ cc} \times \text{weight in kilograms} \times \% \text{TBSA}$) provides an estimation of fluid requirement within 24 hours of burn (15).

The Lund and Browder chart as well as the rule of nines are the commonly used calculation of total body surface area (TBSA) for burned areas (15). Decisions over operative interventions or conservative management are determined by the burn depth (16).

1.3.1 Major burns

In medical terms, burns are classified according to the extent and depth (17). In this current study, only those burns, determined as major; are investigated. The main reasons for the exclusion of non-major burns is because non-major burns cause less long-term consequences in terms of physical, psychological, social, vocational, and aesthetic aspects in comparison to major burns (18).

With regards to the definition of major burns, the common terms used to determine the epistemology of burns are described here. In particular, the common terms are burn depth and burn severity. These terms need explanation as hospital personnel, patients, and the relatives of patients may not be aware of the different management needed corresponding to the diagnosis.

1.3.2 Burn depth

Burn depth is categorized into superficial, partial-thickness, and full-thickness. Partial-thickness wound is categorized into superficial and deep which reflects the layer of dermal injury (15). Superficial burn appears as erythematous skin changes and painful as it involves the epidermis layer (15). Superficial burn normally heals within three to five days and application of topical agents is acceptable to promote re-epithelialization and alleviate pain (15). Sunburns for an example is a type of superficial burn (15).

Partial-thickness burns involves all layer of epidermis and part of the dermal layer (15). Superficial partial-thickness is also a painful wound which appear as pink and moist wound (15). Scalded burns injuries for an example is a type of superficial partial-thickness wound (15). These wound typically heals within 2 weeks and normally scarless, however pigmentation alteration varies among cases (15). The antibiotic impregnated paraffin gauze is usually applied to this type of burn wound (15).

Deep partial-thickness burn injury involves the entire layer of epidermis and part of the reticular dermal layer (15). These type of burn wound does have variable of sensation and appear as dry, mottled pink to white wound (15). Typically this wound heals within three to eight weeks, provided there are presense of viable adnexal structures available (15). Usually this type of wound heal with variable degree of scarring and contractures (15).

Full-thickness burns involves the entire epidermis and the dermal layer (15). These type of wounds typically are insensate and appears as brown-black and leathery (15). Excision and grafting are the standard management for full-thickness burn, except if the wound is very small (15).

1.3.3 Burn severity

Burn severity is grouped into minor, moderate and major. The grouping is based on the extent and depth of the burn injury (17). However, the focus of this current study is on major only. The criteria for major burns are (17):

- 25% TBSA or greater
- 20% TBSA or greater in children under 10 and adults over 40 years of age

- 10% TBSA or greater full-thickness burn
- All burns involving eyes, ears, face, hands, feet, or perineum that are likely to result in or functional impairment or cosmetic defect
- All high voltage electrical burns
- All burn injury complicated by major trauma or inhalational injury
- All poor-risk patients with burn injury

1.3.4 Complications of burn injuries

Burn injury complications can be categorized into early or late complication. The most common early complications of burn injuries as mentioned before are pneumonia, sepsis, lung failure, infection of the wound and acute respiratory distress syndrome (ARDS)(19). Pneumonia is defined as inflammation of the lungs with consolidation (20).

While sepsis is presence in the blood or other tissues of pathogenic microorganisms or their toxin (20). Lung failure and ARDS are basically is a syndrome in which the respiratory system fails in one or both of its gas exchange functions: oxygenation delivery and carbon dioxide elimination (20). Whenever there is an invasion/replication of microorganisms within the wound area or body tissue, leading to cell injury and tissue damage, the wound is considered as an infected wound (20).

Late complications are also known as post burn sequelae. Post burn scars by definition is a mark remaining after the healing of a burn wound, like any other scar it can also called as cicatrix (20). The post burn scars may appear as atrophic, hypertrophic, keloid, hypopigmented/ hyperpigmented and stable scars (21).

Definition of an atrophy scar is actually diminution in the size of the scar itself (20). Hypertrophic scar is a scar formed by exuberant cicatrization that does not grow beyond the wound margin (20). Keloid is an abnormal proliferation of scar tissue that forms at the site of skin injury, it does not retrogress and develops beyond the original margins of the scar (20).

Post burn contracture is a condition of fixed high resistance to passive stretch of a muscle, resulting from fibrosis of the tissues supporting muscles or the joints, or from disorders of the muscle fibers (20). Post burn losses is a condition where the burned tissue is loss for example the ear, scalp, nose, eyebrows, nipple-areola complex and testis (21). Definition of psychological disorders are derangement or abnormality of function of a mental state (20). Beyond the physical sequelae a burn injury can also result in emotional distress and severe psychological distress (21).

1.3.5 Psychological impairments

Psychological impairments refer to the negative psychological outcomes experienced by major burn victims. The impairments may be immediately apparent or may develop over time. For the purpose of this research, psychological impairments include a wide range of negative outcomes for example posttraumatic stress disorder (PTSD) and depression.

Posttraumatic stress disorder (PTSD) is defined as a pathological anxiety that usually occurs after an individual experiences or witnesses severe trauma that constitutes a threat to the physical integrity or life of the individual or of another person (22). PTSD symptoms include (22):

- Persistent re-experiencing of a traumatic event
- Resultant numbness Avoidance
- Negative thoughts and mood or feelings
- Hyperarousal

Symptoms should be present for a minimum of one month following the initial traumatic event (22). The disturbance causes clinically significant distress or impairment in functioning (22). The disturbance not attributable to physiological effects of a substance or other medical condition (22).

The exposure must result from one or more of the following scenarios, in which the individual (22):

- directly experiences the traumatic event
- witnesses the traumatic event in person
- learns that the traumatic event occurred to a close family member or close friend (with the actual or threatened death being either violent or accidental); or
- experiences first-hand repeated or extreme exposure to aversive details of the traumatic event (not through media, pictures, television or movies unless work-related).

Depression is a form of mood disorder, it is a state of "low spirits or vitality". Persistent feelings of sadness and loss of interest in previously enjoyed activities (23). It can be divided into either endogenous (i.e., no apparent external cause) and reactive (i.e., an identifiable external cause) types (23). Types of depression are listed below (24):

- Disruptive Mood Dysregulation Disorder
- Major Depressive Disorder, Single and Recurrent Episodes
- Persistent Depressive Disorder (Dysthymia)
- Premenstrual Dysphoric Disorder
- Substance/Medication-Induced Depressive Disorder
- Depressive Disorder Due to Another Medical Condition
- Other Specified Depressive Disorder
- Unspecified Depressive Disorder

Depression criteria are listed below and reflect specific symptoms, at least 5 of these 9, should be present nearly every day (24):

- Depressed mood or irritable most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad or empty) or observation made by others (e.g., appears tearful).
- Decreased interest or pleasure in most activities, most of each day
- Significant weight change (5%) or change in appetite
- Change in sleep: Insomnia or hypersomnia
- Change in activity: Psychomotor agitation or retardation
- Fatigue or loss of energy
- Guilt/worthlessness: Feelings of worthlessness or excessive or inappropriate guilt
- Concentration: diminished ability to think or concentrate, or more indecisiveness
- Suicidality: Thoughts of death or suicide, or has suicide plan
- Anxiety symptoms that may indicate depression: irrational worry,
- Preoccupation with unpleasant worries, trouble relaxing, feeling tense, fear that something awful might happen.

2.0 STUDY PROTOCOL

2.1 Documents Submitted for Ethical Approval

2.1.1 Study Proposal

Prevalence of post major burn complications, posttraumatic stress disorder and depression among HUSM patients treated for major burn between 2006 and 2016

Student : Dr Siti Fatimah Noor bt Mat Johar

Matric No : PUM 0193/13

Programme : Master of surgery (Plastic Surgery)

Supervisors:

- 1) Prof Madya Dr Wan Azman Wan Sulaiman
(Reconstructive Science Unit)
Hospital Universiti Sains Malaysia
- 2) Dr Arman Zaharil M.Saad
(Reconstructive Science Unit)
Hospital Universiti Sains Malaysia
- 3) Dr Geshina Ayu Mat Saat
Pusat Pengajian Sains Kesihatan
Universiti Sains Malaysia

ABSTRACT

In 2013 the Ministry of Health (MOH) reported as much as 3712 burn injury patients who were admitted to government hospitals for burn care. The 2010 annual report for Non-Communicable Disease stated that death due to post burn complications in Malaysia surpassed the death due to surgical or medical complications. The purpose of this study is to determine the early and late complications of major burn injury to prevent unnecessary death or psychological distress and to evaluate patients' quality of life. Major burn patients who were treated in Hospital Universiti Sains Malaysia will be included. The existing burn proforma which will be used to documents patients' demographic information and clinical assessment. The percentage and frequency of post major burns complications will be calculated. This study also uses the Malay Post Traumatic Stress Disorder checklist for civilians (MPCL-C) and Malay translated Trauma Symptom Inventory-2 (TSI™-2) in order to screen for posttraumatic stress disorder symptoms. The Malay translated Center Epidemiological Study Depression Scale (CES-D) and the Malay translated Beck Depression Inventory (BDI-Malay) will be used to screen for depression symptoms. After screening, the difference for PTSD and depression based on TBSA will be calculated. Burn specific health scale – Brief (BSHS-B) will be utilized in this study to assess post burn quality of life. The association of severity of burn and quality of life will be identified. The results are expected to be used to generate a more comprehensive database regarding major burn patients and to determine post major burn case management needs.

1. Introduction

This chapter highlights several precursory information to this study. The information includes the background of the study, justification of the study and definition of terms. Each of the subtopic will be elaborated further to emphasize the core of the study.

1.1 Background of the study

As this study focuses on post major burn complications in HUSM, some pertinent background information and situations are described. The key background information and situations explained here are the 1) prevalence of major burn cases in HUSM, 2) complications of major burn injuries and 3) psychological impairments. All burn cases that fall into inclusion criteria regardless of being inpatient or outpatient are included in this study.

1.1.1 Prevalence of major burn cases in HUSM

For the purpose of this proposal, step one is to screen all major burn cases that fits into inclusion criteria (section 4.1). Step two is to plot in the form of a trend analysis prevalence rates according to burn etiologies presented to HUSM between the years 2006 and 2016 (Fig. 6 - Fig. 9 are referred) . This presents an eleven year analysis of major burn cases due to mainly mishaps that occurred in Kelantan. These mishaps are largely accidental in nature, occurring in the home environment, work environment or during journeys.

Burn etiologies are divided into thermal injuries which includes flame, scald and contact burn. Other than thermal injuries, there are electrical burn, chemical burn, radiation burn, laser burns and friction burns to be considered .¹⁶ In the local setting,

burn causes are categorized into scald injury, flame injury, thermal injury, chemical injury, electrical injuries and others based on the existing burn proforma.

The existing burn database shows that burn cases are predominantly caused by scald injuries, followed by flame injuries based on the existing HUSM database dated 2006 until 2016. A previous study ¹⁵, reported that burn frequencies are as follows: 61% scald injury, followed by thermal injury 27%, electrical 10% and chemical burn 2%. This information is pertinent as it depicts the seriousness of the problem and a need to appropriately manage cases beyond what is currently available.

1.1.2 Complications of burn injuries

Burn injury of the body surface have an intricate pathological process which influence numerous body functions ⁶. The body is exposed to multifactorial damage, as a result of the sudden release of vasoactive mediators from the burned body parts, including glucocorticoids, kinins, catecholamines, and prostaglandins ⁶. The outcome of these vasoactive mediators depends on which end organ that was effected.

Burn injuries complications can be divided into early or late complication. The most common early complications of burn injuries are ⁶:

- pneumonia (in 4.6% of all cases)
- sepsis (2.7%)
- lung failure (2.5%)
- infection of the wound (2.2%)
- acute respiratory distress syndrome (ARDS) (1.2%)

Late complications also known as post burn sequelae; which come after the wound healing process is completed. As for burn scars such as hypertrophic and keloid, it is a resultant of unabated healing process also known as excess healing ¹⁷. Post burn sequelae are as listed below¹⁶:

- Post burn scars
- Post burn contractures
- Post burn losses
- Chronic unhealed areas
- Bone and joint deformities
- Development of malignancy
- Psychological disorders

However the scope of this study only includes patients suffering from post burn scars (hypertrophic scar/keloid), contractures and psychological distress. The reason for this scope is that these cases are commonly encountered during clinic visits. Once late complications are identified, a patient will be treated accordingly.

1.1.3 Psychological impairments

Over the past decades, burn management has improved tremendously that survival rates increased significantly. During the postburn follow up, while assessing their physical recovery, it is also vital for the burn team to evaluate the mental and affective states of patients ¹⁸. Burn injury does not only change a person physically, but invariably causes mental distress or psychological impairment ¹⁸.

One of the most prevalent psychological impairment in burn injuries is posttraumatic stress disorder (PTSD) ². In 2016, Anna Giannoni-Pastor et al, revealed that the prevalence of PTSD ranged from 3 to 35% at 1 month of injury, 2 to 40% between 3 and 6 month of injury, 9 to 45% in the year postinjury and range 7 to 25% more than 2 years later ². It is crucial for the managing team to identify PTSD symptoms as it could lead to social withdrawal and lack of self-esteem which leads to poor quality of life.

Another psychological impairment commonly experienced by major burn victims is depression. Wiechman et al reported depression rate in burn patients as high as 54% at 1 month and 43% at 2 years ³. Therefore there is a need for psychosocial welfare and rehabilitation to be further developed and improved for patients ⁷. It is the burn team's responsibility to evaluate and to assist a patient in receiving psychological or psychiatric aid as necessary ¹⁸.

1.2 Justification for the study

Based on the above background information and situation, three justifications for the need for the study have been identified. Firstly, there is insufficient and obsolete information on local burn database, and this current study reflects upon an eleven year trend analysis of post major burn complications in HUSM. The second justification is a lack of burn sequelae investigation beyond diagnosis of major burn physical recovery. The third justification is a need to evaluate the quality of life post major burns.

1.2.1 Lack of contemporary information on post major burn complications in local setting

As evidenced from a literature search, the local epidemiology data of burns is still limited. Nine accessible materials were found for the years between 1997 and 2016 using GoogleScholar. Of these materials, the foci were on microorganism, drug-resistant genes, drug-resistant Staphylococcus. Only three articles focused on epidemiology data of burns in Malaysia (9-11).

A review on management of burn patients admitted to the Burn Units of Hospital Raja Permaisuri Bainun, Ipoh (HRPB) between 1 January and 31 December 2011, reported that burn injuries were more likely to occur in homes (66.7%) compared to industrial areas or on roads (11). Scalding due to hot liquid was the most common cause (49.6%). This was followed by flames (41.5%). Two cases of mortality were reported due to sepsis (11).

A study of burn patients' admission to Hospital Universiti Kebangsaan Malaysia from 1999 to 2001, reported that the death rate was 6.3%¹⁵. Complications that were listed as contributing factors to death were inhalational injury 86%, septicemia 86%, pneumonia 57%, acute respiratory distress syndrome 57%, disseminated intravascular coagulation 40%, acute renal failure 40%, myocardial infarction 7%, cerebral vascular accident 7% and infected wound 7%¹⁵. Unfortunately, the local epidemiology data of burns is still limited. With this study, there will be a eleven year trend analysis of post major burn complications from 2006 until 2016.

1.2.2 Burn sequelae

Burn sequelae or late complications that will be discussed are post burn scars, contractures and psychological distress. Mirastschijski et al reported that post burn scar incidence varies between 30% and 91% depending on the predictors for severe scarring such as wound depth and total body surface area burned (TBSA)¹⁹. Most mutilating scarring, requires secondary surgical interventions which is the scar release, with or without plastic-surgical reconstruction ¹⁹.

Psychological distress that will be included in this study is the posttraumatic stress disorder and depression. Anna Giannoni-Pastor et al, revealed that the prevalence of PTSD ranged from 3 to 35% at 1 month of injury, 2 to 40% between 3 and 6 month of injury, 9 to 45% in the year postinjury and range 7 to 25% more than 2 years later ². Wiechman et al reported the depression rate in burn patients as high as 54% at 1 month and 43% at 2 years ³. Buja Z. et al found post burn contractures as high as 73.9%, which requires physiotherapy and surgical intervention ²⁰. Local data regarding burn sequelae is unavailable currently, and as such with this study, there will be local data regarding burn sequelae.

1.2.3 Post burn quality of life

Physical or psychological status have been key predictors for post burn quality of life. Pertinent to this, an injury-specific tool was developed by Willebrand and Kildal in order to assess burn patients' quality of life based on physical, mental, social, and general aspects which is called Burn Specific Health Scale – B (BSHS-B) ²¹. If a patient has poor quality of life, post burn due to physical restriction, social withdrawal or psychological distress; financial burden will arise. This is because a patient is unable

to perform in society like he or she used to be able to. The end spectrum of burn management is to prepare a patient to return back to society and good functioning. Therefore, it is vital to address patients' burn sequelae concerns, in order to give the patient a good quality of life.

1.3 Definition of key terms

This section is concerned with the definition of key terms. Definition of major burns, including depth and extent of burn are elaborated. In addition, major burn complications and psychological impairments are explained further in this section.

In managing burn cases, the most important evaluation that needs to be established is the depth and extent of burn injuries. This is done via clinical judgment. The extent of the burn injuries influence fluid resuscitation as demonstrated by Parkland formula, as described by Baxter; $(4 \text{ cc} \times \text{weight in kilograms} \times \% \text{TBSA})$ which provides an estimation of fluid requirements within 24 hours of burn⁴. The depth of the burn injuries will determine whether operative interventions or conservative management is needed⁴. Currently, the commonly used calculation of total body surface area (TBSA) of burned areas is by using the rule of nines as well as the Lund and Browder chart⁴.

1.3.1 Major burns

In medical terms, burns are classified according to the extent and depth⁵. In this current study, only those burns, determined as major; are investigated. The main reasons for the exclusion of non-major burns is because non-major burns cause less long-term consequences in terms of physical, psychological, social, vocational, and aesthetic