EPIDEMIOLOGY AND PATTERNS OF TRAUMA DEATHS IN HOSPITAL UNIVERSITI SAINS MALAYSIA, KUBANG KERIAN, KELANTAN

by

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TO MY HUSBAND AND CHILDRENS

A bouquet of thanks for bringing joy and colours to my life

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LIST OF ABBREVIATIONS

AAAM	Association for the Advancement of Automotive Medicine
A&E	Accident & Emergency
AIS	Abbreviated Injury Score
ANNOVA	Analysis of One Way Variance
AP	Anatomic Profile
APACHE	Acute Physiology and Chronic Health Evaluation
BLS	Basic Life Support
CNS	Central Nervous Systems
CPI	Continuous Performance Improvement
CPR	Cardio Pulmonary Resuscitation
CT	Computed Tomography
DALY	Disability – Adjusted Life Years
EMS	Emergency Medical Services
GCS	Glasgow Coma Scale
HUSM	Hospital Universiti Sains Malaysia
ICISS	International Classification of Diseases- based ISS
IISC	International Injury Scaling Committee
ISS	Injury Severity Score
IV	Intravenous

MOF	Multiorgan Failure
MV	Motor Vehicle
P_s	Probability of Survival
PTSD	Post Traumatic Stress Disorder
RR	Respiratory Rate
RTS	Revised Trauma Score
SBP	Systolic Blood Pressure
SPSS	Statistical Package for Social Science
SIRS	Systemic Inflammatory Response Syndrome
START	Simple Triage And Rapid Treatment
TBI	Traumatic Brain injury
TRISS	Trauma and Injury Severity Score
WHO	World Health Organization

ABSTRAK

EPIDEMIOLOGI DAN CORAK KEMATIAN YANG DISEBABKAN OLEH TRAUMA DI HUSM, KUBANG KERIAN, KELANTAN

Pengenalan :

Trauma adalah masalah yang semakin meningkat dan merupakan penyebab utama kecederaan, kecacatan dan kematian di kalangan mereka yang berusia 40-an di negara membangun termasuk Malaysia. Adalah di ketahui bahawa penyelidikan tentang epidemiologi trauma sangat kurang. Objektif kajian ini dijalankan adalah untuk memeriksa epidemiologi, corak kecederaan anatomi bagi mangsa trauma dan kebarangkalian terselamat dari kematian yang disebabkan oleh trauma.

Kaedah:

Kajian retrospektif telah dijalankan keatas semua kes kematian yang disebabkan oleh trauma di Hospital Universiti Sains Malaysia dari 1 Januari 2008 hingga 31 Disember 2008. Pesakit yang memenuhi kriteria telah dipilih untuk kajian ini. Sebanyak 75 fail kes trauma telah di periksa. Setiap kes telah dianalisa menggunakan Abbreviated Inury Scale (AIS), Revised Trauma Score (RTS), Injury Severity Score (ISS) dan Trauma and Injury Severity Scale Methodology (TRISS).

Keputusan :

75 kes kematian telah dianalisa. Didapati kesemua pesakit adalah berbangsa melayu yang terdiri daripada 84% (n=63) lelaki dan 16% (n=12) perempuan. Purata umur pesakit adalah 43.0 (SD=27) tahun. Terdapat seramai 45(60%) orang pesakit berumur 55 tahun kebawah. Kecederaan tanpa tusukan (73 orang, 93.33%) lebih kerap dialami berbanding kecederaan dengan tusukan (2 orang, 2.67%). Kebanyakan kematian adalah disebabkan oleh kemalangan jalan raya 82.67% (n=62). Daripada 75 orng pesakit didapati hanya 2 orang pesakit mengalami tekanan darah rendah (SBP<90), 3 orang pesakit mengalami gangguan pernafasan (RR>29 /min atau <10/min); dan 57 orang pesakit mengalami kecederaan kepala yang serius (GCS<9) apabila tiba di hospital. Pesakit yang berumur kurang daipada 55 tahun adalah signifikan secara statistik ($GCS \leq 8$; X^2-test, df=1, $p<0.05$) mengalami kecederaan kepala yang serius berbanding pesakit yang lebih tua. Sebab utama kematian adalah kecederaan CNS 77.3% (n=58), dikuti oleh SIRS/MOF 18.7% (n=14), pendarahan teruk 2.7% (n=2) dan lain-lain 1.3% (n=1). Median ISS adalah 25 (9-54). Purata keseluruhan ISS adalah 27.6± 8.6. Apabila masa kecederaan dibahagikan kepada tiga kumpulan (akut< 48 jam; awal=3-7 hari; lewat>7hari) perbezaan RTS adalah signifikan secara statistik ($F=9.820$, $p<0.05$). Dengan menggunakan klasifikasi Trunkey didapati corak kematian adalah bersifat bimodal. Daripada metodologi TRISS, 62 (82.7%) orang pesakit mempunyai $P_s > 0.5$ dan daripada bilangan itu 41 orang mempunyai $P_s > 0.75$.

Kesimpulan :

Keberangkalian terselamat adalah didapati melebihi 80%, tetapi mangsa masih boleh meninggal dunia mungkin di sebabkan oleh kekurangan rawatan di jabatan kecemasan. Oleh yang demikian, amat penting untuk memikirkan cara terbaik bagi mengelakkan trauma, meningkatkan strategi perawatan terbaik dan menggalakkan lagi penyelidikan ke atas trauma.

ABSTRACT

EPIDEMIOLOGY AND PATTERNS OF TRAUMA DEATHS IN HUSM, KUBANG KERIAN, KELANTAN

Introductions:

Trauma is an ever increasing problem and it is the leading cause of morbidity and mortality in the under 40s age group in most developed and developing countries including Malaysia. The lack of research into trauma epidemiology is well known. The paucity of information has led to conclusion that proper epidemiological studies cannot be conducted in the absence of meaningful data. The objective of this study is to examine patterns of anatomical injury in victims of trauma death and to determine the probability of survival of trauma death patients.

Methodology:

This was a retrospective evaluation of 75 consecutive of trauma files at Hospital Universiti Sains Malaysia, of all trauma death during 1 year period, beginning 1st January 2008 until 31st December 2008. Patients who fulfill the inclusion criteria were selected for the study. Patients were analyzed for injury severity by standard scoring systems (Abbreviated Injury Scale [AIS], Revised Trauma Score [RTS], and Injury Severity Score [ISS], and Trauma and Injury Severity Scale [TRISS] methodology.

Result:

75 patients were enrolled. 84% (n=63) were male and 16% (n=12) were female and all are Malays. Mean age group was 43.0 (SD=27.0). 45 (60%) patients were younger than 55 years old. Blunt injuries 73(97.33%) were the dominant mechanism in fatal trauma whereas penetrating injuries were only 2(2.67%). Majority of trauma death was due to MVA 82.67% (n=62). Total numbers with normotensive SBP (≥ 90mmHg) versus hypotensive (<90 mmHg) on arrival were 73 and 2 patients, respectively. For normal respiration (RR 10-29/min) versus respiratory distress (RR>29 /min or <10/min); the numbers found to be 72 and 3 patients respectively. Noted 18 patient with no or only minor and moderate head injury (GCS≥9) versus 57 patients with severe head injury (GCS<9). Cross-tabulated for age, victims (<55 years) were **significantly** had a deranged cerebral status (GCS≤8; X^2-test, df=1, $p<0.05$) on arrival compare to older victims. The predominant cause of death was CNS injury in 77.3% (n=58), followed by SIRS/MOF in 18.7% (n=14), exsanguinations 2.7 %(n=2) and others 1.3 %(n=1). Median of ISS was 25 (range: 9-54). The overall mean ISS score was 27.6±8.6. There was statistically significant difference in the RTS for the three time to death groups (acute :< 48hrs; early: 3-7days; late >7 days) ($F=9.820$, $p < 0.05$). When using the Trunkey classification of immediate, early and late deaths, we found that a trend of deaths, clustering in a bimodal–like fashion when stratified according to cause of death. By using TRISS methodology, 62 (82.7%) patient had a P_s >0.5 and 41 of them were judged "frankly preventable" (P_s>0.75).

Conclusions:

Despite a probability of survival above 80%, the early management has thrown up possibilities for prevention of trauma death, improving treatment strategies and enhancing trauma research. Focus on injury prevention is imperative, particularly for brain injuries. The figures from this study, mandate further exploration of preventability issues, management improvements, and areas of clinical awareness that should be apply not only to this trauma system, but also to similar systems as general.

1. INTRODUCTION

Traumatic injury and trauma deaths have been worldwide considered a major health problem. The World Health Organization estimates that 16 000 people die every day from trauma injuries, and for every person who dies, several thousands more are injured, many of them with permanent sequelae. Injury accounts for 16% of the global burden of disease (Olivieri, 2006). According to WHO, road traffic injury is ranked ninth among the leading causes of loss of disability-adjusted life years (DALYs) worldwide, and is anticipated to rise to become the third leading cause by 2020. Thus, the main challenge for public health in this century is to decrease the burden of injuries. Injury is a disease. It has a host (the patient), and it has a vector of transmission (e.g motor vehicle, fall etc.).

Trauma is a major public health public health problem and the leading cause of death in the 12 to 45 year age group in almost all countries in the world. As it commonly affects children, adolescent and young adults, trauma results in the loss of more productive work-years than any other disease. The effects of trauma to the society manifest itself in various ways. Trauma cause lost of lives, increase health costs, loss of services and human resources. Trauma also will affect the individual in the following ways; causing pain and suffering, incapacitation, disfigurement and loss of self-esteem (Abdullah, 2002).

For example in America, injury is the fourth leading killer and the single greatest cause of death before the age of 45 years. These have made Americans more cognizant of the need for trauma systems and trauma centers. Yet, it is the everyday "unspectacular" injuries that account for nearly 150,000 deaths each year. The predominant causes of death following trauma (i.e., head, chest, and major vascular injuries) imply that the organization of trauma centers and trauma systems should be predicated on the concepts of rapid triage, diagnosis, and therapeutic intervention (Tintinalli J E, 2004).

In Malaysia, trauma is an ever increasing problem and it is the leading cause of morbidity and mortality in the under 40s age group (FJ Sabariah, 2008). Trauma also is a major cause of death among children and adolescent. For every person killed there are at least two who survive with serious permanent disabilities (Yates D W, 2000). Trauma is the third most common cause of admission to Ministry of Health hospitals following normal delivery and complications of pregnancy and childbirth, and is the fifth principal cause of death (Ministry of Health Malaysia, 2007). In terms of medically certified and inspected death, injuries accounted for about 15% of all death in the country from 1991 to 1995. Subsequently in 1997, unintentional injuries form a major cause of death due to trauma. Of these, 3,795 (60.3%) were from motor vehicle accident (Injury Prevention Consultancy Report, 2001) (FJ Sabariah, 2008). In a developing nation such as Malaysia, there are currently multiple efforts aimed at strengthening its disease burden surveillance as well as addressing issues which have been kept aside for far too long. This includes the problem of injuries, especially among children and adolescents. The impact of injury is tremendous. Age specific injury patterns are important in determining primary and secondary prevention strategies (Yee, 2006).

Mortality varied between hospitals. To reduce trauma morbidity and mortality, trauma care planning, injury prevention and systems improvement is extremely important (Kjetil Soreide, 2007). Trauma care involves a chain of services, and its effectiveness depends on quality and cooperation between each individual service. It starts from the scene of the accident and finishes with a rehabilitative therapy. A lot of measures need to be done to promote road safety and other forms of injury prevention. As a result, many lives could be saved and disabilities prevented by low-cost improvements in the care of injured persons.

Although the major impact of lowering the trauma morbidity and mortality is through prevention of injury, there is considerable evidence that early correction (resuscitation) and definitive management will result in better outcome (Cameron P R, 2002). Therefore, quality of trauma care depends on prehospital care, resuscitation in Emergency Department as well as in-hospital care. Subsequently, the increase awareness of the importance of measuring the effectiveness of the 'process' of trauma care will be an aid for development of optimal systems.

The knowledge of the epidemiological characteristics of trauma death is the backbone for trauma care planning, injury prevention and systems improvement. In addition, this knowledge serves as an extremely useful baseline for determining health policy and for writing legislation at both the local and national level (Kjetil Soreide, 2007). Determination of causes will help to create concrete measures to decrease injury fatality (Zhuravlev *et al*, 1995). For example, increase safety-belt use by front-seat occupants can reduce motor-vehicle-related injuries (Weltzer Larson, 1992). Another example is by increase the understanding of nonfatal MV backover injuries and help

guide the development of prevention strategies, such as education, environmental improvements, and changes in vehicle design might help to reduce these injuries among children.

Trauma care is often viewed as a "chain of survival", stretching from the site of injury in the field to the emergency department, to the operating theatre, to the intensive care unit, and beyond to the rehabilitation centers. How one manages the same problem will vary depending on the point of care (Soreide E *et al*, 2006).

However, in Malaysia it is well known that there is a lack of research into trauma epidemiology (FJ Sabariah, 2008). Thus, the goal of this study is particularly to collect a data on the epidemiology, pattern of injury and to determine any preventable trauma death in HUSM, Kelantan. Patient will be analyse for injury severity by standard scoring systems (Abbreviated Injury Scale [AIS], Revised Trauma Score [RTS], Injury Severity Score [ISS] (Baker SP; O Neil B, 1974), and the Trauma and Injury Severity Scale [TRISS] methodology). The primary aims of this study are to document the demographic factors, the predominant injury mechanisms and severity, the causes of death, and the time distribution from injury to death after trauma. So that, this reliable data can be use for planning current and future trauma care in Kelantan specifically and in Malaysia generally.

2. LITERATURE REVIEW

2.1 Definition of Epidemiology

The term 'epidemiology' is derived from the word "epidemic" which means 'among people' and "logy" mean 'to study'. So, epidemiology refers to the study of the variation in human environment and state health. It also gives the information about distribution and magnitude of diseases in human population at a place. In other words, **epidemiology** is the study of patterns of health and illness and associated factors at the population level. It is the cornerstone method of public health research, and helps inform evidence-based medicine for identifying risk factors for disease and determining optimal treatment approaches to clinical practice and for preventative medicine. It is the field of medicine dealing with the determination of specific causes of localized outbreaks of disease for example, infection, toxic poisoning, or other disease of recognized etiology.

WHO (World Health Organization) define epidemiology as the study of the distribution and determinants of health-related states or events (including disease), and the application of this study to the control of diseases and other health problems. Various methods can be used to carry out epidemiological investigations: **surveillance and descriptive studies** can be used to study distribution and **analytical studies** are used to study determinants.

In this study, epidemiology can be defined as the study of the relationships of various factors determining the frequency and distribution of trauma death. It studies of how often trauma deaths occur and why. This epidemiological information is used to plan and evaluate strategies to prevent trauma death and as a guide to the management of trauma patients in Kelantan specifically and in Malaysia generally.

2.2 Trauma

Trauma is a physical harm or damage to the body resulting from an exchange of chemical, mechanical, thermal or other environmental energy that exceeds the body's tolerance. The term trauma and injury are interchangeable. Commonly, trauma deaths can be major subdivide into homicide, suicide and unintentional. The latter term is referred to accidental, which means that injuries occur by chance and cannot be prevented (Soreide *et al*, 2006). Trauma has been a significant cause of death and disability throughout history (Wilkinson, 2009).

Trauma is also can be defined as severe physical injury resulting from dissipating of energy to and within the victim, caused by a penetrating and blunt mechanism. The anatomic injury and subsequent physical derangement depend on the location of the injury and the amount of energy dissipated. In general, widely used divisions are found in the pattern of injury: blunt versus penetrating; intentional versus unintentional; high energy versus low energy, and so on (Andrew BA, 2002).

In other words, **Trauma or injury** refers to "a body wound or shock produced by sudden physical injury, as from violence or accident. Other definitions include: "a deeply distressing or disturbing experience (Soanes C, 2005) and "a physical wound or injury, such as a fracture or blow (Martin, 2010). Major trauma defined by an Injury Severity Score of greater than 15 (Soreide, 2009) can result in secondary complications such as circulatory shock, respiratory failure and death. Resuscitation of a trauma patient often involves multiple management procedures.

Trauma is the fifth leading cause of death worldwide, accounting for 10% of all mortality, and is a serious public health problem with significant social and economic costs. Approximately 50 million people die in the world each year. It has been estimated that approximately 10 % of this global mortality is attributable to trauma; for example, 5.1 million people died from injuries in 1990 (C Murray, 1997). Approximately 0.9 million of these trauma deaths are recorded in the WHO registered statistics. In majority of the countries submitting data to the WHO, heart disease and malignant neoplasm are the top two causes of death. Trauma ranks usually from third to fifth place, along with cerebrovascular disease and respiratory disease (Council, 1995).

Trauma can be divided into blunt or penetrating trauma. Most cases of blunt trauma are caused by motor vehicle accidents (Prima, 2009) another example of blunt trauma is falls. In most cases a fall of greater than three times the victim's height is defined as a severe fall (Dickenson ET, 2009). Penetrating trauma is caused when a foreign object such as a bullet or a knife enters a tissue of the body, creating an open wound. In the United States, most deaths caused by penetrating trauma occur in urban

areas and 80% of these deaths are caused by firearms (Mitchell, 2005). Blast injury is a complex cause of polytrauma. It commonly includes both blunt and penetrating trauma and may also be accompanied by a burn injury.

By identifying risk factors present within a community and creating solutions to decrease the incidence of injury, trauma referral systems can help to enhance the overall health of its population (Coimbra, 2007). Ingestion of alcohol and illicit drugs are risk factors for trauma, particularly traffic collisions, violence and abuse. Long-acting benzodiazepines increase the risk of trauma in elderly people (Calland, 2008).

People who have suffered trauma may require specialized care, including surgery and blood transfusion. Outcomes are better if this occurs as quickly as possible thus the so called golden hour of trauma. This is not a strict deadline, but recognizes that many deaths which could have been prevented by appropriate care occur in a relatively short time after injury as shown by the fact most deaths by trauma occur in the first several hours after the event (Davis, 2009). Community-based trauma referral systems seek to decrease overall injury-related morbidity and mortality and years of life lost within a population by ensuring the provision of optimal care during both the acute and late phases of injury (Coimbra, 2007). Such systems have been established in many places to provide rapid care for injured people. The organized trauma systems are important to reduce the death from physical trauma. The care of acutely injured people is a public health issue that involves bystanders and community members, health care professionals, and health care systems. It encompasses prehospital assessment and care by emergency medical services personnel, emergency department assessment, treatment, and