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Burn disasters in the middle belt of Ghana from 2007 to 2008 and their consequences

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ARTICLE INFO

Article history:
Accepted 23 March 2010

Keywords:
Burn disaster
Mortality rate
Total body surface area
Disability

ABSTRACT

Aim: To study the survival and mortality trends in four fire disasters in the middle belt of Ghana from 2007 to 2008 and to explore measures that could minimize the risk of future disasters.

Methods: Data were collected from clinical records from the Burns Intensive Care Unit and the Casualty Unit of the Komfo Anokye Teaching Hospital, Kumasi, Ghana and from the various disaster sites and the Ghana Police Service.

Results: A total of 212 were injured from four burn disasters; 37 (17%) died on the spot; 175 (83%) reported to the Casualty Unit out of which 46 (26%) were admitted. The victims admitted had mean age 24.6 years with male to female ratio 2.3:1; 25 (54%) of the admitted victims died. The average burned surface area of the admitted victims was 63%, with a mean survival rate of 46%. Statistical analysis for mortality when the surface area of the burn was >70% was 0.0005 (P-value).

Conclusion: The four petrol-related fire disasters showed variable mortality rates. Death and severe disability of victims of future disasters can be avoided if intensive road accident preventive measures and massive public education are encouraged.

1. Introduction

Burns and their sequelae are responsible for significant mortality and morbidity worldwide, especially in developing countries [1,2]. Petrol-related fires, caused by an overturned fuel tanker, are particularly common in developing countries, where transport systems are poor, law enforcement for traffic violations is weak, emergency response services are limited, public resources devoted to fire fighting are few and knowledge about fire safety amongst the general public is low. A burn disaster in this context is a catastrophe caused by petrol-related fire which claims human lives or causes trauma to the affected individuals within a period of time.

Fuel-related accidents do not happen by chance. It is a chain of events that eventually end up in the accident, a disaster in this case. If the chain is broken in any way, an accident will not occur. Some of the events that cause accidents may be preventable, while others may not. If just

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0305-4179/$36.00
doi:10.1016/j.burns.2010.03.017

one of the avoidable events is prevented from occurring, no accident will happen. Fire-related burns represent an extremely stressful experience for both the burn victims as well as their families. An extensive burn profoundly affects the patient's physique, psyche, financial situation and family. Patients with extensive burns frequently die, and for those with lesser injury, physical recovery is slow and painful. In addition to their dramatic physical effects, burn injuries frequently cause harmful psychological complications [2].

In developing countries burns are much more common (exact numbers are difficult to determine) than in the USA and Europe [3] or other affluent developed countries due to poverty, overcrowding and illiteracy [1,4]. Globally, fire-related burns are responsible for about 265,000 deaths annually [5]. Over 90% of these fatalities occur in developing countries with south-east Asia alone accounting for over half of fire-related deaths [4,6]. India for instance, with a population of over 1 billion, has 700,000–800,000 burn admissions annually [4]. There are approximately 1500 severe burns cases in Ghana each year, and a sizeable fraction of these burns occur in large-scale disasters caused by petrol-related fires. Petrol-related fires, such as those instigated by an overturned fuel tanker, are particularly common in developing countries [7]. In Kenya, on 31st January 2009, a tanker with approximately 30,000 l of fuel overturned, caught fire and exploded, killing more than 90 local residents who were siphoning the petrol [8].

The management of burns and their sequelae, even in well-equipped, modern burn units, remains demanding despite advances in surgical techniques and development of tissue-engineered biomaterials available to these burn centres [9]. Difficulties experienced in burn management are amplified many times in developing countries [1] and lack of government initiative and low literacy rates preclude effective prevention programmes [4]. The cost of managing burns is invariably high [10]. It is a fact that countries with sound economies as depicted by the gross national product per capita tend to have a better health status. Related to the economy is health expenditure, which is also likely to have an impact on health status [11,12]. Poor facilities and health structures are a common denominator in most parts of the developing world. Most existing burn centres are situated in large cities and are insufficient for the high incidence of injuries [4]. Regardless of inadequate physical structures, these centres are invariably plagued with lack of resources, lack of operating time and shortage of blood. Often there are few dedicated burn surgeons and it is mostly general surgeons without formal training who are involved in burn care [4]. Burn nursing is also not a recognized concept [4]. Resuscitation is often delayed as patients have to travel long distances and transport facilities are poor [4,13].

Ambulance and pre-hospital services are nonexistent [13]. Despite the reported annual increase in expenditure for burn care in a large number of developing countries and improving conditions of existing burn centres, burn management remains particularly inadequate in rural areas [1]. Moreover, there is generally no coordination between district hospitals and tertiary burn centres [4].

Burns are quantifiable and pathophysiologic derangement is related to the size of the injury. The surface area of a patient's palm is approximately 1% of their total body surface area and provides a quick estimate of burn size in smaller injuries. Typically, burn size estimations are derived from the ''Wallace's Rule of Nines'' [14]. The body's surface is divided into areas of roughly 9% each, which includes the head and neck, the chest, the abdomen, the upper back, the lower back, each lower limb and each upper limb; the perineum is rated as 1%. Although useful in adults, the ''Rule of Nines'' overestimates burn size in children. The head and neck account for a larger proportion of the total body surface area (TBSA) in children, more than 21% BSA in toddlers and babies. For greatest accuracy and reproducibility, burn size should be determined by plotting the burn wound on Lund and Browder burn diagrams [14]. A major burn is defined as greater than 25% BSA involvement (15% in children), or more than 10% BSA full-thickness involvement. Major burns require aggressive resuscitation, hospitalization and appropriate burn care. Additional criteria for major burns include: deep burns of the hands, feet, eyes, ears, face or perineum; inhalation injuries; and electrical burns. Moderate thermal burns of 15–25% BSA or 3–10% BSA full-thickness, often require hospitalization for optimal patient care. Other criteria for admission include concomitant trauma, significant pre-existing disease and suspicion of child abuse. Minor burns can generally be treated as out-patients [14].

A careful study of burn survival and mortality trends in these four disasters is presented in this paper. The aim is to make a critical analysis of survival and mortality in Komfo Anokye Teaching Hospital (KATH)-Burns Intensive Care Unit (BICU) of the Reconstructive Plastic Surgery and Burns Unit with a view to explore measures that could minimize the risk of future disasters and improve treatment for victims.

Table 1 – Age distribution of the victims.

Age (years)	Frequency	Percent
0–9	2	4.3
10–19	11	23.9
20–29	22	47.8
30–39	9	19.6
40–49	1	2.2
50–59	1	2.2
Total	46	100.0

Table 2 – TBSA distribution of the victims.

TBSA (%)	Frequency	Percent
<10	1	2.2
11–20	3	6.5
21–30	1	2.2
31–40	6	13.0
41–50	7	15.2
51–60	4	8.7
61–70	4	8.7
71–80	6	13.0
81–90	4	8.7
91–100	10	21.8
Total	46	100.0