

THE OVERALL PATTERNS OF BURNS

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SUMMARY. Burn patterns differ across the whole world and not only in relation to lack of education, overcrowding, and poverty. Cultures, habits, traditions, psychiatric illness, and epilepsy are strongly correlated to burn patterns. However, burns may also occur because of specific religious beliefs and activities, social events and festivals, traditional medical practices, occupational activities, and war.

Keywords: electrical flash burns, traditions, white phosphorus, Gaza siege

1.1 Burns related to habits and traditions^{1,2}

1.1.1 Tanning

Young people (mainly women) use psoralen (either topically or systemically) followed by ultraviolet exposure in an intent to enhance sun tanning. This may result in extensive second-degree burns.³

1.1.2 Cooking / eating / drinking habits

In the Far East, people eat using chopsticks. Steel chopsticks are popular in Korea. Paediatric electrical burns have been reported when young children insert the steel chopsticks into an electric wall socket, according to Lee et al.⁴ reporting on chopstick burns treated in a burns unit in Korea.

Barbecue burns mainly occur during the summer months and usually affect young adults and children.^{5,6} *Flambé* burns are also well-known burns related to eating habits. *Flambé* (i.e. flaming) entrées, desserts, and drinks are served in elegant restaurants in western countries. Although this practice is usually carried out by experienced waiters, burns have been reported both to patrons and to the waiters themselves.⁷⁻¹¹

1.1.3 Lighting

At night in rural villages, a home-made chimney containing kerosene oil is commonly used as a source of light. The kerosene chimney tragedy in Rajasthan (India) is well known in the literature.

1.1.4 Heating

The “sandal” is an ancient, primitive heating device

that is still used by both poor and rich people in mountain areas in Middle Asia. A hole for some specially prepared live coals is made in the floor in the central part of the room. A square wooden table is placed over this hole. In cold weather, people of all ages sit around the table (the “sandal”). Unsupervised toddlers may crawl or fall into the coals and suffer severe burns.^{12,13}

In Spain, “ember” burns are common in rural areas, with one study reporting on 162 patients.¹⁴ The family burns olive trees or evergreen timber to produce incandescent residues (known as *brasas* or embers). These residues remain alight and undergo slow combustion and are then used for heating. Sheets may catch fire from the hot embers and infants may crawl into them.

“Kangari” burns and “kangari” cancer are well known in India. A kangari is a portable earthenware charcoal brazier, used for personal warmth during the winter in Kashmir. It is usually kept close between the legs while squatting on the ground. Repeated exposure results in erythema to the inner thighs and lower abdomen. Later on, skin cancer develops at these sites.¹⁵

In the developed countries, gas fires¹⁶ and domestic central heating radiators¹⁷ are steadily increasing forms of domestic heating. Contact burns are known to occur owing to these devices. A full-thickness burn may occur in less than one second at this temperature, and this kind of contact burn can occur in both adults and children. Scrambling over radiators is the predominant mechanism of injury in school-age children. The main causes in adults and the elderly are loss of consciousness, epilepsy, and vasovagal attacks.

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1.1.5 Dowry and suttee (or sati) burns and marital traditions

These burns are well known in India. After marriage, if the wedding gifts (the dowry) are considered 'inadequate', the wife is set on fire (usually after kerosene has been poured over her body). Burns due to this practice are known as 'dowry' burns. In 'suttee' burns, the wife throws herself onto the burning body of the deceased husband. Both traditions are the frequent cause of major burns with high mortality.^{18,19}

1.1.6 Drug addiction habits

Butane gas, which is widely available as cigarette lighter fluid, causes euphoria and hallucinations. The flammable gas results in facial burns in sniffers.²⁰

Nitrous oxide is marketed in steel cylinders as a pressurized liquid gas. Sniffing nitrous oxide directly from the cylinder makes the user disoriented, and the cold gas results in frost bite of the cheek.²¹

1.1.7 The street soccer game tradition

In many developing countries, children and adolescents frequently play (barefoot) in the street. 'Car-tyre' friction burns are seen in this population. When the car tyre impacts on a child's foot, the driver will usually try to stop the car, resulting in a friction burn to the foot as well as shearing and avulsion of the skin. Most cases are treated by debridement and grafting, although severe cases may require flap coverage.^{22,23}

1.1.8 The tradition of aesthetic skin branding

Branding is a form of body art wherein third-degree burns are inflicted on the skin to produce permanent scars. The process can be performed through the use of electrocautery, chemicals, and freezing or hot metal.

1.1.9 Traditional Arabic depilation (Halaawa)

Halaawa "sweetness") is a wax mixture so called because it is sugar- and/or honey-based. Most women in Middle Eastern countries still make Arabic wax as an all-natural hair remover. Preparing the sugar wax requires mixing and boiling the ingredients (sugar and/or honey, lemon juice, water). Sometimes women do not wait until the mixture cools and apply it to the skin while still very hot, causing a superficial contact burn. One young female patient was admitted to the Al-Shifa burn unit because of second-degree face burns and first-degree burns in the genital and pubic area covering about 4% TBSA. A urinary catheter was inserted. The burn occurred when the woman was applying hot wax to her skin.

1.1.10 Burns suffered while swimming in the Mediterranean Sea

Envenomation due to the Mediterranean jellyfish

(*Rhopilema nomadica*) sting is very common, with an estimated 10,000 cases every summer in Australia alone.²⁴ Envenomation by *R. nomadica* is considered much less toxic than the sea wasp (*Chironex fleckeri*). The majority of jellyfish toxins contain a complex mixture of polypeptides and proteins,²⁵ including catecholamines,²⁶ histamines,²⁷ hyaluronidases,²⁸ fibrolyns,²⁹ kinins,³⁰ phospholipases, plus various haemolytic, cardiotoxic, and dermatonecrotic agents.³¹ Diagnosis is based on the clinical presentation, which typically is akin to that of chemical burns, which can be either local or generalized. Local reactions are characterized by a painful, pruritic, erythematous dermatitis at the site of the sting which may be papulovesicular haemorrhagic or necrotic.²⁷ Generalized reactions include symptoms of weakness, headache, vomiting, muscle spasms, fevers and chills, difficult breathing, and anaphylactic shock. Rare cases have been reported of paralytic ileus, Mondor's disease, and upper limb ischaemia.

In the summer many people turn to us at the Al-Shifa burns centre for medical advice after burning themselves while swimming in the sea.

1.2 Burns occurring during religious activities

1.2.1 "Shabbes" burns

This is a unique scald burn that occurs among Jewish Orthodox children. The injury occurs between Friday and Saturday evening, which is the time of the Jewish Sabbath ('Shabbes' in Yiddish). The Sabbath heater boils the water for a shower and injury occurs when the heater is accidentally pulled onto the person.³²

1.2.2 Foot burns during Friday mass and pilgrimages to Mecca

Before entering a mosque, Muslims leave their slippers outside. After mass the slippers may have been displaced. Standing or walking barefoot in the street during the hot summer may result in burns of the sole of the foot, especially in diabetics with peripheral neuropathy.³³

1.2.3 Camphor burns of the palm of the hand

In some Indian communities the practice exists of presenting requests to the gods. Devotees first have to fast for a few days and they then spread camphor on their palms and set it on fire.^{34,35}

1.2.4 Ritual burns in the Buddhist tradition

The mystic significance of fire is common in many religions. In Buddhist communities acts of self-mutilation by burning reflect a tradition whose direct precedent is set down in the ancient scriptures of the Lotus Sutra. Burns are produced by contact with incense and treated with oil and vegetable dressings.³⁶

1.3 Burns occurring during social events and festivals

1.3.1 Fireworks-related burns

Fireworks are widely used in most countries during national holidays and traditional festivals. Hand burns are commonly seen in users of the fireworks and the injury rate is highest among boys aged 10 yr.

1.3.2 Halloween "Egyptian Mummy"

The eve of All Saints' Day is celebrated, as Halloween, the night of 31 October every year. It is the day when for fun people dress up as ghosts. In the United Kingdom, teenagers like to wrap themselves up in toilet tissue paper from head to toe, looking like an Egyptian mummy. This outfit easily catches fire from nearby lighted candles, leading to burns that can be extensive and full-thickness.³⁷

1.3.3 Chinese mid-autumn festival burns

The mid-autumn festival dates back to the Mongol Dynasty in China. The people wanted to overthrow the corrupt government. The revolution occurred on a full-moon day in mid-autumn. Lighted lanterns were used as signals for the revolution. Traditionally, the lanterns are lit with a candle inside. The candle can easily tip over and lanterns catch fire.

At the end of the festival, teenagers boil the wax from candles in a pot over a fire and then pour cold water onto the boiling wax. Hot wax and water droplets shoot up 20 to 30 ft and burn the bystanders.³⁸

1.3.4 The Turkish "flying toy balloon"

Normally helium is used to inflate the flying toy balloons that one sees at parties and festivals. In Turkey, acetylene gas was once preferred to helium because it was cheaper, but acetylene is a highly flammable gas that can explode and cause severe burns.³⁹

1.4 Burns related to practice of traditional medicine

1.4.1 Garlic burns

The application of crushed garlic to a site of local pain is a well-known remedy and is practised by 'naturopathic physicians' worldwide. Garlic contains diallyl disulphide' and alliline. After long periods of exposure these compounds cause chemical burns.

1.4.2 Middle Eastern "cupping"

Cupping, a practice observed mainly by Middle Eastern societies, involves applying cups on the back, which contain a piece of burning cotton. The burned cotton from the cup may spread over the user's back and catch fire.⁴²

1.4.3 Vinegar burn (acetic acid)

Acetic acid, the chief acid in vinegar, is used as an

alternative medicine in most Arab countries as a topical treatment for all kinds of warts. Acetic acid can cause serious deep dermal chemical burns. A young male patient was admitted to the Centre with deep chemical burns on his fingers and signs of ischaemia on his left fourth and fifth fingers, caused by ten applications of acetic acid - which can be bought from any spice dealer - to treat his warts. The middle and distal phalanges of both fingers had to be amputated.

1.4.4 Vietnamese "coining"

Coining or coin rubbing is an ancient Vietnamese folk remedy to treat minor ailments. It involves the application of hot mentholated oil to the back, chest, and shoulders. A coin is then vigorously rubbed on the body. Minor and major burns resulting from this practice have been reported.⁴³

1.5 Self-immolation related to socioeconomic, cultural, epileptic, and psychiatric patterns

Self-immolation accounts for approximately 1% of all suicides in high-income countries (Western Europe and the United States) but this statistic is much higher in many low-income countries. Self-immolation has been reported to account for up to 40% of suicides in some areas of the developing world and accounts for 71% of suicides in specific areas.⁴⁴⁻⁴⁶ In most low- and middle-income countries, young and adolescent women are overrepresented among self-immolation cases, while in high-income countries self-immolation occurs most often among older men. Whereas adjustment disorders are the most prevalent predisposing psychiatric factor in Iranian and other non-western surveys, those from the western world tend to report major depressive disorders, psychoses, and addictions as the psychiatric conditions most frequently related to self-immolation.⁴⁵

Patients with epilepsy may sustain serious burns, typically affecting the trunk, legs, arms, and buttocks when a seizure occurs while showering.

1.6 Burns related to occupational activities and the lack of preventive measures

1.6.1 Electricians flash burn in Gaza

Problems with electricity are still persistent in Gaza today, and have been so for five years since the city has been under Israeli siege, since 2007, while at the same time Israel controls Gaza's electricity as insufficient fuel is provided for the generators. According to the Gaza-based Palestinian Center for Human Rights, more than 200,000 Palestinian families in the Gaza Strip have been suffering from power outages for 16 hours a day, and this places a heavy burden on the Electricity Company in Gaza, which has no central control room to monitor and manage the flow of electricity. Whenever it is necessary to redistribute electricity to share out the power cuts, technicians have

to proceed to a substation and pull a switch manually. The switches are designed to be activated once a year for maintenance, but they are currently being used five times a day. Consequently, a significant proportion of patients admitted to our burns centre present burns due to electrical switchboard explosions. These injuries were all flash burns associated with low-voltage current.

It was only recently that we began to collect general burn patient data treated in the Al-Shifa Burn Center and therefore, prior to the year 2010, we do not know the exact number of patients admitted to our burns unit. We started to collect data about flash burn patients in 2011.

In April 2011 two young male patients were admitted to the Al-Shifa Burn Unit with electrical flash burns. Both patients presented first- and second-degree burns to the face, neck, upper limbs, and chest wall. Burn extent ranged from 12 to 18% TBSA. Both patients had an ophthalmological examination no eye injuries were found.

1.6.2 Generator-related burns

As a result of rolling blackouts, Palestinians in Gaza have resorted to installing emergency generators in their homes, many of them of poor quality, in a desperate bid to be able to cook, wash, and have water to drink. Generators have become part of the furniture in many homes in Gaza, but people are not aware of the dangers involved and have inadequate knowledge of the correct use of generators. Many other Gazans have lost their lives as a result of handling generators in a hazardous manner. In the last two-year period, 15 patients died because of fires caused by gas explosions and hundreds more were seriously injured. These accidents happened when people smoked a cigarette near the generators or refuelled them while still standing on the blocks or blocking the airways in some way.

At the Al-Shifa Burn Unit, there are at least two cases every month of children burned by the plug wire of an electric generator and admitted for hand or finger debridement, having sustained third-degree hand and finger burns.

1.6.3 Gaza Strip tunnels

These tunnels were dug under the Egypt-Gaza Strip separation barrier which separates Egypt from the Gaza

Strip. Since 2007, Israel has imposed a very tight siege on the Gaza Strip, preventing anyone from entering the Gaza Strip and has blocked the importing of building materials and most kinds of goods. Tunnels provided a solution to the Gazans' needs. We have admitted to our Centre many tunnel workers with open fire burns suffering from extensive, deep, inhalation burns; the majority died. These burns occurred when a tunnel worker lit a cigarette, causing the explosion of residue gas, or when cables inside the tunnel shortcircuited.

1.7 Burns related to war at Gaza (Gaza massacre)

In January 2009 Israel violated international laws and conventions and used white phosphorus. Many of the victims were children and adults. White phosphorus (WP), also known as Willy Pete, is used for signalling, screening, and incendiary purposes. WP is a colourless to yellow translucent wax-like substance with a pungent, garlic-like smell.⁴⁷ The form used by the military is highly energetic (active) and ignites once it is exposed to oxygen, extinguishing only when deprived of oxygen or totally consumed.⁴⁸ Such heat is produced by this reaction that the element bursts into a yellow flame and produces a dense white smoke. White phosphorus results in painful chemical burn injuries.⁴⁹

Several burn patients were admitted to the Al-shifa Hospital Burns Unit during wartime with deep, extensive dermal burns due to exposure to an incendiary white phosphorus shell. Patients with extensive and inhalation burns died; survivors were subjected to debridement and skin grafting in our burn unit; and today, three years after the Gaza war, we are still following up the victims in order to establish whether there are any long-term complications of white phosphorus burns.

Conclusion

The literature on burns is full of isolated case reports and limited case series of burns related to a specific pattern. This review summarizes all these unique burns. Knowledge of burn patterns leads to the implementation of preventive measures, raises awareness of the suffering of poor societies, alleviates the state of siege in countries such as Palestine, and helps to reduce the incidence of burns.

RÉSUMÉ. Les typologies des brûlures varient de pays en pays et non seulement en ce qui concerne le manque d'instruction, le surpeuplement et la pauvreté. Les cultures humaines, les habitudes, les traditions, les maladies psychiatriques et les troubles de l'épilepsie manifestent une corrélation étroite avec ces typologies. Toutefois, les brûlures peuvent être également causées par les croyances et les activités religieuses, par les événements sociaux et les festivals, par les pratiques médicales traditionnelles, par les activités professionnelles et par la guerre.

Mots-clés: brûlures électriques éclair, traditions, phosphore blanc, siège de Gaza

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