Burns due to flaming alcoholic beverages in the UK:
A mini series and experimental study

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A R T I C L E   I N F O

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1. Introduction

Alcohol has contributed more than any other substance to the burden of burn care worldwide, largely by virtue of its intoxicating effects after ingestion. Alcohol however can cause burns by other methods, if used carelessly in certain environments. Contemporary bars serve various forms of flaming drinks, usually made with very high-proof alcohol. The drinks are lit and then served, sometimes by the bar staff as part of a 'show', but mostly by intoxicated revellers showing off to their friends. These drinks are almost exclusively consumed by individuals who are already under the influence of alcohol with delayed reaction and risk assessment abilities. In this manuscript, we investigate the basic combustion characteristics of spirits required to allow flaming beverages, present four cases of burns caused by flaming alcohol drinks resulting in total burn surface areas of up to 25%, and make public health recommendations. These potentially life threatening injuries are readily preventable, but there is concern that these burns may become more prevalent with recent legislative changes to allow 24 h drinking in the UK.

2. Case 1

A 29-year old woman was admitted as an emergency to our burns unit having sustained burns to the mouth, face, neck and shoulder following a night socialising with friends. She had been attempting to drink a high alcohol spirit which had been purposefully ignited. The shock of the heat touching her lips, caused her to jump, spilling the burning drink over herself. On arrival at hospital she was assessed as having 6% superficial and superficial dermal burns (Fig. 1). No intra-oral burn was identified. The burn was debrided with saline swabs and dressed with paraffin tulle and silver sulphadiazine ointment. She was discharged two days after admission and successfully managed as an out-patient.

The burn was healed by day 12. At follow-up nine months later, the patient was troubled by mild residual hyperpigmentation which affected her choice of clothing.

3. Case 2

A 17-year old woman sustained 25% burns to her left arm, leg, chest and abdomen whilst on holiday. The woman was sitting in front of the barman as he poured a flammable drink onto the bar and set it alight as part of a 'show'. The flames ignited her summer clothing. She sustained mixed superficial and partial thickness burns which caused pain, morbidity and a truncated holiday. The burns were treated conservatively abroad before being brought back to mainland UK. The wounds were healed within two weeks of conservative management.
4. Case 3

A 22-year old woman sustained 1% superficial dermal injury to her face, nose and lips whilst attempting to drink her ignited alcoholic shot. The burns were managed conservatively and were healed within two weeks.

5. Case 4

A 24-year old man was using a handheld gas lighter to ignite drinks in a night club. A burst of flaming alcohol caught his face and right hand causing a 5–6% burn. He was assessed in the admitting accident and emergency unit as having sustained an airway burn (singed nasal hairs, lip swelling, facial oedema) necessitating intubation prior to transfer to our regional burns centre. Following transfer to the intensive care unit, his burns were managed conservatively. He remained ventilated for three days until the facial oedema had subsided. The wounds healed well with conservative management only.

6. Experimental observation

In order to ascertain some basic combustion characteristics of the spirit required to allow flaming, a simple dilution and surface area experiment was carried out. Having first determined the broad threshold for sustained combustion, laboratory grade absolute ethyl alcohol was diluted in distilled water to give 1% increments between 36% and 44% alcohol by volume. These dilutions were placed in a 60 ml pyrex beaker to imitate a typical “shot” glass, (surface area: 20 cm²) at 20 °C and ignition attempted with household matches. Alcohol at ≥41% allowed sustained combustion in the pyrex beaker, whereas concentrations of ≤40% did not. When the 39% and 40% dilutions were placed in a pyrex bath with a much greater surface area (surface area: 370 cm²), to allow surface wetting, combustion was sustained.

7. Discussion

The contribution of alcohol in the overall picture of burn aetiology and management is both direct and indirect. The association between alcohol consumption/dependency and burns is accepted and well documented [1–3] and can be considered an indirect causal agent. Alcohol combustion as a direct physical agent of causation is equally well recognised. Alcohol lamps, [4] surgical skin preparations [5–8] and after-shave, [9] all of which contain high levels of ethyl alcohol, have all been reported in the burns literature. Burns caused by flambé foods and beverages [10] and flaming alcoholic beverages [11–13] have been previously reported, and we feel our mini series from the United Kingdom, plus experimental observations merit dissemination.

Our simple experimental observations confirm that spirits, in a typical glass will combust at approximately 41% of ethyl alcohol. However, increasing the surface area with the probable effect of increasing evaporation, can decrease the concentration required for combustion to approximately 39%. This observation is put into traditional effect in many restaurants and households in the form of flambé dishes. The mechanism of burns which arise can depend upon the rituals involved around the different types of spirit being imbibed. Some require the flame to burn out before consumption. However, in the cases reported three patients were trying to consume the drink whilst actually burning and the forth during ignition of the spirit.

Other techniques which exist involve pouring spirit into an already lit beverage, this can allow the flame to travel back up the stream into the bottle thus igniting vapour within the bottle to produce an explosion or flame-thrower effect. Another technique involves a spirit being added to a spoonful of sugar, lit and when molten adding it to a glass of the spirit, thus providing a unique taste, at the expense of the added burn danger of molten sugar. Information regarding flaming drinks, which mixtures to use, techniques and some safety advice can be found on certain internet sites [14]. The majority of our patients were fortunate to have received mostly superficial burns with residual hyper-pigmentation only. This was due to the fact that the burns were a direct result of burning alcohol on skin. If incidents cause the ignition of clothing, the resultant flame burns will tend to be more significant. These cases highlight the potentially significant danger in the practice of drinking flaming spirits, particularly with one of our cases requiring ventilation. This ritual is widely practiced and condensed by bars and clubs and it is a preventable cause of burns in young adults. Awareness of the potential for this type of injury should provide an opportunity to introduce preventive measures and encourage lobbying for the cessation of this practice by restaurant and bar staff.
REFERENCES