CASE REPORT

A DISTURBING EMERGING TREND OF ALCOHOL-BASED HAND SANITIZER BURNS IN NORTHERN GHANA: A CASE SERIES

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Abstract

Introduction: During the COVID-19 pandemic and in the aftermath of it, there was a surge in the use of alcohol-based hand sanitizer (ABHS). This was because the Center for Disease Control and Prevention and the World Health Organization recommended it as an essential commodity for hand hygiene and the reduction of infection transmission. However, alcohol is flammable and has the potential to cause burns if ignited. There are few reports of ABHS-related burns in literature. We aim to report 8 cases of ABHS burns in Northern Ghana and sound a clarion call to stakeholders on a disturbing emerging trend.

Case Presentation: About 62.5% of the victims were children and 75% were female with a male-to-female ratio of 1:3. The mean age of victims was 13.25 years while the mean total burn surface area was 29.8%. All victims in this study sustained their injuries because of an attempt by either them or their collaborators to use ABHS as fuel to light a fire for domestic purposes. Most of the burns sustained were second-degree (75%). The case fatality rate of ABHS burns was 25%.

Conclusion: Alcohol-based hand sanitizer, though effective for hand hygiene, is flammable and can cause burns when used injudiciously. ABHS burn is an emerging public health problem. There is a need for public education to curb this emerging trend and forestall future incidents. The Food and Drugs Authority (FDA) should consider the addition of warning labels for flammability on the containers and instruction manuals of sanitizers.

Keywords: *Alcohol-based hand sanitizer, Burns, Northern Ghana*

Introduction

In the wake of the COVID-19 pandemic, there was a surge in the use of alcohol-based hand sanitizers (ABHS) among people. It was a recommendation by the World Health Organization (WHO) and the Center for Disease Control and Prevention (CDC) to wash hands with soap and use ABHS for effective hand hygiene to prevent the transmission of COVID-19[1,2]. ABHS on the market are formulated either in liquid or gel form. A key component of these products is alcohol. The CDC guidelines for the production of ABHS are to use at least 70% of isopropanol or 60% of ethanol[2]. ABHS is effective for hand hygiene, albeit notable complications such as contact dermatitis, burns, ocular irritations, etc[3–6]. ABHS is highly flammable, more so in the liquid form than the gel form, and thus can cause burns if used injudiciously7. There are few reports of ABHS-related burns in the literature[6,8].

We aim to report a series of 8 cases of ABHS burns that presented to the Plastics and Reconstructive Unit of Tamale Teaching Hospital for management. We also wish to sound a clarion call to stakeholders on an emerging trend of burns that has the potential to impact an already burdened healthcare system.

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Cases Presentation

Case 1

A 27-year-old female igniting charcoal using ABHS burst into flames causing second-degree burns on the left upper limb with a total burn surface (TBSA) area of 9%. She learned from her siblings that sanitizers could be used to light a fire. She had in stock lots of donated ABHS during the COVID-19 pandemic (**Figure 2**), which was about to expire, so she decided to put it to use. She was a first-time user. She spent 9 days in the hospital and was managed expectantly.

Case 2

A 15-year-old female sustained 22% second-degree burns to the face, upper limbs, and trunk (**Figures 1b and 1c**) while attempting to light up charcoal using ABHS and match sticks. She presented 4 days after the incident and was admitted for 7 days and managed expectantly. She had learned from her peers at school that ABHS was a quicker and better agent for lighting a fire than the usual paper or kerosine. Since then, she had used ABHS to light up fire multiple times before this incident.

Case 3

A 5-year-old girl was sitting beside her mother who was cooking in an open kitchen. Her mother attempted

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lighting a fire using ABHS which resulted in an explosion and her clothes caught fire resulting in about 10% second-degree flame burns on the face and upper limbs. She was admitted for 7 days and managed conservatively. The mother did not sustain any burns. The mother had seen her co-tenants and neighbors use ABHS to light a fire and she decided to try it also. She attributes the explosion to pouring a lot of the sanitizer over the charcoal.

Case 4

A 2-year-old girl sustained 26% second-degree burns from naked flames when her mother tried to light up some charcoal using a matchstick and ABHS. It exploded and burnt her. She was admitted and managed conservatively for 14 days. The mother is a multiple-time user of ABHS to light fires and had learned this from her peers at work. She used her COVID-19-donated ABHS for this act.

Case 5

A 25-year-old mother was lighting up charcoal using match sticks and ABHS. It resulted in an explosion that caused burns in her and her 1-year-old baby who was sitting beside her. She sustained 54% mixed-thickness flame burns affecting the face, upper limbs, and trunk (**Figure 1a**). She was admitted and counseled for skin coverage with skin grafting but she did not consent to surgery. She developed sepsis and succumbed to it after 48 days of admission. She too was a multiple-time user of ABHS to light fires. She had learned this from her peers at work. She was using her expired stock of COVID-19 donated ABHS to light fire multiple times before this incident. Both the mother and baby sustained burns.

Figure 1a: Mixed thickness burns on face, trunk, and limbs

Figure 1b: Second-degree burns on face, trunk, and upper limb

Figure 1c: Second-degree burns on face, trunk, and upper limb

Case 6

A 1-year-old boy was a collateral victim of case 5. He sustained 10% second-degree flash burns to the face and upper limbs. He was admitted and managed expectantly for 17 days.

Case 7

A 5-year-old boy was standing closer to the mother who was trying to light up some charcoal using ABHS and match sticks. It exploded causing about 37%

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second-degree burns to the face, upper limbs, and trunk. He was admitted for 18 days and managed expectantly. The mother escaped unhurt. The mother had been using her expired sanitizer stock to light fire. She learned the behavior from her neighbors. She attested that ABHS was a quicker and better agent for lighting up a fire than her usual kerosine.

Figure 2: Different types of alcohol-based hand sanitizers

Case 8

A 26-year-old female attempted to ignite charcoal for cooking using ABHS and a matchstick. It exploded and her long straight nylon dress caught on fire. She sustained about 70% mixed-thickness flame burns. She was brought to Tamale Teaching Hospital where the initial resuscitation and wound dressing was done and then referred to Komfo Anokye Teaching Hospital for admission into a burn intensive care unit. She succumbed to her injuries 3 days later due to multiple organ dysfunction. She was also a multiple-time user of ABHS to light fires. She learned this from her peers and ever since had been using her stock of expired ABHS donated to her during the COVID-19 pandemic.

Discussion

During the COVID-19 pandemic and in the aftermath of it, the CDC and WHO recommended both hand washing with soap and ABHS rubs as effective methods of reducing the transmission of infections. These hand hygiene techniques were made available at entry and exit points in public and private places to enable usage[1]. While both are effective hand hygiene techniques, ABHS is relatively easier to use and less time-consuming, hence an increase in the compliance of usage. They can also be used in places where there is no portable water. ABHS contain moisturizers and emollients which make them less allogenic when compared to handwashing with soap[5]. They have become a household commodity even in the aftermath of the COVID-19 pandemic and are carried around for sanitary hand rubs. Ethanol, isopropanol, and n-propanol are the commonly used alcohols in clinical practice. They have a wide antimicrobial coverage which makes them effective in infection prevention. They are bactericidal, fungicidal and viricidal[9]. They are used in varied proportions in ABHS. The CDC and WHO recommend greater than 70% isopropanol (isopropyl) and at least 60% ethanol (ethyl alcohol) to be used in ABHS for maximum antimicrobial activity[1,2]. It has been established that effective bactericidal activity can be achieved with about 15 seconds of ABHS hand rubs[10]. Alcohol for medical use is highly flammable and therefore must be used with utmost precautions[7,11]. In our setting, there were a lot of donations of ABHS to communities, individuals, and hospitals by both governmental and non-governmental organizations. To date, most of these products are still in use in most households. During the COVID-19 pandemic, most ABHS in Ghana were produced by local manufacturers with little or no supervision or certification by the Food and Drugs Authority (FDA). A lot more of the locally produced ABHS did not meet the minimum standard requirements of CDC or WHO. These products were put to judicious use during the COVID-19 pandemic. However, in the aftermath of the pandemic, a lot of these ABHS have expired, and people have large volumes in stock. The emerging trend therefore appears to be an alternative use that has been discovered to put these expired sanitizers to use.

In this study, more than 75% of the victims were female with a male-to-female ratio of 1:3. About 62.5% of the victims were children. The mean age of victims was 13.25 years. This is at variance with available literature where most of the victims of ABHS burns are adults and males[6,8]. A significantly higher mean age of victims (33.2±17.9 years) was reported in an Iranian study[6]. Thus, most of the studies report adults as the predominant victims which is contrary to this study. The TBSA in this study ranged from 9-54% with a mean TBSA of 29.8%. All but 2 of the cases sustained second-degree burns (75%). All the patients in this study were admitted. The mean length of hospital stay was 15.9 days. The case fatality rate of ABHS burns was 25%. The available literature on ABHS burns is scanty globally. This may be because it is an emerging trend of burns which is a sequela of the pandemic. Dahmardehei et al (2021) in an Iranian study reported about 76 cases of ABHS burns with most of them being males (75%) as compared to more females (75%) in the present study. Their mean TBSA was significantly lower (6.1±6.5 years) compared to our study[6]. This means that most of the burns sustained in their study were minor burns. Their mean length of hospital stay (11.7±8.6 days) was also comparable to the present study. Their study did not record a mortality[6]. Gupta and More (2021) in a study in India also recorded a case fatality of 25% which is similar to the present study[8]. To the best of our literature search, there were no reports of ABHS burns in Sub-Saharan Africa (SSA). In Ghana, there were also no reports of ABHS burns in literature even though

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colleagues from some tertiary hospitals have managed a case or two of such. All the cases in this study resulted from imprudent use of ABHS. In all the cases described, there was an attempt to light up charcoal for domestic purposes using ABHS as the fuel. This resulted in an explosion because of the highly flammable nature of ethanol and isopropanol. ABHS burns could be accidental or intentional. There are reported reports of the use of ABHS burns for homicidal and suicidal purposes[8]. However, the majority of ABHS burns are accidental from injudicious use of the products. All 8 cases in this study could have been avoided if the ABHS had been used for its intended purpose. This emerging behavioral trend needs to be modified through public health education to prevent future casualties. Considering the old medical adage, "prevention is the best medicine", we strongly recommend that the public refrain from using alcohol-based hand sanitizers to light fires. This will prevent needless injuries and avoidable deaths. We also recommend that the Food and Drugs Authority consider the addition of warning labels for flammability on hand sanitizer containers and their instruction manuals. However, if one must use ABHS to light a fire, then it must be done using the following safety precautions. A small amount of the ABHS should be used to avoid an explosion when the fire is lit. It should be done in an open space that is less windy to prevent flash or flame burns. One must not wear long and loose clothing while using ABHS to light a fire. Before lighting the fire with ABHS, one must rub their hands to make sure the sanitizer dries before the act.

Conclusions

Alcohol-based hand sanitizer (ABHS) is a useful commodity that is effective for hand hygiene and infection prevention. It is also flammable and can result in burns with imprudent use. There is a need for public education by key stakeholders to curb this emerging trend and forestall future incidents. The Food and Drugs Authority (FDA) should consider the addition of warning labels for flammability on the containers and instruction manuals of sanitizers.

Consent

All patients and caregivers consent to the use of their medical data and images for academic and research purposes.

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Authors' Contribution

ASS and EI conceived the study and AIL and AAA gathered the data for the study. ASS wrote the first draft. All authors reviewed and approved of the final draft.

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