

ALCOHOL-BASED HAND SANITIZER: ABUSE DURING LOCKDOWN AMIDST COVID-19 PANDEMIC

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ABSTRACT

Alcohol-based hand sanitizers are popular alternative to the traditional handwashing with soap and water in both healthcare and community settings. Although some people use to carry small sanitizer bottles with them during travel; its utilization by common people come into picture during the COVID-19 pandemic. Because of sudden requirement of those products within a short time, there was even shortage during the initial days. Once nationwide lockdown was declared in India, to prevent community spread; all the shops were closed including wine shops. During this tough time, many alcohol withdrawal cases were reported from different regions. Some people started taking hand sanitizers as a replacement for potable alcohol. Because of high alcoholic content and adulteration with methanol or any other substances, most of the people became ill and they were hospitalized. Deaths were also reported from different states following its consumption. Addiction to hand sanitizers is now considered as one of the overlooked problems globally. It is very difficult to erase the problem, especially among teenagers. Multi-task approach involving different populations at different levels are required to handle this problem.

Keywords: Alcohol-based hand sanitizers, COVID-19, Pandemic, Adulteration.

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INTRODUCTION

Hand sanitizers were initially manufactured for use in hospitals to minimize the spread of infection among patients and health care workers. Its use in hospital and laboratories was required because of repeated hand washing in those settings. The United States' Centers for Disease Control recommends the use of hand sanitizer before and after handling a patient [1]. Thereafter, it became a routine practice to keep sanitizer bottles at specific areas (out-patient department, operation theaters, nursing stations, etc.) of the hospitals for its use by the staff. In both healthcare and community settings, alcohol-based hand sanitizers (ABHSs) have become a popular alternative to the traditional handwashing with soap and water [2].

Although, some common people carry small sanitizer bottles with them, especially during traveling; its major role came into picture in the context of the COVID-19 pandemic. Within a short period of time, it became an essential protective measure against coronavirus. For the 1st time, it was made mandatory to carry them all the time and use frequently to make the hands non-infective to break the chain of COVID infection. Because of its extensive use since the discovery of the virus in Wuhan (December 2019), there was a reversal of demand and supply ratio among general population; especially during the early part. However, the problem was sorted out by the respective administration within a short period and the market became flooded with different concentrations from various companies.

COMPOSITION OF HAND SANITIZERS

Hand sanitizers are mainly of two types- alcohol based and non alcohol based. As the name suggests, in alcohol-based variety; the core content is alcohols (mainly ethanol, isopropyl alcohol [IPA], propan-1-ol, propan-2-ol, etc). Most of the products, ethanol, and IPA are found isolated or in combination with different concentrations. To make it more attractive, some additives such as colorants, stabilizers, fragrances, and preservatives which may include formaldehyde, parabens among other chemicals may be used along with water [3-5].

Skin dehydration is a major topical problem, seen among its repeated users. To prevent it, humectants are included. The product can be stabilized by using excipients which prolongs the time of alcohol evaporation thereby increasing its biocidal activity [6]. In general, ABHS contains either ethanol or IPA in the strength of 60–95% by v/v. This is considered as safe and effective [7-9]. Different guidelines are available for its preparation regarding the portion of constituents use. The World Health Organization recommended use of 80 % ethanol (v/v) or 75% IPA (v/v), 1.45% glycerol and 0.125% hydrogen peroxide for getting the desired effect [10].

The target of ABHS is the envelope of the agent. The efficacy can be increased by adding acids where it is suspected that viruses are resistant to ethanol or IPA [11-13].

EFFECTS ON HUMAN BODY

ABHS are made strictly for external use only (over intact skin). However, various incidences of its oral intake have been reported so far around the globe. As the concentration of alcohol is very high, even a small quantity seems to be fatal among various age groups [14-19]. The signs and symptoms are similar to drunkenness which may include hypothermia, central nervous system and respiratory depression, cardiac dysrhythmias or arrest, hypotension, nausea and vomiting, acute liver injury, myoglobinuria, lactic and ketoacidosis, and hypoglycemia depending on the amount consumed and concentration of the same [20].

Risk of respiratory depression usually increases with a serum ethanol level of 300 mg/dl or more. With a serum concentration of 500 mg/dl or more, chances of cardiac arrest and death are enhanced. Sometimes, deaths are even seen at lower levels and there are reported cases of survival even with a very high blood alcohol level (≥ 1200 mg/dl) [20]. Hence, it is not only the blood alcohol concentration, some other factors also play a vital role when toxicity comes into the picture.

Its toxicity also depends on the status of the person who consumes it. Some are habituated and addicted to it. Usually, in non habituated

individuals; a lethal dose is achieved by consuming even a volume of as little as 40 ml of 80% (v/v) alcohol-based solution [21]. The toxicity of IPA is considered more compared to ethanol. The metabolite (acetone) takes longer time (24 h or more) to get eliminated from the body compared to the parent compound. Even, most of the symptoms are considered to be because of parent compound rather than the metabolite. Coma has been seen if the IPA concentration is more than 150 mg% (less in comparison to ethanol) [22,23]. CNS and respiratory depressant effect of IPA are more than ethanol [24]. However, effects are similar if the ingested amount is as little as 100 ml of 70% IPA [21].

Children are having less liver glycogen storage compared to adults. Hence, they are more prone to hypoglycemia even with a small amount. The different effects in children and adults are also because of some other pharmacokinetic factors [25-27]. A study done among children between 2011 and 2014 in the United States showed ocular irritation (31.4%) and vomiting (22.8%) to be the most common effects. They also reported some cases of conjunctivitis (10.5%), oral irritation (9.5%), cough (8.6%), and abdominal pain (3.9%) in the study population. Some other rare effects such as coma (five), seizures (three), hypoglycemia (two), metabolic acidosis (two), and respiratory depression (two) were also reported [9].

Another major problem is alcohol-alcohol adulteration which is seen when some other alcohol is mixed with ethanol or iso-propyl alcohol because of economic benefit. Most common agent used is methanol which is available easily at a cheaper cost. This combination may cause toxicity even at a very minimum concentration leading to irreversible blindness, coma, or death [14,17,19]. Even with topical application, methanol may cause ill effects through its transdermal absorption [28,29]. In an incident in China, surgeons in a hospital developed various local and systemic effects following topical use of such kinds of sanitizers in operation theatres [28].

GLOBAL SCENARIO OF ABUSE

Addiction to ABHS and its health-related issues are not new to medical sciences. Incidences have been reported since long back in all age groups among both sexes. They may be intentional or accidental. The first one is usually seen amongst teenagers and those who are addicted and cannot buy alcohol because of social reason. However, most of the incidences are reported amongst patients with a history of mental illness who use ABHS as a replacement whenever potable alcohol not easy available or accessible [14]. Hence, hospital emergency room, general hospital rooms, prison, psychiatric, and in-patient substance abuse units are considered as the most common place because of non-accessibility of alcohol [14-16,30-36].

Teenagers are mostly attracted to hand sanitizers because of various reasons. They are usually not legally at permissible age to buy potable alcohol from stores. Hence, they found it easier to buy sanitizer and have it as alternate. Some schools even require or ask children to carry hand sanitizers with them while coming to school. A study examining Texas poison center data from 2000 to 2013 found that, among 385 adolescents who ingested hand sanitizer, 35% occurred at school [17]. Teenagers extract alcohol from the preparation by adding salt to make a strong one, for which instructions can easily be retrieved from Internet. Others may ever consume it as such, starting with a small dose which may eventually increase to a fatal dose within a short span. The majority of intentional exposures have been found in the age group of 6-12 years [9].

Exposure to small children is considered to be because of attractive color and aroma of the product. The United States poison control centers received more than 100,000 calls of children exposed to hand sanitizer within a period of 5 years (2011-2016) [37,38]. Hence, it is now considered as a major overlooked problem, especially among children and teenagers requiring prompt global attention [16,19,36].

Various reports have been published in different journals regarding the problem. Gormley *et al.* described a case of 17 years old patient who

was admitted in hospital with chronic mental illness along with some other physical ailments who was fed by Ryle's tube. 1 day morning, he put all the contents of a hand sanitizer into the feeding tube and became unconscious. Later on, he was transferred to intensive care unit (ICU) and recovered gradually. While searching the literature, author found 14 similar cases who were also admitted to hospital for mental illness [14].

Stevens and Hix also described a female patient admitted in hospital with underlying psychiatric illness who was later shifted to ICU in a critical condition after consuming hand sanitizer containing IPA along with some other unknown intoxicants [23]. Death of a 24 years old person was described by Shetty *et al.* after consuming sanitizer containing IPA [39]. Another 29 year old male chronic alcoholic with a history of depression was also brought to hospital after ingesting liquid hand sanitizer. He was not able to buy alcohol for few days and consumed sanitizer. On laboratory investigation, his blood alcohol level was found to be 446 mg/dl [40].

An article reported a case of a male patient who suffered respiratory arrest after consuming about 350 ml ethanol-based hand sanitizer with a concentration of 62% (v/v). Later on, his blood alcohol level was found to be 536 mg/dl [33].

In a separate case, a 50 years old chronic female alcoholic was admitted in hospital with acute alcohol intoxication. She became stable within 24 h. However, on the very next day; she was found unconscious on her bed with an empty bottle of ABHS lying nearby. She was taken immediately to ICU in a critical condition with a Glasgow Coma Scale score of 3, evidence of lactic acidosis and a blood alcohol concentration of 362 mg/dl. Luckily she was revived in ICU and went home healthy after few days [41].

A 7-year-old kid was also admitted for the same reason in a critical condition in hospital, which was reported in 2015 [33]. Another author described an interesting case of extraction of alcohol from hand sanitizers using table salt in a psychiatric ward. He was kept in a locked psychiatric facility where he consumed two bags (1 liter each) of hand sanitizers [15].

SCENARIOS DURING COVID-19 LOCKDOWN PERIOD

Immediately after lockdown was declared all over India in March 2020, there was a complete shutdown of all the establishments including wine shops. This type of shutdown was not experienced by any Indians in their life. For initial few days, people were expecting it to be over within few days and life will come into normal as before. However, things turned out to be opposite and people had to bear the pain for a longer period which was never expected.

During this period many alcohol withdrawal cases were reported in various newspapers. Black market was also completely crashed. Demands from different areas started coming to re-open wine shops maintaining COVID-19 protocol. During this period, news started floating in various national and local newspapers of people consuming ABHS to make them high as a replacement of consumable alcohol. Many people died and some were admitted in critical condition after consuming these products containing very high concentration of alcohol.

Although, consumption and supply ratio for hand sanitizers were initially reverse; the demand was fulfilled within a short period of time once state governments granted permission to some distilleries on a priority basis to produce sanitizers in bulk. Most of the companies were known to common people and they preferred to buy only those brands thinking it will solve their purpose of making themselves high amid lockdown period as an alternative to potable alcohol. By this time, some people even became victim of some rumors that alcohol can prevent COVID-19 infection. In this false belief, many people started consuming ABHS as an alternative. The first of its kind was reported by Binder *et al.* at the Department of Internal Medicine, Division of Gastroenterology

and Hepatology, Medical University of Graz, Graz, Austria. A case of severe gastrointestinal damage in a female patient was reported after she had intentionally ingested hand sanitizer to prevent COVID-19 in the false belief of cure [42].

In Coimbatore, an adult cylinder delivery person died after consuming ABHS which was given by his employer to prevent COVID-19. He was a chronic alcoholic and due to lockdown was unable to buy alcohol. Immediately after he mixed it with water and consumed, he was rushed to Coimbatore Medical College with breathing difficulty. By the time he reached hospital, he was declared brought dead [43]. In Dharwad district of Karnataka, two brothers and their sister died at Karnataka Institute of Medical Science, Hubli and 13 other admitted in a serious condition after consuming ABHS during the lockdown period. They all had mixed it with hooch and consumed continuously for 4 days before developing pain abdomen and breathlessness [44].

A driver in Bhopal consumed ABHS frequently, mixing with water during the early days of nation-wise lockdown. He consumed it because of easy availability at cheaper price compared to any other alcohol bottle [45].

During this tough time, some people started taking advantage of lockdown by making alcoholic drinks from hand sanitizers and sold it among addicted people at higher cost. Such an incidence was reported in the Raisen district of Madhya Pradesh. Police arrested the culprit who tried to reverse engineer the sanitizers containing 72% alcohol (v/v). However, no fatality was reported from that area [46]. Similar nexus was also demolished by Nagpur police on April 15, 2020. They arrested one person selling hand sanitizer in the name of alcohol and 4 persons who were buying from him. Police has recovered 46 bottles of hand sanitizers from the accused [47].

Some reports also came people injecting hand sanitizers which addicts usually used for cleaning purpose during drug injection [48]. Similar reports of fatalities also came from other regions of the world. Six people were hospitalized in Mexico after consuming hand sanitizer that contained methanol. Three of them died in hospital and rest were seriously ill out of whom, one was permanently blind [49].

According to the director of the Arizona Poison and Drug Information Center, four people have died and 26 people were hospitalized after ingesting hand sanitizer containing methanol after May, 2020 [50].

PREVENTION

Consumption of ABHSs is a serious social problem which is increasing worldwide especially amongst teenagers. Although, adults used to have it during lockdown period; they had easily shifted to routine alcoholic beverages immediately after shops were open. Problem amongst young population and patients with psychiatric hospitals or jail inmates will however remain the same.

Recently, the Indian government has relaxed the rule for taking license to sale hand sanitizer as per Drugs and cosmetics act. This may again cause easy availability of some low-grade sanitizer in near future. To lower the misuse of it, Food and Drugs Administration has asked the companies to make the taste worst by adding denaturants. This is one way to lower the incidence of intentional consumption. Hospital authorities must take special precaution within their premises so that these products cannot be easily accessible to any psychiatric or any other patient who is addicted to alcohol. For that purpose, provision of wall mount automated dispensing tank installation should be made in each and every designated areas of hospital. Alongside, there should always be some monitoring provision from the authority. No portable bottles should be allowed to bring inside the wards by any patient. The same provision can be adopted in other areas also where teenagers are mostly engaged.

However, the problem cannot be prevented until the target population is well oriented regarding the topic of discussion. Hence, those vulnerable

populations should be oriented with some awareness programs so that they can take care for themselves. In this series, parents, teachers, and other family members will definitely play the vital roles.

CONCLUSION

ABHSs has now become an important part of hand hygiene since the COVID-19 pandemic. Every time, the hand cannot be cleaned with traditional soap and water. Hence, it has to be carried with us whenever we go out for some reason. Hence, chance of its misuse is also increased. Since it cannot be completely prevented by a single approach; it should always be used cautiously especially when carrying or keeping with children. Special attention should be given to chronic alcoholics and teenagers. No psychiatric patient should be unattended while inside the hospital. Jail authority should always keep their eyes on inmates so that they cannot misuse it.

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