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A REVIEW ON USING AN ALCOHOL-BASED SANITIZER AS A PROPHYLACTIC MEASURE AGAINST MICROORGANISMS

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ABSTRACT

Because of the COVID 19 pandemic, we now utilise hand sanitizer in our daily lives. Hand hygiene has become a legal requirement. Infection control is becoming a requirement. Hand hygiene is widely regarded as the most practical and effective way of infection prevention. Hand sanitizer is thought to have played a significant role in reducing illness transmission to patients. Because it is more cost-effective and efficient. The efficiency of hand sanitizer is totally determined by how it is used. There are two sorts of hand sanitizers on the market. 1) Hand sanitizer with alcohol 2) Hand sanitizer that isn't alcohol-based. Most effective hand sanitizers contain 70 percent to 95 percent alcohol, which has the potential to denature microbial protein and inactivate viruses. The impact of hand sanitizer on human health care is significant, and this review article will provide you with information on several elements of hand sanitizer

INTRODUCTION

Wuhan, China, reported some unknown viral illnesses or diseases in December 2019. According to laboratory studies of respiratory samples, the Novel Corona Virus is the cause of viral pneumonia. According to their medical records, these individuals were involved with the wholesale distribution of sea food and wet animals. And the disease is known as COVID 19, where CO stands for corona, VI for virus, D for disease, and 19 stands for the year it was found, with the virus being Severe Acute Respiratory Corona Virus 2 (SARC COV 2) [1]. COVID

19 has caused considerable problems by infecting the human respiratory system, rendering them unable to breathe and surviving on surfaces for up to 9 days, according to the International Committee of Taxonomy. As a result, it is critical to break the virus's chain of transmission by using contact isolation and adequate infection control measures, such as face masks, avoiding social gatherings, and maintaining correct hand hygiene, as hands can spread a variety of infections. It is also critical to keep our hands clean in order to prevent the transmission of this disease [2]. Hand hygiene includes the use

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of soap and water, as well as hand sanitizer, which is an important alternative to handwashing. Hand sanitizers of various types are also available on the market. Hand sanitizer with a 60% or higher alcohol content is recommended for eradicating harmful bacteria. The World Health Organization has emphasized the need of following hand hygiene rules. Coronavirus infects persons with weakened immune systems, such as those with Diabetes Mellitus [3]. Hand hygiene is often used to avoid infection among medical patients and hospital staff. Because there are so many different hand sanitizers to choose from, WHO recommends using an alcohol-based hand sanitizer. Because it contains ethanol, the main ingredient is isopropyl alcohol, which has a concentration of at least 5%, whereas non-alcohol hand sanitizers comprise Benzalkonium and quaternary ammonium salts, which are less efficient than alcohol-based hand sanitizers [4].

COMPOSITION OF HAND SANITIZER

Sanitizer are classed as follows based on their alcohol contains **ALCOHOL BASED HAND SANITIZER:** According to the WHO, alcohol-based hand sanitizers are an alcohol-containing solution intended for use on the hands to totally remove or destroy bacteria or to limit their growth for a period of time. One or maybe more forms of alcohol are incorporated in these types of formulations with active chemicals and some moisturising component. Alcohol-based hand sanitizers come in two sorts of compositions or formulations, according to the WHO. We should fill the beaker to 1000ml with clean water and carefully shake the mixture to blend the 96 percent v/v ethanol (833.3ml) and 3 percent glycerol (145ml). Fill the beaker with filtered water to produce 1000ml, then mix the ingredients by agitating the flask with 3 percent water (41.2 ml) and 98 percent glycerol (14.5 ml) [5].

CATEGORIES OF HAND SANITIZER

1] **ALCOHOL BASED HAND SANITIZER:** As an active ingredient, alcohol-based hand sanitizer comprises an appropriate concentration of hydrophilic alcohol. Alcohol's exact mechanism is uncertain. It is thought to be linked to protein degradation, which explains why it is likely to have a broad antibacterial action against viruses, bacteria, and fungi. There are three alcohol domains in use. Ethanol, isopropanol, and n-propanol are three types of alcohol. Methanol is too toxic and reactive to have the intended bacterial effect, hence the use of n-propanol in Antibacterial hand sanitizer gel (ABHSG) is not

allowed by the US Food and Drug Administration (FDA). As a result, certain clear warnings on the trade rising alcohol repeats lack desirable qualities for use in ABHS can be discovered. Acidity, Turbulence aroma, and industrial pollutants are examples. Commercially accessible hand sanitizer is utilised as an active ingredient in alcohol-based hand sanitizers. Alcohol-free hand sanitizers, on the other hand, are considered less important in the medical field [6].

2] **NON ALCOHOL BASED HAND SANITIZER:** Non-Alcoholic – based hand sanitizers contain Benzalkonium chloride quaternary ammonium, as an active ingredient in commercially available preparations today. However, Alcohol-free hand sanitizers are believed to be less important in the health market [5].

EFFECTIVENESS

Alcohol-based hand sanitizers are used for hand disinfection in the healthcare industry and in the real world. The main goal is to clean hands without leaving any dirt or oil behind, and it should be gentle on the hands according to the manufacturers. After applying the sanitizer, the hand should be wet and held for 30 seconds. Several studies suggest that 2-6 ml of alcohol-based hand sanitizer should be massaged for 20-30 seconds. Hand sanitizers are also ineffectual against bacterial spores, enveloped viruses, and encysted parasites, according to some studies. When soap and water are not available, hand sanitizers are more useful [7]. The effectiveness of hand sanitizers is largely determined by a number of factors, including how the product is applied, such as the amount used, the duration of exposure, the frequency of use, and whether the infectious microbes or agents present on the person's hands are susceptible to the product's active ingredient. These alcohol-based hand sanitizers must be rubbed properly on hands and fingers surfaces for at least 30 seconds before complete air drying to kill bacteria, fungi, and some enveloped viruses like influenza A viruses. Similar effects have been reported for certain alcohol-free formulations like SAB hand sanitizer [8].

MECHANISM OF ACTION OF HAND SANITIZER AGAINST BACTERIA AND VIRUSES

N-propanol is the most common alcohol found in biocides. It is most commonly used in biocides. Furthermore, the mechanism of action of this alcohol's antibacterial properties remains unknown. However, it is most likely linked to membrane

damage and mRNA inhibition or detachment, and protein synthesis is via ribosomes and RNA polymerase activities or protein denaturation, where protein synthesis can be influenced by ribosomes and RNA polymerase, and its bactericidal effectiveness is best at doses ranging from 60% to 90% [9]. The viral RNA is formed from the lipid membranes of the host and the nutritional enzyme that carries and protects the genetic material, and the majority of the elements are required for viral replication. Accessory, penetration, biosynthesis, maturation, and lysis are some examples. As a result, the virus's capacity to transfer to others is high, as it's plausible to suppose that are likewise required for it to propagate to others [2].

EVALUATION PARAMETER OF ALCOHOL BASED HAND SANITIZERS

1. **Acceptability Test (Skin Irritation Study):** The pH evaluation, viscosity, and its spreadability and last but not the least its antibacterial activities. There are few things the market demand in hand sanitizer where it should smell good, feel good when we use them and most importantly it should be easy to apply and non-sticky and should have good antibacterial activity. The hand sanitizer gel which having 2.5 percent clove oil was quite well accepted in the trail of the skin irritation with no sign of sensitivity or skin redness after application [10].
2. **Spreadability measurement:** The spreadability plays a critical role in the application of hand sanitizers, and is associated with consumer compliance and uniformity of the applied gels to meet topical application quality standards. Hence, the gel spreadability test was carried out to assess the ability of the prepared hand gels to distribute properly when applied to the skin, in which the optimal gel formulation should have less spreading time (i.e., high spreadability). One of the main parameters that can affect the gel spreadability is the viscosity of the formulation, in which a lower viscous gel has higher spreadability [11]
3. **Viscosity measurement:** The viscosity of a formulations is one of the fundamental parameters that should be controlled, as it can reflect the consistency and flowability of the gel formulations when applied to the skin. The viscosity test is carried out to determine the thickness of the preparations using a TCV 300 viscometer and to explore the

influence of gel components on the products and rheological properties [12].

4. **pH measurement:** The pH values of the formulated hand sanitizer is measured using a digital pH meter. To check the neutralization of different prepared formulations. The ideal standards for a pH value of a topical dosage form should be within the broad pH range of the skin, i.e., 4.0 to 7.0, in order to avoid skin inflammation and irritation [13].
5. **Antibacterial:** The results of this study shows that hand sanitizer reduced the bacterial load on the hands of the subjects to a varying degree. Complete biocidal activity will be shown only by brands which will claimed for it. This is probably because that the reduction in bacterial load is not just because of alcohol but also other ingredients incorporated [14].

ROLE OF SANITIZER IN HEALTH CARE PROFESSION

Since the introduction of alcohol-based hand sanitizers, hospital hand hygiene compliance has significantly improved. They are simple to use, effective, and easy to locate. Even if they are less effective in some situations than regular soap and water, if you use an alcohol-based hand sanitizer on a regular basis, the extra expense may be worth it. The rules for using soap and water instead of ABHS can be created by taking into account the most common bacteria in a specific situation [15]. Throughout the last decade, hand sanitizer has become the most effective method for preventing infections in the healthcare setting, and its effectiveness in promoting compliance is currently being researched with the use of alcohol-based treatments.

The efficiency of hand sanitizer has been established in a number of studies, including 4,5 trials, with reduced infection spread. As a result, hand sanitizer usage has increased [16]. Hand sanitizer may also be helpful on unclean or oily hands with particular microorganism when they come into contact with germs or bacteria but are not filthy or oily, according to several other research. When hands are multiply filthy or oily, such as after playing outdoor games, gardening, travelling, or engaging in extension activities like as canvassing, hand sanitizers may not be effective; in this instance, hand washing with soap and water is always the best alternative. Sanitizer will not remove grime, dirt, or lubricant from your hands in this scenario; instead, it will make your hands sticky, which will accumulate dirt [17].

Because of the COVID 19 pandemic, hand dermatitis has increased in more than 90% of healthcare workers, with hand eczema appearing in around 14% of these cases. And not all of the formulations on the market are appropriate for this use. SARS-COV-2 was entirely inactivated after the hand wash, which may be washed or cleaned either by soap or water by ABHS, and when it comes to hand sanitizer usage, 87.6% indicated their behaviours had changed as a result of the pandemics. 62.2 percent of people had never used hand sanitizer before the pandemic, but 3.7 percent used it 3-10 times per day during the pandemic, and 23.5 percent used aroma sanitizers. As Hand sanitizers are the simplest and most preferred approach for treating the current important issue of SARS-COV2 and other diseases associated with the neighbourhood and care facilities [18]. According to the World Health Organization, the Centers for Disease Control and Prevention, and other consulting businesses. The most crucial is frequent hand washing with soap and water or, in the absence of water, disinfecting hands with ABHS [19]. Antibacterial activity of ABHS & ABHSs (hand rubs) is due to alcohol's ability to breakdown protein. To counteract the drying effect of the alcohol, these products typically contain 60-95 percent alcohol with thickening additives like polyacrylic acid, glycerine, or propylene glycol [20]

MANUFACTURING AND PACKAGING

Many countries have specific regulations that govern the production of ABHS [21]. In Europe, ABHS are governed by the Biocidal Products Regulation [22]. The FDA regulates ABHS in the United States as a drug product. Furthermore, the FDA distinguishes between health-care antiseptics and consumer antiseptics [23]. Personnel engaged in manufacturing and packing tasks must be safe, primarily because organic mixes can be combustible and harmful if handled incorrectly. Solvents must be properly stored, and manufacturing facilities must be well ventilated and air conditioned. Equipment grounding, the use of mechanical processors to decrease static discharge, lowering oxygen levels in mixing containers, and maintaining alcohol vapour levels in manufacturing rooms below threshold limits are among the safety precautions for the production [24]. Although packaging in the case of ABHS composition is commonly disregarded, it is a critical aspect in ensuring product dependability, stability, and convergence. When the ethanol-based composition was placed in aluminium liquor bottles, no deterioration was detected, despite the fact that plastic containers

are the most prevalent packaging for ABHS [25]. Dispensers or containers are frequently utilised in hospitals and other areas where ABHS is in high demand. The design and operation of the dispensers are also crucial to their efficiency. In a study conducted at a hospital that has recently deployed dispensers, malfunctioning was an unusual occurrence [26]

BENEFITS

Hand sanitizers have the advantages of being portable, easy to use, and convenient. Users of hand sanitizer had a decreased risk of spreading gastrointestinal and respiratory infections to themselves and even family members. Hand sanitizers are widely available and contain a chemical that aids in skin hydration [27].

TECHNIQUE

The four stages of using hand sanitizer are as follows: It is necessary to have a completely clean hand or palm. Before using a solvent-based or waterless sanitizer, make sure there is no dust, blood, or lubricants on the surface. On one palm of your hand, dab a small amount of this solvent or waterless sanitizer. Now, using the other palm, we can rub to cover both the palm and the hand, and this will continue until the solvent or waterless sanitizer is exhausted [28].

CLINICAL SIGNIFICANCE

The use of ABHS in a hospital setting has significantly improved hand hygiene practices. They are not only effective, but also simple to use and complete in a short amount of time [29]. Even though they are less efficient in some situations than traditional soap and water, the trade-off could be justified if ABHS is used, which leads to improved hand hygiene. Taking into account the common microorganism within a given situation, a recommendation for the use of soap and water rather than ABHS can be made [30].

CONCLUSION

Hand sanitizer is an alternative to hand cleaning with soap and water, as we learned in this article. Hand sanitizer aids in the prevention of germs or bacteria, and we investigate the mechanism of hand sanitizer as well as its impact on the health care business and in the actual world. Alcohol-based hand sanitizers and non-alcohol-based hand sanitizers are the two sorts of hand sanitizers, and we've learned about the various assessment factors, benefits, and significance.

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Nil

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

Priyanka Ranabhat, Deepika Khatiwara and Moumita Paul designed the work and made necessary corrections and revisions in the manuscript. Arnab Bagchi collected the content and did literature review and also contributed in drafting the manuscript. All the authors framed the final manuscript.

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