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The Scientific Basis and The Critiical Importance of Hand Hygiene in Fighting Infection and Preventing the Transmission of Diseases

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Abstract

Introduction. Hand hygiene is one of the most important preventive methods to combat infections and prevent the transmission of harmful germs. It is an easy way to protect oneself from infections and the accumulation of germs. Hands are the primary pathways for the transmission of germs, either through direct contact with other people or by touching contaminated surfaces and objects. Washing hands with soap and water or using hand sanitizers plays a vital role in reducing the spread and transmission of many diseases caused by touching the mouth, eyes, or nose. Methods. To complete this research on hand hygiene, I followed a systematic approach and employed several methods to ensure a comprehensive and accurate output. Here's the process: Searching for Reliable Scientific Sources. I relied on reputable global organizations, such as Centers for Disease Control and Prevention (CDC): To understand the appropriate techniques and health benefits of handwashing. Conclusion: This research was prepared with a rigorous methodology, combining scientific analysis and logical organization to deliver content that effectively meets the reader's needs

Keywords: *Hand Hygiene, Medical-Healthcare.*

INTRODUCTION

Hand hygiene is one of the most important preventive methods to combat infections and prevent the transmission of harmful germs. It is an easy way to protect oneself from infections and the accumulation of germs. Hands are the primary pathways for the transmission of germs, either through direct contact with other people or by touching contaminated surfaces and objects. Washing hands with soap and water or using hand sanitizers plays a vital role in reducing the spread and transmission of many diseases caused by touching the mouth, eyes, or nose.

Medical hand hygiene aligns with the healthcare professions, particularly for practitioners who handle medications and medical care, as it helps to prevent or minimize the spread of diseases. The primary medical objective of hand washing is to ensure hands are clean, limiting pathogens such as bacteria, viruses, and chemicals that may cause personal harm or disease. This is especially important for individuals who handle food or work in the medical field, as well as the general public.

Individuals may be exposed to respiratory illnesses such as influenza, the common cold, food poisoning, diarrhea, and even antimicrobial resistance. Thus, proper hand hygiene is essential for all to prevent the spread of these diseases

The hands of healthcare practitioners and workers in the healthcare field play a crucial role in combating infections and ensuring patient safety. If healthcare professionals and workers do not clean their hands at the appropriate times and using proper methods, they may transfer infection-causing germs from one patient to another. Implementing hand hygiene at critical moments is an essential intervention in healthcare.

Proper hand hygiene enhances patient safety, reduces the spread of germs (including antibiotic-resistant ones), and decreases healthcare-associated infections. Effective and timely hand hygiene is considered the cornerstone of infection prevention and control.

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METHODS

To complete this research on hand hygiene, I followed a systematic approach and employed several methods to ensure a comprehensive and accurate output. Here's the process:

1. Searching for Reliable Scientific Sources:

- I relied on reputable global organizations, such as:
- *World Health Organization (WHO):* For guidelines and recommendations on hand hygiene and infection control.
- *Centers for Disease Control and Prevention (CDC):* To understand the proper techniques and health benefits of hand washing.
- *UNICEF:* To highlight the impact of hand hygiene in reducing child mortality in developing communities.

2. Reviewing Scientific Studies and Research:

- I reviewed academic articles published in journals like The Lancet and Cochrane Library.
- Examples of reviewed studies:
- Research on reducing child mortality rates through proper hand hygiene.
- Comparative studies on the effectiveness of soap versus alcohol-based sanitizers.

3. Structuring Content:

- Information was organized into sections:
- Introduction.
- Health benefits of hand hygiene.
- Techniques and practices.
- Materials used.
- Recommendations and conclusions.

4. Validating Information:

- Cross-referenced multiple sources to verify data accuracy.
- Ensured that the information was up-to-date and relevant to current practices.

5. Utilizing Specialized Research Tools:

- Used academic search engines like PubMed and Google Scholar to access recent studies.
- Referenced platforms like Research Gate to obtain credible reports.

6. Formatting the Research:

- Presented the information in a clear and concise manner for a general audience.
- Focused on actionable steps, supported by scientific evidence.

7. Enhancing the Research Quality:

- Incorporated practical tips and real-world examples to emphasize the importance of hand hygiene.

- Simplified scientific jargon to make the content more accessible.

Health Benefits

Healthcare practitioners must understand that infections, bacteria, and viruses occur in all healthcare facilities without exception and can easily spread between patients and healthcare providers. Hand washing helps limit their spread, prevent infections, and protect against other contagious diseases, such as diarrhea, while also reducing respiratory infections and other illnesses.

Child mortality rates caused by respiratory diseases and diarrhea can be reduced by 50% through simple practices like hand washing with soap .

Hand washing with soap is the most effective and cost-efficient way to prevent diarrhea and acute respiratory infections, potentially saving millions of lives. It reduces deaths caused by diarrhea by half and those from acute respiratory infections by a quarter. It is more effective than any vaccine or medical intervention, according to UNICEF. Hand washing with water and soap should become a habitual practice among healthcare workers, children, families at home, and communities worldwide.

Visitors to patients in hospitals, particularly those suffering from serious illnesses, should wash their hands and use hand sanitizers. They may also be required to wear gowns, masks, and gloves before entering the patient's room.

***Key health measures for infection prevention that healthcare practitioners and the general public should know include**

-Hand hygiene is a critical component of infection prevention and control.

-Discussing the use of gloves and hand hygiene during patient care activities.

-Demonstrating the correct hand washing technique with soap and water as recommended by the World Health Organization (WHO) and the Ministry of Health.

-Teaching the proper method for cleaning hands using soap, water, and alcohol-based rub according to WHO and Ministry of Health guidelines.

-Addressing key issues and considerations for hand hygiene in healthcare facilities.

Forgetting to wash hands can cost us dearly, as it risks losing precious lives. To build a safe environment, improve hand hygiene practices in healthcare institutions, and reduce the transmission of infections, the following measures should be implemented

* -Continuous education and training:* Regularly update and educate healthcare workers about hand hygiene practices and offer practical training workshops to ensure updated knowledge and skill application.

* -Enhancing access to hand hygiene supplies:* Ensure that hand hygiene products, such as soap, hand sanitizers, and single-use towels, are readily available at all care points.

* -Promoting a hand hygiene culture:* Foster a culture of hand hygiene by encouraging best practices and creating a supportive environment where healthcare workers feel empowered to adhere to hand hygiene protocols.

* -Conducting regular audits and reviews:* Perform frequent audits to monitor compliance rates and provide feedback to healthcare workers.

* -Engaging patients and visitors:* Educate patients and visitors on the importance of hand hygiene and encourage their participation in practices that reduce infection transmission.

* -Providing clear signage and instructions:* Display clear instructions and signs in waiting areas and patient rooms.

* -Standardizing hand hygiene protocols:* Develop and implement unified hand hygiene protocols across all departments and facilities, ensuring alignment with best practices and consistent application.

* -Celebrating successes and improvements:* Acknowledge achievements and improvements in hand hygiene compliance, celebrate them, and promote the observance of World Hand Hygiene Day.

Although it is impossible to keep hands completely free from germs, washing hands multiple times with soap and water can significantly reduce the transmission of bacteria, viruses, and other microbes. Hands should be washed

Before and after patient care.

-If hands are contaminated with blood or other bodily fluids.

-When providing services or care for a patient.

-When visiting patients in a hospital or other healthcare facilities.

-Before treating wounds or injuries, and afterward.

-Before, during, and after preparing food.

-After using the restroom.

-After changing diapers or cleaning a child who has used the restroom.

-After blowing the nose, coughing, or sneezing.

-After touching animals, feeding them, or handling their waste.

-After dealing with pets or their food.

-After touching garbage.

-Before inserting or removing contact lenses.

According to recommendations from the *World Health Organization (WHO)* and the *Saudi Ministry of Health*, healthcare professionals play a vital role in protecting patients from hard-to-treat infections by practicing proper hand hygiene. It is preferred to rub hands with an alcohol-based sanitizer or wash them with soap and water when visibly dirty to prevent the spread of infections. The correct method for washing and disinfecting hands includes the following steps:

*** *First: The correct method for hand rubbing when using sanitizer (Procedure duration: 20–30 seconds *(**

.1Apply sanitizer to the palms, distributing it evenly on both hands .

.2Rub hands thoroughly, ensuring the palms are rubbed together .

.3Rub the back of the left hand with the right palm, interlacing the fingers, and vice versa for the right hand .

.4Interlace fingers and rub between them, ensuring all areas are cleaned .

.5Rub the back of the fingers on one hand with the palm of the opposite hand, and switch sides .

.6Use a circular motion to rub the left thumb with the right palm, then repeat for the right thumb with the left palm .

.7Rub the right hand in a circular motion backward and forward, ensuring fingers are interlocked with the left palm, and repeat for the left hand with the right palm .

.8Wait until the hands are dry .

***Second: The correct method for hand washing (Procedure duration: 40–60 seconds *(**

.1Wet hands with clean, running water, and apply enough soap to cover both hands .

.2Rub hands together, ensuring the palms are cleaned thoroughly .

.3Rub the back of the left hand with the right palm, interlacing the fingers, and vice versa for the right hand .

.4Interlace fingers and rub between them, ensuring all areas are covered .

.5Rub the back of the fingers on one hand with the palm of the opposite hand, and switch sides .

.6Using a circular motion, rub the right thumb with the left palm, and repeat for the left thumb with the right palm .

.7Rub the right hand in a circular motion backward and forward, interlocking the fingers with the left palm, and repeat for the left hand with the right palm .

.8Rinse hands thoroughly under running water .

.9Dry hands completely with a clean towel or a disposable paper towel .

.10Use the towel to turn off the faucet .

.11Hands are now safe.

Materials Used in Hand washing:

1. *Water and Soap:*

It is well-known that using soap and running warm water is essential for thoroughly cleaning all hand surfaces, including under the nails. Hands should be rubbed together with soap for at least 20 seconds, away from the water flow, before rinsing them completely and drying them with a clean, designated towel. Using only water is insufficient for cleaning the skin, as water alone often cannot remove dirt, oils, and proteins. Effective removal of microbes requires adding soap or sanitizers to the water, ensuring the water used is warm enough to facilitate the removal of bacteria, dirt, and oils from the hands. It is also important to avoid using solid soap bars repeatedly as they may harbor bacteria from prior use.

2. *Hand Sanitizer:*

In addition to washing hands with soap and water, alcohol-based hand sanitizers are an effective method for killing certain types of pathogens. Hand sanitizers are a convenient and waterless alternative for cleaning hands. Alcohol-based rubs (known as waterless hand rubs or hand sanitizers) became popular in the late 1990s and early 2000s. These sanitizers typically contain *isopropyl alcohol* or *ethanol, combined with a thickening agent like **carbomer* to form a gel, or with a moisturizer like *glycerin* to create a liquid or foam for ease of use and to reduce the drying effects of alcohol.

Hand sanitizers should contain *60–95% alcohol* to effectively kill germs. Their use has increased due to their convenience and quick germ-killing action.

Medical studies have shown that alcohol-based sanitizers often include emollients, which are gentler on the skin than antibacterial soaps or detergents. Contact dermatitis or eczema caused by hand sanitizer is rare, as are allergic reactions to the alcohol or additives. However, sanitizers are not effective when hands are very dirty or greasy.

3.*Drying*

Effective hand drying is a critical component of the hand-cleaning process. It has been proven that using a towel is essential for effectively removing contaminants. Washing separates contaminants from the skin but does not completely remove them. Removing the remaining moisture on the hands (using a towel) also eliminates these separated contaminants. After drying, a paper towel should be used to turn off the faucet (and open the door if in a public restroom).

In 2008, the University of Westminster in London conducted a study comparing hygiene levels provided by paper towels, warm air dryers, and modern jet air dryers. The key findings were as follows:

- After washing and drying hands with a warm air dryer, the average total number of bacteria increased by *194% on the fingertips* and *254% on the palms*.

- Drying with a jet air dryer resulted in an *increase* in the average total number of bacteria by *42% on the fingertips* and *15% on the palms*.

- After washing and drying with paper towels, the average total number of bacteria *decreased* by *76% on the fingertips* and *77% on the palms*.

The scientists also examined the potential spread of contamination to other restroom users and the restroom environment based on the type of drying method used. They found:

- The jet air dryer, which expels air at a speed of *400 miles per hour, was able to blow microorganisms off hands and the device itself, potentially contaminating other restroom users and the environment up to a distance of about **2 meters*.

- The warm air dryer spread microorganisms up to *0.25 meters* from the dryer.

- Paper towels showed no significant spread of microorganisms.

Symptoms and Side Effects of Hand Washing:

1. *Skin Damage Due to Over washing:*

Excessive and frequent hand washing can lead to skin damage due to dryness. A Danish study conducted in 2012 found that excessive hand washing may result in itchy, flaky skin known as contact dermatitis. This condition is particularly common among healthcare workers.

2. *Obsessive-Compulsive Disorder (OCD):*

Over washing hands is also considered one of the symptoms of OCD.

CONCLUSION

Professor Didier Pittet, Director of the WHO Collaborating Center on Patient Safety (Infection Control) at Geneva University Hospitals, stated:

"This sustained increase in participation highlights that hand hygiene efforts continue to remain a global priority, particularly when combined with critical objectives like combating antimicrobial resistance."

The Centers for Disease Control and Prevention (CDC) also confirmed:

"Effective hand washing is one of the most well-documented measures for preventing the spread of pathogens."

In general, hand washing effectively protects healthcare professionals and the public against droplets and airborne diseases, such as *measles, **smallpox, **influenza, and **tuberculosis. It also remains the best defense against diseases transmitted through fecal-oral routes (e.g., many types of **stomach infections* or what is referred to as *stomach flu) and direct physical contact, such as **impetigo*.

Summary of the Study

Hand hygiene is the correct and essential approach to preventing the transmission of infections and diseases to the general public. Therefore, it is crucial to maintain hand hygiene using water, soap, sanitizers, and proper drying methods, following the guidelines provided by the World Health Organization (WHO) and the Ministry of Health to prevent infection and safeguard our lives.

Since healthcare professionals are on the front lines, they must maintain the cleanliness of their hands and ensure the safety of those they serve. They should also educate and raise public awareness to protect their health and the health of the community.

Neglecting hand hygiene could result in the spread of infections and diseases, which could lead to severe consequences, including the loss of lives due to negligence or laziness in keeping hands consistently clean.

Adhering to WHO and Ministry of Health recommendations on hand hygiene and proper hand washing techniques reflects awareness, care, and understanding of the risks of spreading infections and causing serious diseases.

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