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Reducing the Risks of Bacterial Infection through Hand Wash

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Abstract

Hands often act as vectors that carry disease-causing pathogens from person to person, either through direct contact or indirectly through surfaces. Humans can spread bacteria by touching other people's hand, hair, nose and face. Hands that have been in contact with human or animal feces, bodily fluids like nasal excretions and contaminated foods or water can transport bacteria, viruses and parasites to unwitting hosts. From this setting, it has become obvious that, though there has been a lot of sensitizations on hand washing, many persons have not developed the culture of hand washing practices hence resulting in poor hand hygiene practices. Also, many pathogenic bacteria have also been reported to inhabit the hands which eventually gain access through different routes into the system with its possible health effects. Therefore, this calls for a strong health education and hygiene sensitization on the need for effective hand washing practice. Thus, encourage hand washing practices as this reduces the risk of transmission of pathogenic infection. However, Edem (2022) asserts that Public sensitization is more effective when it engages culture as a medium for transmitting values and shaping communal behaviour.

Introduction

The primary mode of transmission of many infectious diseases is the hand, especially among people working in close proximity to one another such as in home, schools and community. The hands are important given that they are the last line of defence within the chain of transmission of enteropathogens, with transmission occurring either directly from the hand to the mouth or indirectly via handling and transfer of contaminated food and water. The hands play a role in the transmission of respiratory pathogens through fingers contaminated with respiratory viruses; for example, transmission can occur by rubbing the conjunctiva of the eyes or the nasal mucosa with

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contaminated fingers. The hands can also play a part in the transmission of skin, wound, eye and other infections. The hands are among the most important mechanisms that transmit pathogenic micro-organisms that cause infection. Evidence indicates that the hands, along with contact with food and other environmental surfaces, cause 60% of spread of gastrointestinal infections. Contaminated hands are also associated with up to 50% of respiratory tract infections. Promoting improved hand hygiene has been recognised as an important public health measure. Results from intervention studies show that handwashing reduces gastrointestinal and respiratory tract infections to up to 50%–60%. Education about handwashing in the community reduces the number of people who get sick with diarrhoea by 23%–40%, reduces diarrhoeal illness in people with weakened immune systems by 58%, reduces respiratory illnesses such as common cold in the general population by 16%–21%, and reduces absenteeism due to gastrointestinal illness among schoolchildren by 29%–57% (Gizaw*et al*., 2022).

Hand hygiene is a key component of good hygiene practice in the home and community and can produce significant benefits in terms of reducing the incidence of infection, most particularly gastrointestinal infections but also respiratory tract and skin infections. Contaminated hands serve as vehicles of transmission of infectious diseases (Ogba*et al.,* 2018). Infectious diseases remain a serious public health threat and hand washing has emerged as one of the components of a package of public health tools to be used in preventing them. To be effective, the different components, including water supply, personal hygiene, food security and sanitation have to function in coordination with one another. Cholera, typhoid and hepatitis A are some of the communicable diseases that are spread via the faecal-oral route. They occur when microorganisms enter the mouth through food, water and unhygienic toilet practices (Burton *et al.,* 2011).

The primary mode of transmission of many infectious diseases is the hand, especially among people working in close proximity to one another such as in schools. Contaminated hands serve as vehicles of transmission of infectious diseases (Ogba*et al.,* 2016) which may increase infection rates among children. Hands often act as vectors that carry disease-causing pathogens from person to person, either through direct contact or indirectly via surfaces. Humans can spread bacteria by touching other people's hand, hair, nose and face. Hands that have been in contact with human or animal feces, bodily fluids like nasal excretions and contaminated foods or water can transport bacteria, viruses and parasites to (Ray *et al*., 2011) unwitting hosts.

Hand hygiene involves any action of hand cleansing, rubbing your hands with an alcohol or washing your hands with soap and water to avoid the growth of microorganisms on hands.

Hand washing with soap and water is one of the most effective and inexpensive means of preventing infections. The value of hand washing for the prevention of cross infection was first observed in the middle of the nineteenth century. This practice especially when done with soap can remove agents of infection both at the time they were emitted from the primary host and prevent them from reaching the secondary host, however, there is difficulty of maintaining

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compliance to basic hand washing practices and this are difficulties to conquer, especially being in school environment. Hand washing has been recorded to have significant impact in the reduction of microbial loads in the hands of individuals (WHO, 2013). Regular hand washing is thus an excellent way of preventing the transmission of microbes from one person to another and has been described as a modest measure with big effects. Hand washing is especially important where people congregate (schools, offices), where ill or vulnerable people are concentrated (hospitals, nursing homes), where food is prepared and shared and in homes, especially where there are young children and vulnerable adults. As simple as hand washing appears to be, it has been found not to be a common practice (Opera and Alex-Hart, 2009). Since culture shapes daily habits, hygiene education should also address the values, routines and behaviours learned within communities (Edem, 2024).

Hand washing is the most effective and simple method of preventing the spread of communicable diseases (Burton *et al.,* 2011). Lack of compliance to basic hand washing practice in the school environments due to time constraints and lack of water and sinks in most classrooms has been reported as a contributor to disease outbreaks by the World Health Organization (World Health Organization guidelines on hand hygiene in health care, 2013). Failure to perform appropriate hand hygiene practice has been recognized as a significant contributor to outbreaks of infectious diseases by the World Health Organization (WHO guidelines on hand hygiene in health care, 2013).Therefore, this study is aimed to create an awareness of reducing the common infection through hand wash.

Hand hygiene

Hand hygiene has been recognized as an important public health measure. Hand washing with soap and water is one of the most effective and inexpensive means of preventing infections. The value of hand washing for the prevention of cross infection was first observed in the middle of the nineteenth century.This practice especially when done with soap can remove agents of infection both at the time they were emitted from the primary host and prevent them from reaching the secondary host. Regular hand washing is thus an excellent way of preventing the transmission of microbes from one person to another and has been described as a modest measure with big effects (Gizaw*et al.,* 2022).Hand washing is especially important where people congregate (schools, offices), where ill or vulnerable people are concentrated (hospitals, nursing homes), where food is prepared and shared and in homes, especially where there are young children and vulnerable adults. As simple as hand washing appears to be, it has been found not to be a common practice (Opera and Alex-Hart, 2009).

Microorganisms

All humans carry microorganisms on their skin.Pathogens such as bacteria, viruses, protozoans and helminths either from human or animal sources (Gizaw*et al*., 2022). In the case of Bacteria, these have been divided into two groups -transient and resident bacteria. Transient (or contaminating) bacteria colonize the upper layers of the skin and are acquired during direct contact

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with people and contaminated equipment or the environment. Transient bacteria may also be easily passed on to others or to objects in the environment and are a frequent cause of infections. Resident bacteria are found in deeper layers of skin and are more resistant to removal, these bacteria do not generally cause infections and can be beneficial to the good health of the skin (WHO. 2009).

Skin Bacterial Flora

Skin flora also called skin microbiota, refers to microbiota that reside on the skin,typically human skin, many of them are bacteria of which there arearound 1,000 species upon human skin from nineteen phyla. Every person's skin carries a unique microbial population, which may help to protect skin or increase its vulnerability.9 The microbiota present on the skin (which consists of both commensal and pathogenic microbes) can be transient or resident (Zhu *et al.,* 2019), and these microbes affect the skin barrier and epithelial innate immune responses.12,13 When the barrier is disturbed or the balance between commensal microbiota and pathogens is disrupted, skin disease or even systemic disease may occur (Byrd *et al*., 2018; Chen *et al*., 2018).

The skin microbiome plays important roles in preventing invading pathogens, educating the host immune system, and breaking down natural products, similar to the gut microbiomes.Microbiota include *Staphylococcus* spp*, Streptococcus* spp*, Escherichia coli,Micrococcus spp* ((Qiao*et al.*, 2021).

Gram-positive bacteria *Staphylococcus spp.* are gram-positive cocci that aggregate in clusters. Commensal *Staphylococcus spp.* are distinguished by their inability to produce coagulase, an important virulence-associated enzyme. There are 32 species of coagulase negative *staphylococci*, of which 15 are exclusive to humans, and 10 routinely isolated from normal glabrous skin. *Staphylococcus epidermidis* and *S. hominis* are the most prevalent coagulase-negative commensals. Occasionally, these organisms cause nosocomial infections in patients with indwelling foreign bodies such as heart valves and intravenous catheters. *Micrococcus spp.* are also gram-positive cocci, distinguished from *staphylococci* by the inability to produce acid anaerobically from glycerol. Moreover, *Micrococcus spp*. are not lysed by lysostaphin and nitrofuran. At least eight species have been isolated from human skin, the most common being *M. luteus. Coryneform* are gram-positive *pleomorphic bacilli.* Skin commensals include *Corynebacterium spp., Propionibacterium spp., Dermabacter spp.* and *Brevibacterium spp. Corynebacteria* are classified as either lipophilic or nonlipophilic. Lipophilic organisms colonize areas rich in lipids or sebum such as the axilla and include *Arcanobacteriumhaemolyticum, C. xerosis, C. minutissimum and C. striatus.* These organisms do not produce toxins and are nonmotile. *Propionibacterium acnes* is the dominant anaerobic *coryneform* on the skin. Unlike most commensals, its anaerobic requirements favour growth deep in adnexal structures as opposed to squamous epithelium. *Dermabacter* and *Brevibacterium spp*. prefer glabrous, humid skin such as the toe webs. The production of methane thiol by *Brevibacterium spp*. is the cause of "foot odor". Gram-negative bacteria do not normally reside in the dry environment of normal skin.

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Occasionally, moist intertriginous areas allow for the growth of *Acinetobacter spp.* (Rocha and Bagatin, 2018; Chiller *et al.,* 2001).

The Science of Hand Washing

The bacterial flora of the hands is similar to other skin sites. *Coryneform* and coagulase negative *staphylococci* are the most common. Some bacteria, such as staphylococcus epidermidis, produce a chemical that kills other bacteria. This is part of the body's defense system to control the growth of transient microorganisms. The hands are unique in that the various parts of the hand, the interdigital spaces (webs between fingers), nail folds (skin around the fingernail) and palms can each support different types of bacteria due to the differences in the environment in these places. They are constantly coming in contact with environmental surfaces (Galiani*et al.,* 2012). The hands can carry many different types and populations of transient and potentially pathogenic microorganisms. Gram-negative bacteria, while only comprising about 10% of the total bacteria population on the skin, often reside and proliferate at high numbers on the hands of health care workers. Due to regular handwashing and the application of creams and lotions, the flora on the hands frequently changes (Ferozee*t al.,* 2014). The bacteria population on other parts of the body remains fairly constant. In one experiment, subjects refrained from bathing for five to seven days. The bacteria populations on the backs and shoulders increased just slightly. This was not true of the hands. Bacterial density on the hands was shown to be directly related to the frequency of handwashing: although, there is a minimum number that can be achieved (Chew, 2015). With very high levels of handwashing, some bacterial levels, such as *staphylococcus aureus*, actually increase. This is probably due to the removal of the lipid/sebum layer during washing, which helps control the environment of the skin for the resident microorganisms. Anything that interferes with the body's ability to regulate the resident flora can inadvertently allow pathogenic bacteria to thrive. This is not to suggest that hand washing is in any way contraindicated however (Snelling *et al*., 2011).

Hand washing removes skin lipids and sebum and decreases both acidity and the moisture content of the hands. Various experiments have demonstrated that hand washing for 30 seconds or more with ordinary soap increased the skin pH by 0.6 to 1.8 units, with the pH increasing as high as 8. A change in pH of the skin may make it harder for resident bacteria to survive but may make it easier for transient bacteria to thrive. The skin took between 25 minutes to three hours to return to the normal pH of 5 to 6 (Halder*et al.,* 2010).

The dorsum (backs) of the hands replace the lipids removed during hand washing at a rate of 20% after one hour and 50% after three hours. Other lab experiments confirm that after thoroughly removing all of the sebum from the hands it takes the body three hours to replace 50% of the sebum on the hands. The sebum helps control the pH and moisture of the hands, which controls the population of resident organisms. Removal of all of the sebum makes it easier for transient microorganisms to thrive on the hands. Naturally occurring fatty acids in the stratum

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corneum have fungicidal and bactericidal activity, which is critical in regulating the skin flora (Park *et al.,* 2010).

During hand washing, friction is applied to the skin of the hands to remove the lipids/sebum, soils and microorganisms present. This is accomplished in the presence of water and soap. Hand washing also removes the first several cell layers of the stratum corneum and usually lowers the number of bacteria on the skin surface, but does not remove all of the bacteria from the hands. During subsequent hand washing, which removes more skin cells and bacteria, the bacteria numbers remain the same. This again indicates that bacteria are located in the deeper skin layers, hair follicles and sebaceous glands (Pickering *et al.,* 2010).

Handwashing with plain soap can physically remove a certain level of microorganisms, but with an antimicrobial agent is needed to kill or inhibit microorganisms and reduce the members of bacteria further. If the scop is antimicrobial, it kill microorganisms not moved by the mechanical washing process. It could potentially leave a resident effect on the hands to prevent later bacterial growth by binding to the stratum resulting in a persistent activity on the skin, which keeps the numbers of bacteria fear up to several hours (Aremu, 2012)

In the presence of a heavy contamination of transient microorganisms, handwashing with plain soap may fall to remove all of the transient organisms. Hands that have been heavily contaminated need to be washed with an antiseptic soap (Ogba*et al.,* 2013). In one study, frequent washing with an antimicrobial soap increased the number of organisms being spread on nurses' hands. This was attributed to an overall decline in skin health rather than any failure of the antimicrobial soap or the washing process (Ogba*et al.,* 2013)

Frequent hand washing with plain soap can damage the skin that can result in an increase in shedding of more resident organisms into the environment. Overall skin health is at least as important as using an antimicrobial soap in controlling microorganism populations. Studies of showering and bathing demonstrated that these activities also fed in an increase in the number of bacteria being shed into the air. This seems to be caused by breaking up the skin surface and bacteria then contaminating surrounding surface skin cells which are shed following showering and bathing. (Joshi and Amad). 2013). While drying the skin is a necessary mechanism to promote the "self-sterilization" of the skin, dryness is partially a result of the loss of lipids, which causes a loss of water in the skin. Drying of the stratum corneum (outer layer of skin) below a 10% water content causes cracks in the skin, destroying the integrity of the skin. In performing a handwashing experiment, Doctors Meers and Yeo found a 17-fold increase in the number of particles carrying viable bacteria released from the skin after handwashing with bar soap. This shedding of bacteria was notably decreased after using an antibacterial soap instead of the bar soap. The scrubbed hands appear to react to the removal of bacteria during handwashing by replacing them and quickly increasing the population of resident bacteria on the surface of the skin (Jenkins *et al.,* 2013).

These studies demonstrate that handwashing programs in which employees alternate between the use of plain soaps and antiseptics result in widely fluctuating bacterial counts on the

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employees' hands. Handwashing without using an antiseptic/anti-bacterial soap removes transient bacteria but also aids the body in replenishing the resident bacteria on the skin. Hand washing with antiseptic/antibacterial hand soap kills or removes both resident and transient bacteria and suppresses the natural regeneration of resident bacteria because of the residual effect left on hands, making it easier for transient bacteria to flourish. Even for health care workers, routine hand washing with antimicrobial soaps may not be desirable, since repeated washings suppress their population of normal flora on the hands, thus making it easier for transient flora to flourish (Nwambete and Iyombe, 2011)

Plain soaps are adequate for routine hand washing, but bar soap should not be used. Gram-negative bacteria have been isolated from the sludge in bar soap dishes. While there is some evidence that this does not result in the transmission of microorganisms, it is far from conclusive and thus as a sensible precaution should be avoided (Nwambete and Lyombe, 2011).

A number of studies have compared different hand hygiene methods in hospital settings (WHO, 2010; Judah*, et al.,* 2010).

There are a few simple steps to take to give your hands a thorough cleaning and prevent the spread of illness. The steps are:

1. Wet your hands with clean running water (warm or cold).
2. Lather up your hands with soap. Rub your hands together for at least 20 seconds. Don't forget to wash your wrists, the back of your hands, between your fingers and under your fingernails.
3. Rinse your hands well under running water.
4. Turn off the water with your elbow.
5. Dry your hands with a clean towel or air dry them.
6. If you used a towel to dry your hands, use the same towel to open the bathroom door to leave the room. Discard the towel in a wastebasket.

Benefits of Hand Washing

1. Creating a safer working environment for medical staff and the patients

The nature of many kinds of medical procedures is very delicate. It usually deals with exposed internal organs or passing drugs into the body. So in these particular cases hand washing has to be taken seriously because harmful bacteria can easily get into our bodies to cause more harm.

Good medical facilities have the basic facilities for hand washing easily accessible. These facilities should be used regularly by the doctors, patients, and visitors.

Additionally, those facilities need to be absolutely sanitary and the soap dispensers, sanitizers and other items need to be replenished regularly. Also, special waste disposal units need to be in the washroom, as well.

The efforts for creating a safer working environment also include a more thorough and more detailed hand scrubbing than it is expected from other employees. There is a certain way medical personal prepares for the surgeries and interventions and it requires a lot of high-quality soap

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2. Prevention of diarrhoea and uncomfortable intestinal diseases

Contact with faecal matter laden with the causative bacteria can lead to **diarrhoea and intestinal illnesses**. Regular washing of the hands removesfaecal matter and bacteria from our hands even when contacted them from other people or objects.

If this contamination happens over and over again, it is possible to develop **chronic issues with the intestinal bacteria**. The new bacteria that a person introduces to their intestinal system by dirty hands destroys the balance which is difficult to restore.

3. Avoidance of common eye infections

Eye infections are commonly caused by the bacteria that get into the eyes from our hands. It would be great if you could refrain from touching your eyes with your bare hands. However, it usually happens involuntary.

Therefore, it is best to handle this in another way. Control what you can – wash your hands. Keeping the hands clean by regular washing prevents common infections.

However, the common eye infections that happen as a result of direct contact with different germs are:

1. Conjunctivitis (pink eye)
2. Keratitis
3. Stye
4. Blepharitis

All these infections start with similar symptoms: redness of the eye, mild pain, itching sensation, blurry vision and the like. Again, while these issues are not very difficult to treat, prevention is a much wiser course of action. You should never touch your eyes with unwashed hands and your hand washing needs to be thorough.

4. Obstruction of respiratory tract infections

In the same way, the germs that cause these infections are usually found on dirty hands. Regular washing of the hands removes germs easily, keeping you safe.

Germs that cause respiratory infections include bacteria, viruses and even some fungi. The symptoms can be quite common for all of them:

- Coughing
- Sneezing
- Runny nose
- Nasal discharge
- Nasal congestion

However, the flu might be the most annoying and the most common respiratory infection. While the virus that causes it is airborne, transmission through air is not that efficient. The truth

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is, the most cases of flu are caused by viruses being transmitted to the wet patches of the face by dirty hands.

5. Reduction of the bacteria content on your hands

Bacteria have been known to linger on the hands and other objects for days! This means that if you do not wash your hands expecting the bacteria to die, you might be in for a surprise. They Bacteria stay on your hands, or even worse – make their way to your eyes or mouth, causing infections.

6. Keeping your workplace free from bacteria

Regular cleaning of **commonly used office equipment** with an alcohol-based cleaning product can reduce the number of bacteria on them.Still, this doesn't save you from their presence. You should also wash your hand regularly to prevent your hands from being the medium through which the bacteria is carried all around the office

(https://www.alsco.com.au/2017/07/benefits-proper-hand-washing/)

Recent Study on Hand Wash

A study by Watutantrige*et al.,* (2012) on Hand Contamination and Hand Washing Practices among Medical Students reported that, a total of 38 unique bacteria colonies were isolated based on colony morphology from the hands of subjects after toilet use. There was a total of 27 Gram positive isolates and a total of 11 Gram negative isolates. Of the 27 Gram positive isolates, 21 were cocci and six were bacilli. Of the 11 Gram negative isolates, three were cocci and eight were bacilli. 18 of the total 38 isolated bacteria were successfully amplified using the PCR technique and only 10 different species were identified. Successful PCR amplification was confirmed through gel electrophoresis, which yielded bands at specific size for *Staphylococcus aureus, Staphylococcus haemolyticus, Staphylococcus capitis, Staphylococcus hominis, Staphylococcus epidermidis, Kocuriarhizophila* and *ArthrobacteraurescensStaphylococcus aureus* was isolated from the hands of 21 students (18 males and 3 females) after toilet use of which 15 belonged to the group that did not use soap to wash hands. Before toilet use, *Staphylococcus aureus*was isolated from the hands of only three students. The bacteria identified from the hands of the students belong to the normal flora of the hand and pose no significant health hazard to healthy individuals. However, the normal flora of the hands of Health Care Workers could be pathogenic especially in immune compromised patients (Wilson, 2005). The isolation of *Staphylococcus aureus* from the hands of 21 students is significant. *Staphylococcus aureus* is one of the most common causes of both community and hospital acquired infections (Hidron*et al.,* 2008). *Staphylococcus aureus* is known to be the causative pathogen in a range of diseases: impetigo (Dagan, 1991, folliculitis, septic arthritis (Sladden and Johnston, 2005), osteomyelitis, septicaemia, pneumonia andmeningitis (Pedersen *et al.,* 2005). Students' hands may have got contaminated withstaphylococcusaureus either by contact with the genital area or by contact with contaminated toilet surfaces (Watutantrige*et al.,* 2012).

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Also, a review by Edmonds-Wilson *et al.,* (2015) revealed that, of the eleven studies reviewed characterized the relative abundance of bacteria on hands. Most studies reported between 8 and 24 families of bacteria on hands. Bacteria were found from four phyla across all studies (most to least relative abundance): Firmicutes. Actinobacteria, Proteobacteria and Bacteroidetes. There were considerable differences in the types of bacteria found among the studies with Staphylococcaceae, Corynebacteriaceae, Propionibacteriaceae and Streptococcaceae being found in a majority of the studies. Interestingly, *Propionibacteriaceae,* when detected, was often quite high in relative abundance. The first study of the hand microbiome demonstrated there are on average 150 bacterial species found on the palms, with 3 phyla accounting for >94% of sequences: *Actinobacteria, Firmicutes*and*Proteobacteria* (Fierer*et al.,* 2008). A study evaluating the hands of healthcare workers found those with less microbial diversity were more likely to harbor pathogenic microorganisms on the hands, such as *S. aureus* (including MRSA), *Enterococcus spp. or Candida albicans* (Rosenthal *et al.,* 2014). A study from Kyriacou *et al. (*2009) found that 52.9% of children's hands of the 1956 hand swab samples were contaminated by fecal streptococci. A study from Tambekar*et al.* (2009), demonstrated the presence of bacterial pathogens in the hands of all of the 400 students whose hand swabs were examined. A study evaluated both fungal and bacterial diversity on the hands, found *Malassezia spp*. to be the most common fungal inhabitants, with *Aspergillus spp.* the second most common (Findley *et al.,* 2013). Bacteria were the most prevalent microorganism (>80% relative abundance), then viruses and fungi being least prevalent (<5% relative abundance) on hands (Oh *et al.,* 2014). However, this finding may be somewhat biased for greater proportion of bacteria, since the relative size of viral genomes is small and would therefore be expected to represent proportionally less of the sequence data, even if bacteria and viruses were equally abundant.

Constraints to Hand Washing

A study by Opara and Alex-Hart, (2009) reported that constraints to hand washing include; inaccessible supplies of materials such as soap and water, forgetfulness and laziness. Others were lack of time, inconveniently located sinks and lack of motivation. These factors and many others have been reported in other studies (Global Hand Washing Day Planners Guide, 2010) as barriers to hand washing among health workers. These findings also support suggestions by authors that factors associated with noncompliance with hand hygiene recommendations are related not only to the individual worker but also to the group to which he or she belongs and by extension, to the parent institution. Such factors include lack of appropriate hand hygiene agents and lack of hand hygiene facilities e.g., paper towels as observed in the study.

Motivating Factors to Hand Washing

The greatest motivating factor for hand washing among the medical students according to Opora and Alex-Hart, (2009) was fear of contracting disease. This has been recorded in other studies among health personnel. This finding could be attributed to their knowledge of disease transmission and a personal need for self-protection. Culture/habit was another motivating factor.

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Studies done amongst mothers of young children in Hand Washing with Soap show that they ascribed hand washing habits to what they were taught when they were young. Similarly, in a survey of what motivates hand washing in Ghana, the strongest motivators for hand washing with soap were related to nurturance, social acceptance and disgust of faeces. Protection from disease was mentioned as a driving force but was not a key motivator of hand washing. This further buttresses the point that knowledge of disease transmission is an important motivating factor for hand washing amongst individuals (Scott *et al.,* 2007).

Conclusion

Hand hygiene is a key component of good hygiene practice in the home, schools and community, thus produce significant benefits in terms of reducing the incidence of infection, most particularly gastrointestinal infections but also respiratory tract and skin infections. Decontamination of handsby hand washing with soap or by use hand sanitizers, reduces contamination on hands by removal or by killing the organisms in situ. The health impact of hand hygiene within a given community can be increased by using products and procedures, either alone or in sequence, that maximize the log reduction of both bacteria and viruses on hands

Recommendations

Hand washing with soap and water is the best component of a hand hygiene program to reduce the risk of contamination through contact with hands.

To optimize health benefits,Local health authorities should, therefore, primarily promote hand hygiene, accompanied by hygiene education convincing people to apply hand hygiene procedures correctly and at the correct time.

Sensitization on hand washing should be recommended. Such sensitization can be strengthened through community arts, music and performance, which remain effective tools for public education and behavioural change (Akpan, Edem, & Iseyen, 2025, p. 160).

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