

# Microbial Pollution of Hand Washing Liquids in Kurdistan University Hospitals

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**Background:** Many nosocomial infections are transferred by hand contact between personnel. Among basic actions to control such infections is the investigation of hygienic conditions of washing hands with hand washing liquids. In such situations, if the hand washing agents are contaminated with pathogenic agents, they may lead to the development of nosocomial infections.

**Objectives:** In this study, we investigated infections in hand washing liquids in public hospital of Sanandaj during 2011.

**Materials and Methods:** This was a cross-sectional study conducted in public hospitals of Sanandaj. The type and species of microorganisms from 52 samples were examined and diagnosed. Statistical analysis was done using Excel with frequency distribution tables and descriptive tests.

**Results:** *Pseudomonas aeruginosa* (47.36%) and *Staphylococcus epidermidis* (26.31%) had the highest frequencies and *Escherichia coli* (5.26%) had the lowest isolation rate.

**Conclusions:** The results indicated that the level of contamination at public hospitals of Sanandaj was very high (59.37%). An important finding of this study was the need for appropriate training because we observed liquid containers without lids or with unsuitable lids.

**Keywords:** Nosocomial Infections; Microbial Pollution; Hand Washing Liquids

## 1. Background

Nosocomial infections are considered as a global problem (1). Such infections usually begin 48 to 72 hours after admission to a hospital. These infections do not exist at the time of admission to the hospital or in the personnel working there but are acquired during residence or doing duties at the hospital (2). Nosocomial infections lead to significant morbidity and mortality and place a heavy financial burden on patients (3). Two possible sources of nosocomial infections are infected patients and hospital personnel's hands (1). Hand washing and maintaining hygienic conditions are among basic actions to control such infections. Hospital environments may be contaminated with pathogenic organisms such as *Salmonella*, *Shigella*, *Escherichia coli*, *Klebsiella*, *Streptococci*, *Staphylococci* and other living factors which may carry diseases through foods (2). One way for transmission of pathogens to foods is through contaminated and dirty hands. The most basic action for promoting health and something that is of great importance for hospital environments is decontamination and disinfection because hospital staff and those who come to hospitals can transmit nosocomial infection causing agents. Hygiene (both washing and decontamination of hands)

is the first preventive action (4). Hand washing with an adequate amount of water and soap removes more than 90% of superficial temporary infective factors. As a result, soap is an important factor in preventing transfer of such pathogenic factors (4). However, if the preventive agent itself bears such pathogenic factors, it is necessary to conduct investigations to determine the pathogenic factors within the preventive agent (5, 6).

## 2. Objectives

This study intended to determine microbial contamination of hand-washing liquids used at public hospitals in Sanandaj (Iran) during 2011.

## 3. Materials and Methods

This was a cross-sectional study conducted from September 2011 to February 2012. Three hospitals were selected using random hierarchical sampling including Besat, Tohid and Qods hospitals. Two samples were randomly taken from different wards (infections, internal, pediatric, emergency, neurocerebral, surgery, dialysis, post-parturition cares, coronary care unit, urology, ear,

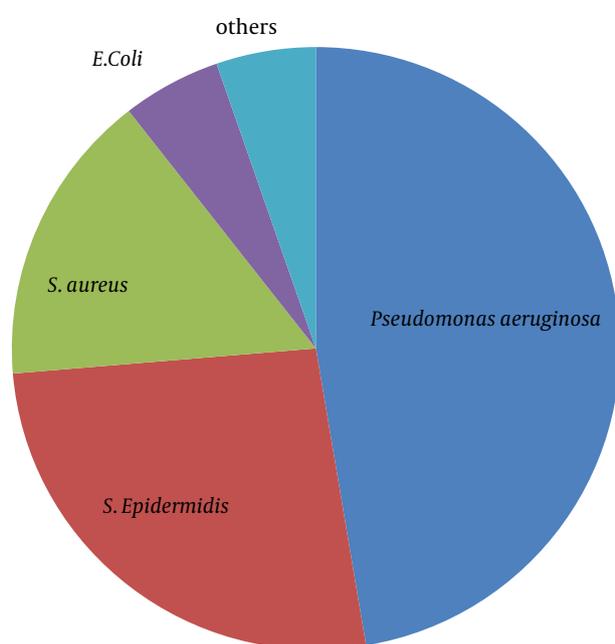


Figure 1. Microbial Contamination

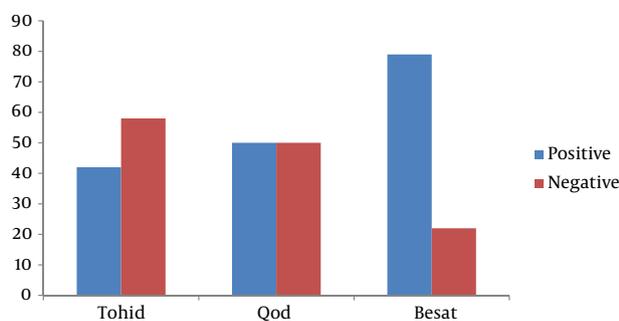


Figure 2. Contamination Distribution

nose and throat). Samples were taken from the fluid discharge around the hand-washing liquid container. Totally, 52 samples were taken. Samples were prepared in two ways: either pouring the hand washing liquid from the container into the bion or sampling from the liquid discharge point using a swab. Samples were taken in sterile conditions and transferred to the laboratory. Equal amounts of normal saline were added to the samples and they were incubated for 2 hours at 37°C. Samples were cultured on eosin methylene blue (EMB) agar and blood agar, and incubated for 24 hours in an incubator. Biochemical properties of each colony were evaluated using biochemical tests. Data and results of experiments were tested using the statistical package for social sciences (SPSS) 15 software and their microbial contamination percentage was determined using the frequency distribution table, cross-sectional test and K-square test.

## 4. Results

Our statistical population consisted of 52 samples from three hospitals in Sanandaj. Depending on the number of wards at each hospital, most samples were taken from Besat hospital (43.57%) and the least samples were selected from Qods hospital (18.75%). According to the findings, 40.63% of samples were microbial negative and 50.37% were positive. As indicated by Figure 1, highest microbial contaminations were related to *Pseudomonas aeruginosa* (47.36%) and *Staphylococcus epidermidis* (26.31%), respectively. The least infection was by *Escherichia coli* (5.26%) and others (5.26%). With respect to inter-departmental infection, emergency departments had the highest microbial infection with 70% of samples contaminated. Most contaminated samples (positive) were from Besat hospital and the least number of infectious samples were from Tohid hospital; 78% of samples from Besat hospital were positive while positive results were obtained from only 42% of samples from Tohid hospital (Figure 2).

## 5. Discussion

Soaps are chemical agents, which are used to prevent transmission of diseases and help individuals and societies improve health. One of the most important places to use soaps is hospitals, where patients can acquire or transmit pathogenic agents to others. The question is, can soaps as anti-microbial agents, contain pathogens? In a study conducted in France, direct contact was found as the most significant way of transmission of pathogens. This work studied bacteria on the surface of nurses' hands at Paul Brousse Hospital and indicated that hand washing is very important before and after contact with patients. In this study, *Staphylococcus* was dominant in terms of amount and frequency. A wider contact surface was associated with higher contamination. Also, *Enterobacter* was observed in lower numbers, which may indicate fecal infections. Some of these bacteria are hospital pathogenic bacteria. When soap is wet it can be an infection source (3). In a study by Graf et al., from a total 492 liquid soap samples with 14 brands, collected from 14 different hospitals and four different departments (sites), it was found that eight samples were sterile and the rest didn't have antibacterial agents and showed microbial infections to different degrees (7). A research by Brooks et al. in New York, studied bacterial resistance to Chlorhexidine in liquid soap and reported that *Klebsiella*, *Pseudomonas* and *Staphylococcus aureus* were abundant in the studied samples (8). Another study conducted by Askari et al. on liquid soap infection at public hospitals of Ilam indicated that 59.5% of samples were positive and 38% were negative. Among positive samples, infection with *Pseudomonas* was the highest (22.6%) (9). In a study conducted by Kabara et al. on liquid and solid soaps in 26 public restrooms, 84% of samples of solid soaps were positive and 3.35% of liquid soaps were negative. This study also demonstrated that bacterial colony counts de-

crease after 6 hours in liquid soap. However, in solid soap, the amounts of microorganisms do not change even after 48 hours. This study suggested that soaps at public places transfer diseases (6). Several studies on microbial pollution of soaps by health researchers and experts showed the importance of this issue. Our investigation on contamination degree of liquid soaps in public hospitals of Sanandaj also confirmed the importance of this issue as more than 57.37% of samples taken from several wards showed microbial contamination. In conclusion, there is no correct training for staff when soap containers don't have suitable caps and when people put their hands into the dish to take out the little amount of soap left at the bottom and this may be a reason for contamination of internal samples. We hope this manuscript provides effective warnings to take public health seriously at least in hospitals.

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