

Original Article:

Prevalence of Bacteria Contaminating the Hands of Healthcare Workers: An Experience of Masaka Regional Referral Hospital, Uganda

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Abstract:

Background: The pathogenic bacterium on the hands of healthcare workers (HCWs) is considered as the main route of spread of nosocomial infections. **Objectives:** To determine bacterial contamination of the hands of healthcare workers during routine patient care in Masaka Regional Referral Hospital, Uganda. **Methods:** This cross-sectional, descriptive study included 70 health care workers, who were actively providing healthcare in the hospital. Doctors, nurses, midwives, laboratory technicians, and pharmacists of the hospital were included in the study. The hand impressions of the participants were taken on 5% blood agar and processed as per guidelines. The criteria used for identification of bacteria were based on colony morphology, Gram staining, catalase test (for Gram-positive cocci), coagulase test (for suspected *Staphylococcus aureus*) and other standard biochemical tests. **Results:** Out of 70 samples, 62(88.6%) showed growth of microorganisms. The most commonly isolated genus was *Bacillus* found in 46(74.2%) of isolates, followed by Coagulase negative *Staphylococcus* (CoNS) found in 39(62.9%) of isolates, *Micrococcus* 18(29%) of isolates, *Pseudomonas* found in 13(21%) isolates, *Acinetobacter* 9(14.5%) and *Staphylococcus* 7(11.3%). *Bacillus* was found in all 5 midwives (100%), 3(75%) of drug dispensary workers, 9(69.2%) doctors, 3(60%) laboratory technicians and 25(64.1%) of nurses. Prevalence of Coagulase negative *Staphylococcus* was also found to be highest in 9(69.2%) of doctors, 2(40%) laboratory attendants, 4(10%) laboratory technicians, 3(60%) midwives and 20(51.3%) nurses. The prevalence rate of pathogenic bacteria is highest among doctors followed by nurses. **Conclusion:** The bacterial contamination on the hands of healthcare workers remains high and measures need to be taken to effectively implement hand hygiene.

Keywords: Healthcare associated infections, healthcare workers, bacterial contamination

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Introduction

Health care associated infections (HCAIs) are a major health problem in both developed and developing countries, and are a major cause of preventable morbidity and mortality.¹ Out of every 100 hospitalized patients, seven patients in advanced countries and ten patients in emerging countries acquire an HCAI.² The mode of transmission of HCAIs is important to understand

in a hospital setting so that the implementation of control measures can be designed to achieve effective control. Transient flora on the hand is mostly acquired from the hospital environment or poor hygiene and is responsible for cross-infections. They are acquired by health care workers (HCWs) during direct contact with patients or contaminated environmental surfaces adjacent to the patient.³

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The most common organisms causing HCAIs are *Staphylococcus aureus*— which can be methicillin-resistant *staphylococcus aureus* (MRSA), *Escherichia coli*, *Klebsiella* sp., *Acinetobacter* sp. or any other pathogen which is present in the environment of a healthcare facility^{4,5}. About 40% of all Gram-negative organisms isolated are multidrug resistant which may lead to an increased length of stay and mortality which increases the cost of healthcare and treatment, causing a big economic burden to the already overburdened economy of the developing countries.^{6,7}

Uganda, like other developing countries, is facing a major health problem brought about by HCAIs. For example, in 2010, the prevalence of HAI was 34% and 17% in 2011 in a large Ugandan hospital.⁸ Most frequently isolated bacteria were *Klebsiella pneumoniae* (30%), *Acinetobacter* species (22%) and *Staphylococcus aureus* (14%).

Another study focusing on Gram-negative organisms found that predominantly *Acinetobacter*, *Citrobacter*, and *Pseudomonas* spp, were prevalent on the hands of HCWs who access the cardiac ICU irrespective of the staff category.⁹ With the emergence of multi-drug resistant (MDR) pathogen,¹⁰ HCWs are turning to the basics of infection prevention by simple measures like hand hygiene.¹¹

Hand hygiene has been found to be the simplest and most effective intervention to control the transmission of infections in a hospital as well as control of antimicrobial resistance. This is because hand hygiene has been found to significantly reduce the risk of cross-transmission of infection in healthcare centers.^{12, 13}

Although adherence to hand hygiene practices is considered as an integral part of quality health care and that it is a Joint Commission requirement that Centers for Disease Control and Prevention hand hygiene guidelines be implemented in hospitals, compliance among health care workers remains low.^{8,14,15}

In the health centers in Uganda however, there is limited evidence to support whether the HCWs have adequate knowledge on the effect of hand hygiene practices against HCAIs. Some studies in Uganda, have dealt with efficacy of hand hygiene to reduce the pathogens in the hands of HCWs, and others have focused on identification and isolate the pathogens from patients suffering from HCAIs. There is limited information on the

pathogenic bacteria carried on hands of health care workers. This study is therefore aimed at finding the pathogenic bacteria on the hands of health care workers.

The recent global pandemic of Corona virus has seen a rise in education and campaigns aimed at increasing hand hygiene awareness and practice. It is with this background that the study is aimed at finding the prevalence of bacteria in the hands of health care workers In Masaka Regional referral hospital.

Methods

A cross-sectional, descriptive study was conducted involving 70 healthcare workers who are actively providing healthcare on randomly selected inpatient wards and special care units at Masaka Regional Referral Hospital, Uganda. Doctors, nurses, midwives, laboratory technicians, and pharmacists from the hospital who gave consent were included in the study. The hand impressions of the participants were taken on 5% blood agar and processed as per guidelines. The hand impressions on the 5% blood agar plates were inoculated in whole plate using a sterile inoculating loop as per the WHO guidelines on hand hygiene in health care. After inoculation, the plates were incubated aerobically at 37°C for 16–18 hours. The bacterial growths were identified as per standard protocol used for identification of bacteria in the bacteriology laboratory. The criteria used for identification of bacteria were colony morphology, Gram stain, catalase test (for Gram-positive cocci), coagulase test (for suspected *Staphylococcus aureus*) and other standard biochemical tests.

Results

Among 70 participants, 39(55.71%) were females and 31(44.29%) were males. There were 38(54.9%) nurses, 13(18%) doctors, 5(7%) midwives, 9(12.7%) laboratory technicians, 5(7%) dispensary/ pharmacist. 35(49.3%) had worked in the hospital for 1 year, 21(28.2%) for 2-5 years and 12(22.5%) for above 5 years. Out of 70 samples collected from healthcare workers, 62(88.6%) showed growth of microorganisms. Table 1 shows that 5(38.5%) of the doctors, 3(75%) of laboratory technicians, 8(25%) of nurses were colonized by *Micrococcus*, whereas 2(50%) of drug dispensers, 2(15.4%) of doctors 7(18.4%) of nurses and 2(50%) lab technicians were colonized by *Pseudomonas*.

Most commonly isolated microorganisms were bacillus found in all 5 midwives (100%), 3 (75%) of drug dispensary workers, 9 (69.2%) doctors, 3 (60%) laboratory technicians and 25(64.1%) of nurses. Prevalence of Coagulase negative *Staphylococcus* was also found to be highest in 9(69.2%) of doctors, 2(40%) lab attendants, 4(10%) lab technicians, 3(60%) midwives and 20(51.3%) nurses. The prevalence rate of pathogenic bacteria is highest among doctors followed by nurses.

39(55.7%) of the samples showed growth of coagulase-negative *Staphylococcus* (CoNS), 46 (65.7) showed *Bacillus*, 18(25.7%) showed *Micrococcus*, 13(18.8%) showed *Pseudomonas*,

9(12.9%) showed *Acinetobacter* 7(10%) *Staphylococcus aureus*, 2(2.9%) *Enterobacter*, 1 (1.4%) *Klebsiella*, 3(4.3) *Corynebacter*. Table 2 shows the distribution of the isolates on the hands of health care workers. Out of 70 samples collected from health care workers, 8 (11.4) showed no growth while 62(88.6%) showed growth of microorganisms. Of those found with one isolate, 11 had bacillus and 1 had CoNS. Of those with 2 isolates, 71.9% had bacillus, 68.8% had CoNS and 25% had pseudomonas. Those with 3 and 4 isolates found had CoNS, bacillus and micrococcus as the main isolates. 25.7% of the health care workers had more than 2 isolates on their hands.

Table 1. Distribution of bacterial isolates among the hospital staff

Category of HCW	<i>Bacillus</i>	<i>Micrococcus</i>	<i>Pseudomonas</i>	<i>Enterobacter</i>	<i>Coagulase negative Staphylococcus</i>	<i>Acinetobacter</i>	<i>Klebsiella spp</i>	<i>Staphylococcus aureus</i>	<i>Corynebacteria</i>
PHARMACIST (n=4)	3 (75)	0(0)	2(50)	0(0)	1(25)	1(25)	0(0)	0(0)	0(0)
DOCTOR (n=13)	9 (69.2)	5(38.5)	2(15.4)	0(0)	9(69.2)	2(15.4)	0(0)	2(15.4)	1(7.7)
LAB ATT. (n=5)	3 (60)	2(40)	0(0)	0(0)	2(40)	0(0)	0(0)	0(0)	0(0)
LABTECH. (n=5)	1 (25)	3(75)	2(50)	0(0)	4(100)	0(0)	0(0)	0(0)	0(0)
MIDWIFE (n=5)	5 (100)	0(0)	0(0)	0(0)	3(60)	1(20)	0(0)	0(0)	1(20)
NURSE(n=38)	25(64.1)	8(25)	7(18.4)	2(5.1)	20(51.3)	5(12.8)	1(2.6)	5(12.8)	1(2.6)
TOTAL (n=70)	46(65.7)	18(25.7)	13(18.8)	2(2.9)	39(55.7)	9(12.9)	1(1.4)	7(10)	3(4.3)
P value	P=0.317	0.065	0.186	0.897	0.259	0.827	0.977	0.736	0.515

Table 2. Distribution of the bacteria

No of HCW with x isolates n(%)	<i>Coagulase negative Staphylococcus</i>	<i>Bacillus</i>	<i>Micrococcus</i>	<i>Pseudomonas</i>	<i>Enterobacter</i>	<i>Acinetobacter</i>	<i>Klebsiella</i>	<i>Staphylococcus aureus</i>	<i>Corynebacteria</i>
0 isolate 8(11.4)									
1 isolate 12(17.1%)	1	11							
2 isolates 32(45.7%)	22(68.8)	23(71.9)	4(12.5)	8(25)	1(3.1)	2(6.3)		2(6.3)	2(6.3)
3 isolates 12(17.1%)	11(91.7)	8(66.7)	8(66.7)	3(25)	1(8.3)	3(25)		1(8.3)	1(8.3)
4 isolates 4(5.7%)	4(100)	3(75)	4(100)	1(25)		2(50)		2(50)	
5 isolates 2(2.9%)	1	1	2	1		2	1	2	

Discussion

In a hospital environment, chances of contamination of hands of healthcare workers are very common. These bacteria have the potential to cause harm to patients especially those who are immunocompromised. In the present study, 62(88.6%) of the health care workers carried pathogens on their hands. However, most of these pathogens were nonpathogenic. CoNS, which is one of the resident flora was isolated on 39(55.7%) of the health care workers. A number of studies have found *S. aureus* which is known to cause most of HCA as the most common isolate.^{16,17} In this study, however, *Staphylococcus aureus* was found on 7(10%) samples.

Among Gram negative bacilli most commonly obtained isolate was pseudomonas isolated on 13(18.8%) of HCW followed by *Acinetobacter spp* 9 (12.9%). *Klebsiella spp* was found on only one healthcare worker. *E. coli* was not found on any HCW. This study is similar to Mojtabah et al.¹⁸, who demonstrated *Pseudomonas* as the most common isolate however in their study, *E. coli* was second common yet in this study, *E. coli* was not identified on any HCW. Contrary to this study, other studies have identified *Klebsiella spp*, as most commonly isolated Gram Negative.

This study demonstrates that there are pathogens on the hands of health care workers. This is the first study done on hand hygiene among healthcare workers after the outbreak of Corona Virus. The expectation was that the prevalence of pathogens would be low due to the outbreak and experience

of corona virus. This study is around the time when the campaigns of hand hygiene observation due to corona virus is on the rise. It was expected to find low prevalence of bacteria due to impact of education on Hand hygiene because of Corona virus.

Conclusion

In a hospital environment, chances of contamination of hands of healthcare workers are very common. Our data suggest that hands of the majority of hospital staff are colonized with pathogenic bacteria, especially Gram-positive *Staphylococcus aureus*.

Conflict of interest: None declared.

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Ethical approval: Ethical approval of this study was obtained from the Ethical and Scientific Review Committee of Islamic University in Uganda, and permission to collect data was obtained from Masaka Regional Referral Hospital, Uganda.

Author Contribution: NA conceptualized and designed the study and did data analysis, literature review, manuscript writing and critical review; LK was involved in data gathering, laboratory analysis and data analysis, manuscript writing and critical review; HA and SA did literature review, manuscript writing and critical review. All authors read and finalized the manuscript.

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