



## AWARENESS AMONG HEALTH CARE PROFESSIONALS REGARDING NOSOCOMIAL PATHOGENS AND ROLE OF FOMITES IN THEIR TRANSMISSION.

**Khadija Mumtaz<sup>1</sup>, Nadia Aslam<sup>2</sup>, Naima Mehdi<sup>3</sup>, Nazma Kiran<sup>4</sup>, Sadaf Farzand<sup>5</sup>, Mahfooz ur Rahman<sup>6</sup>**

1. B.Sc, MLT Student  
Punjab Institute of Cardiology
2. MBBS, M.Phil (Microbiology)  
Associate Professor Pathology  
Rai Medical College, Sargodha.
3. MBBS, M.Phil (Microbiology)  
Consultant Pathologist  
Punjab Institute of Cardiology
4. MBBS, M.Phil (Histopathology)  
Associate Professor Pathology  
Rai Medical College, Sargodha.
5. MBBS, M.Phil (Histopathology)  
Consultant Histopathology  
Punjab Institute of Cardiology
6. MBBS, M.Phil (Hematology)  
Professor Pathology  
Punjab Institute of Cardiology

**Correspondence Address:**

Dr. Nadia Aslam  
Department of Pathology  
Rai Medical College, Sargodha.  
drnadia76@yahoo.com

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**ABSTRACT... Objectives:** This study was performed to access the knowledge of health care professionals regarding health care associated infections, nosocomial pathogens, fomites and their role in transmission of nosocomial pathogens. **Study Design:** Descriptive, questionnaire based, cross-sectional study. **Setting:** Tertiary care hospital of Lahore, Punjab. **Period:** From October 2017 to January 2018. **Material & Methods:** Questionnaires were carefully formulated to access basic knowledge of physicians, surgeons and nurses. Responses given were analyzed and recorded as frequency and percentage. **Results:** Regarding health care associated infections, respiratory tract infections were identified by 72% surgeons, 65% physicians and 59% nurses. Surgical wound infections were identified by 76% of surgeons and 81% nurses. 45.7% physician identified bacteraemia as nosocomial infection. Rate of identification for rest of nosocomial infections was sub optimum (<50%) by health care workers. Regarding identification of nosocomial pathogens, Methicillin Resistant Staphylococcus aureus was marked by 65% of physicians, 83.8% of nurses, 76% of surgeons. Pseudomonas nosocomial pathogen was identified by 40%, 46% and 64% of physicians, nurses and surgeons respectively. The rate of identification for rest of the nosocomial organisms was again sub optimum (<40%) by health care workers. Regarding fomites, mattresses and pillows, thermometer, stethoscopes were identified by 75.7%, 59.2 and 50% of Health care professionals respectively. **Conclusion:** This survey identified positive attitude among Health care workers towards infection control but low level of knowledge regarding health care associated infections and nosocomial pathogens. Therefore, to prevent nosocomial infections, there is strong need to develop strategies for improving knowledge of Health care professionals.

**Key words:** Nosocomial Pathogens, Fomites, Health Care Associated Infections, Health Care Workers.

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### INTRODUCTION

Health care-associated infection (HCAI) or “nosocomial” infection, is an infection acquired by a patient during stay in a hospital or health care facility and infection was not present or incubating at the time of hospital admission. A large number of patients around the world are affected by HCAs but loads of HCAs is much higher in developing countries as compared to developed ones. HCAs not only leads to prolonged hospital stay and spread of drug resistant strains leading to excess costs for health systems as well as for patients but also excess morbidity and unnecessary deaths.<sup>1</sup>

Fomites are inanimate objects or surfaces that

can act as vehicles in transmission of pathogens. Fomites can get contaminated by direct contact with body secretions or fluids, soiled hands or aerosolized pathogen. Transfer of pathogens may occur between inanimate and animate objects, or between different inanimate objects.<sup>2</sup>

Nosocomial pathogens like Vancomycin Resistant Enterococcus (VRE), Methicillin resistant Staphylococcus Aureus (MRSA), *Streptococcus pyogenes*, *Acinetobacter* spp., *Escherichia coli*, *Klebsiella* spp., *Pseudomonas aeruginosa*, *Serratia marcescens*, or *Shigella* spp can survive on dry surfaces for months.<sup>3</sup>

Inanimate surfaces and equipment (e.g., bedrails, stethoscopes, medical charts, ultrasound machine) may get contaminated by multi drug resistant (MDR) isolates and play role in cross-transmission of microorganisms.<sup>4</sup> Hands of healthcare workers (HCWs) may get contaminated after contact with emergency carts and trolleys or after using phones, medical charts, stethoscopes, monitors and ventilators thus playing a role in nosocomial spread of pathogens.<sup>5,6,7</sup>

This questionnaire based survey was performed to access knowledge of physicians, surgeons and nurses regarding infections acquired in health care setting, nosocomial pathogens and role of fomites in the transmission of nosocomial pathogens. Interrupting chain of transmission of nosocomial pathogens is of utmost importance in preventing these HCAs. To break chain of transmission, HCWs must have adequate knowledge regarding the pathogens surviving in hospital environments, their mode of transmission and infections caused by such pathogens.

**MATERIAL & METHODS**

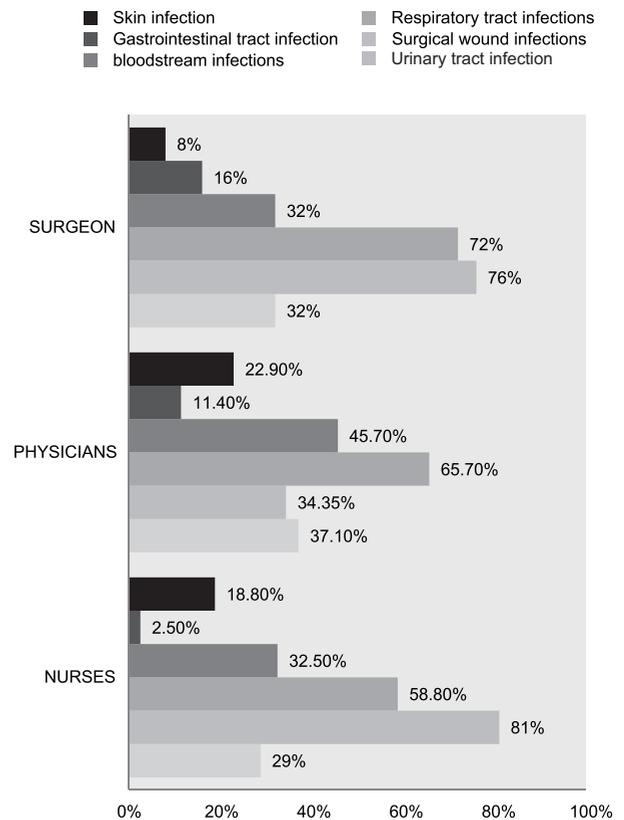
This study was conducted in Punjab Institute of Cardiology (PIC), a tertiary care hospital in Punjab, with 292 bed and providing comprehensive cardiac care services to their patients. Data was collected from October 2017 to January 2018. Questionnaires were completed by health care workers including physicians, surgeons and nurses working in various departments of hospital after taking consent. Questions accessing HCWs knowledge of various HCAs, pathogens responsible for causing infections among hospitalized patients and role of various inanimate objects in nosocomial spread of pathogens were included in questionnaire. Answers given by various respondents were analyzed and recorded as frequency and percentage.

**RESULTS**

Questionnaires were analyzed to access knowledge of the health care workers. Of total 140 respondents, 131 (93.6%) considered themselves as aware of health care associated infections in this hospital while 9 (6.4%) were unaware of HCAs.

Are you aware of HCAs in Hospitals?	Frequency	Percent
Yes	131	93.6
No	9	6.4
Total	140	100.0

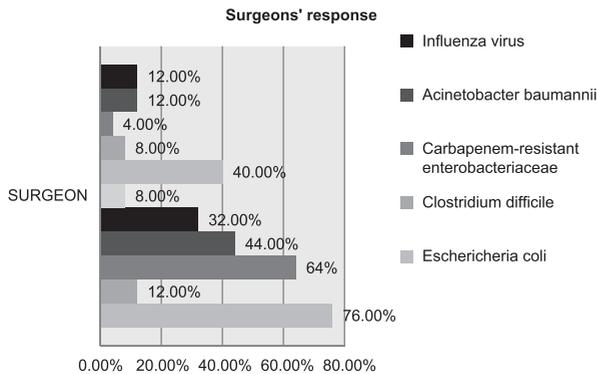
Regarding HCAs prevalent in PIC hospital, respiratory tract infection (RTI) was identified by 72% surgeons, 65% physicians and 59% nurses. Surgical wound infections were identified by 76% of surgeons and 81% nurses. 45.7% physician identified bloodstream infection. Rate of identification of all the other infections was <50% for all the three professionals.



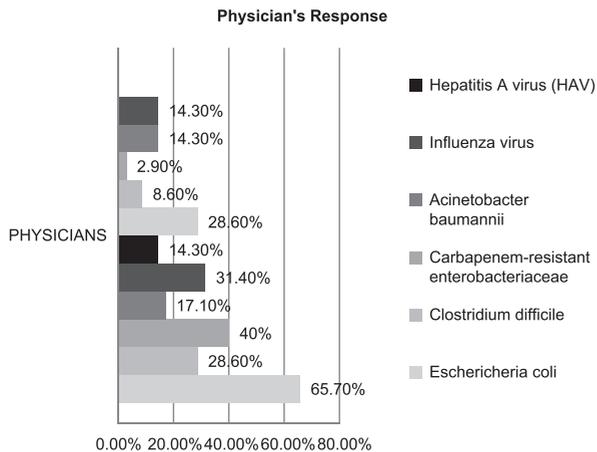
**Figure-1. Showing response of health care workers regarding nosocomial infections.**

Knowledge of health care workers regarding nosocomial pathogens was accessed by asking multiple choice questions, most of health care workers identified MRSA and Pseudomonas as nosocomial pathogens. MRSA was identified by 76%, Pseudomonas by 64, Klebsiella by 44%, E. coli by 40 % of surgeons as nosocomial

pathogens while knowledge regarding rest of pathogens was deficient. Responses of Surgeons are shown in Figure-2.



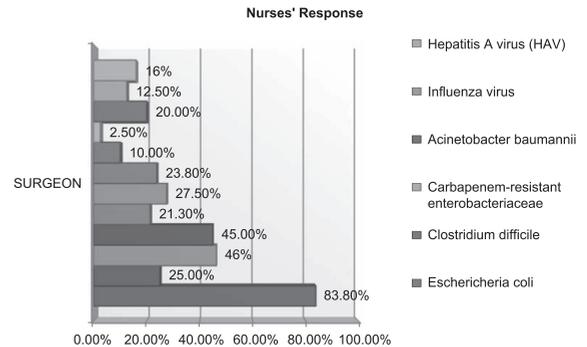
**Figure-2. Showing Surgeons' response regarding nosocomial pathogens.**



**Figure-3. Showing physicians' response regarding nosocomial pathogens.**

Responses of physicians' regarding nosocomial pathogens were recorded and are shown in Figure-3. Only 65.7% of physicians identified

MRSA, 40% Pseudomonas, 28.6% VRE and E.coli as nosocomial pathogens.



**Figure-4. Showing nurses' response regarding nosocomial pathogens.**

Responses of nurses regarding nosocomial pathogens were recorded and are shown in Figure-4. MRSA was identified as nosocomial pathogen by 83.8% nurses, Pseudomonas by 46%, Klebsiella by 45%, E. coli by 23.8% and VRE by 25%.

Regarding Fomites, blood pressure cuff (sphygmomanometer) was identified by 46% nurses, 6% physicians and 5% of surgeons. White coat was identified by 31.3% nurses, 71.4 % physicians and 40% of surgeons. Stethoscope was identified by 62.5% nurses, 42.9% physicians and 20% of surgeons, mattresses and pillows were identified by 82.5% nurses, 60% physicians and 76% of surgeons. Responses of Surgeons, physicians and nurses regarding various inanimate objects playing role in transmission of nosocomial pathogens morbidity are shown in Table-I.

Which of the followings you consider as fomites?	Physicians (35)	Nurses (80)	Surgeons (25)	Total (140)
White coat	25 (71.4%)	25 (31.3%)	10 (40%)	60/140=42.9%
Nurse uniform	14 (40%)	32 (40%)	7 (28%)	53/140=37.9%
Stethoscope	15 (42.9%)	50 (62.5%)	5 (20%)	70/140=50%
Thermometer	14 (40%)	65 (81.3%)	4 (16%)	83/140=59.2%
Wrist watch (for patient care)	4 (11.4%)	23 (28.8%)	1 (4%)	28/140=20%
Blood pressure cuff	6 (17.15%)	46 (57.5%)	5 (20%)	57/140=40.7%
Mattresses and pillows	21 (60%)	66 (82.5%)	19 (76%)	106/140=75.7%
Bedside curtains	10 (28.6%)	30 (37.5%)	7 (28%)	47/140=33.6%
Chair/stools/cabinets	4 (11.4%)	21 (26.3%)	6 (24%)	31/140=22.1%
Air conditioners	10 (28.6%)	11 (13.8%)	8 (32%)	29/140=20.7%

**Table-I. Showing response of physicians, nurses and surgeons regarding fomites.**

## DISCUSSION

Regarding HCAI, surgical wound infection and respiratory tract infection were identified by majority of respondents while most of the respondents were unaware of bacteremia and UTI as HCAs. Blood stream infection especially catheter associated blood stream infections are a major cause of concern in hospitalized patients. Central venous catheter use can lead to complications like Central line-associated bloodstream infection (CLABSI).<sup>8</sup> Healthcare workers should get training and quality control programmes should be implemented to minimize catheter related infections.<sup>9</sup>

A large proportion of HCWs failed to identify gastrointestinal tract infection as HCAs especially *Clostridium difficile* infections related knowledge was deficient and need to be improved as that is *Clostridium difficile* is a major cause of HCAs and leads to change and limit treatment options for the patients. *C. difficile* is a major cause of diarrhea in patients undergoing antibiotic therapy. Patients can suffer from complications like colonic ileus, toxic megacolon and multiorgan failure.<sup>10</sup>

Regarding nosocomial pathogens, most of the respondents accurately identified MRSA and *Pseudomonas* as nosocomial pathogens. Knowledge regarding rest of the infectious agents commonly implicated in HCAs was poor. VRE is a frequent cause of nosocomial infections and are associated with increased hospital costs and higher mortality.<sup>11</sup>

Knowledge regarding importance of Carbapenemase producing Enterobacteriaceae especially *E. coli* and *Klebsiella* in HCAs was poor. *E. coli* is a major cause of UTI, septicemia, pneumonia, neonatal meningitis, peritonitis and gastroenteritis.<sup>12</sup> *K. pneumonia* is notorious for neonatal septicaemia, pneumonia, wound infections and septicemia.<sup>12</sup>

*Acinetobacter* as a nosocomial pathogen was not identified by majority of HCWs. The genus *Acinetobacter* is a member of skin flora, often drug resistant and a major cause of nosocomial infections especially urinary and respiratory

tract infections and peritonitis in patients with indwelling devices.<sup>13</sup> *Acinetobacter* infections are associated with high mortality rates.<sup>13,14</sup>

A large number of respondents (approx. 32% of surgeon and 21% of physicians) marked *Streptococcus pneumoniae* as a cause of HCAs. However, *Streptococcus pneumoniae* is a common cause of community acquired pneumonia instead of hospital acquired pneumonia.<sup>15</sup> Therefore, *Strep pneumoniae* which is cause of community associated infections was wrongly identified as a cause of health care associated infection by HCWs. This shows a large gap for knowledge.

Regarding fomites as a vehicle of transmission of pathogens, knowledge regarding white coats and nurse uniforms as fomites was deficient. White coats can harbor potential contaminants and play a role in the nosocomial transmission of pathogenic microorganisms. Infectious microorganisms shed by patients can contaminate and survive on fabrics used to make white coats.<sup>16</sup>

Various studies have shown role of Wrist watches<sup>17</sup>, Blood pressure cuffs<sup>18</sup>, bedside curtains<sup>19</sup>, chair/stools/cabinets<sup>19</sup>, air conditioners<sup>20</sup> in transmission of pathogens.

## CONCLUSION

This survey found that the knowledge of HCWs regarding HCAs, nosocomial infections and role of various fomites in spread of nosocomial pathogens was not upto the mark. Appropriate knowledge and approach for preventing HCAs by avoiding transmission of nosocomial pathogens by fomites is mandatory. Therefore, in hospitals, workshops and CME sessions should be organized on regular basis to improve understanding of HCAs, nosocomial pathogens and modes of nosocomial spread of infection. Improving the knowledge will change the attitude towards infection control practices and lead to reduction in HCAs and decrease in patient morbidity and mortality.

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### AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Khadija Mumtaz	Author	
2	Nadia Aslam	Co-Author	
3	Naima Mehdi	Co-Author	
4	Nazma Kiran	Co-Author	
5	Sadaf Farzand	Co-Author	
6	Mahfooz ur Rahman	Co-Author	