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PREVALENCE OF MULTIDRUG RESISTANT BUGS OVER HIGH TOUCH SURFACES AT CRITICAL AREAS IN A TERTIARY CARE CANCER INSTITUTE

Healthcare

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ABSTRACT

Background: Hospital acquired infections (HAIs) is the most common cause of morbidity and mortality among hospitalised patients. Inanimate hospital objects are the main exogenous source for HAIs. **Methodology:** This is a prospective study conducted in a tertiary care hospital for 6 months. The study was conducted in the intensive care unit (ICU), Hematolymphoid (HL) ward and paediatric ward. The high touch surface areas were identified and their surveillance swabs were collected. In the Microbiology laboratory these collected surveillance samples were processed on Blood agar plate for culture identification by aerobic culture method and Gram positive and Gram-negative organisms were further evaluated. **Results:** In this study a total of 519 samples were collected from various high touch surface areas in ICU, HL ward and Paediatric ward. Among these 23.89% (n=124) were culture positive. In this study high bacterial growth was from Paediatric ward 9.25% (n=48), followed by ICU 7.71% (n=40) and HL ward 6.93% (n=36). Coagulase negative staphylococcus (CONS) were most commonly isolated from all 3 locations followed by Pseudomonas species and Acinetobacter species. Among the total MDR organisms 26.61% (33/124), the common site contaminated with MDR organisms were bed railings 21.21% (7/33) followed by door handles 9.0% (3/33). **Conclusion:** Environmental surveillance allows for the early detection of pathogens, including MDROs, on high-touch surfaces. Identifying contamination promptly enables healthcare facilities to implement targeted interventions to prevent the spread of pathogens and reduce the risk of HAIs.

KEYWORDS

INTRODUCTION

Hospital acquired infections (HAIs) is the most common cause of morbidity and mortality among hospitalised patients, contributing to prolonged hospital stays and increasing healthcare costs (1,2). Inanimate hospital objects are the main exogenous source for HAIs (3). Most common sources to contaminate inanimate objects and patients' surroundings is the patient's own microbiota and hands of health care workers (HCWs) (4). Environment contains dust particles, which serves as a medium for transporting of microbes and plays an important role in transmission of threatening organisms like antimicrobial resistant organisms like Methicillin resistant Staphylococcus aureus (MRSA), Vancomycin resistant enterococci (VRE), Carbapenem resistant organisms (CROs), Clostridium difficile etc., also prolonged patients harbouring multidrug resistant organisms (MDROs) (5) (6). Presence of such organisms on high touch areas like patient's bedside, bed railings, ventilator monitor, bedside table, Healthcare associated equipment and on patients leads to transmission of MDROs from one patient to another if proper hand hygiene is not followed (7). MDROs presence on high touch surface areas serve as potential sources for HAIs hence cleaning and disinfection of these surfaces is required on a daily basis to minimise spread of these infections (8).

MATERIALS AND METHODS

This is a prospective study conducted in a tertiary care hospital for 6 months. The study was conducted in the intensive care unit (ICU), hematolymphoid (HL) ward and paediatric ward. The high touch surface areas were identified and their surveillance swabs were collected. Cotton swabs were used for collection of samples. They were soaked in normal saline and rubbed over the surface and then placed in sterile culture tubes. In the Microbiology laboratory these collected surveillance samples were processed on Blood agar plate for culture identification by aerobic culture method and Gram positive and Gram-negative organisms were further evaluated for Methicillin resistance and Multi – Drug Resistance (MDR) respectively. MDR status of Gram-negative organisms were evaluated on the basis of susceptibility patterns of the bacterial strain towards Piperacillin-Tazobactum, Ceftazidime, Imipenem, Amikacin and Cotrimoxazole. Antibiotic susceptibility testing was performed by Kirby Bauer Disk Diffusion Method and its results were interpreted according to the Clinical Laboratory Standards Institute (CLSI) 2021 criteria (9).

Statistical Analysis was done using SPSS software. To compare all the organisms between high touch surface areas of ICU, HL ward, and paediatric ward Chi-square goodness of fit test was performed.

RESULTS

In this study a total of 519 samples were collected from various high touch surface areas in ICU, HL ward and Paediatric ward. Among these 23.89% (n=124) were culture positive. In this study high bacterial growth was from Paediatric ward 9.25% (n=48), followed by ICU 7.71% (n=40) and HL ward 6.93% (n=36). Distribution of various organisms isolated from different locations and sites is shown in Table 1 and 2. The most common site with bacterial contamination was bed railings 23.39% (29/124) followed by door handles 13.71% (17/124) . Bed Railings showed maximum growth in all three areas followed by door handles and cardiac tables. Coagulase negative staphylococcus (CONS) were most commonly isolated from all 3 locations followed by Pseudomonas species and Acinetobacter species as shown in Table 1. Among the bacterial isolates, maximum MDROs were isolated from ICU (n=12) and Paediatric ward (n=12) followed by HL ward (n=9).

Overall most common Gram positive MDR bug was MRCONS 75.76% (25/33) and Gram negative MDR bug was Klebsiella pneumoniae 9.10% (03/33) followed by P. aeruginosa 6.10% (02/33). Among the total MDR organisms 26.61% (33/124), the common site contaminated with MDR organisms were bed railings 21.21% (7/33) followed by door handles 9.0% (3/33).

Table 1: Organisms Isolated From High Touch Surface Areas Of ICU, HL Ward And Paediatric Ward.

Organism	ICU n=40	HL WARD n=36	Pediatrics Ward n=48	p-value
CONS	29 (72.5%)	24 (66.67%)	30 (62.5%)	0.688
Enterococcus species	01(2.5%)	-	-	-
Pseudomonas species	04 (10%)	01 (2.78%)	04 (8.33%)	0.368
Acinetobacter species	01(2.5%)	02 (5.55%)	05 (10.43%)	0.197
Klebsiella pneumoniae	01 (2.5%)	01 (2.78%)	03 (6.25%)	0.449
Citrobacter species	-	01 (2.78%)	-	-
Escherichia coli	-	-	01(2.08%)	-
Stenotrophomonas species	-		01(2.08%)	-
GPB	04 (10%)	07 (19.44%)	04 (8.33%)	0.549

GPB Gram positive bacilli

Table 2: Growth Distribution Of Different Sites In ICU And Ward

Site	ICU n=40	HL WARD n=36	Pediatrics Ward n=48	p-value
Bedside Railings	14 (35%)	07(19.44%)	08 (16.67%)	0.227
Injection trolley	06(15%)	06 (16.67%)	01 (2.08%)	0.146
Bed Remote	04(10%)	-	-	-
Water tap handle	04(10%)	03 (8.33%)	06 (12.5%)	0.584
Door Handle	03(7.50%)	07 (19.44%)	07 (14.59%)	0.390
Cardiac Table	02(5%)	03 (8.33%)	08 (16.67%)	0.092
Nursing Station	02(5%)	01 (2.78%)	04 (8.33%)	0.368
Telephone	02(5%)	01 (2.78%)	01 (2.08%)	0.779
Cardiac Monitor	01(2.5%)	04 (11.11%)	03 (6.25%)	0.417
IV set	01(2.5%)	01 (2.78%)	05 (10.42%)	0.102
Mobile	01(2.5%)	-	04 (8.33%)	0.179
Hands	-	02 (5.56%)	-	-
Gown	-	01 (2.78%)	-	-
Infusion Pump	-	-	01 (2.08%)	-

DISCUSSION

In this study a total of 519 swabs were collected among these 23.89% (n=124) were culture positive which is similar to studies by 23.4% Yadav et al (10) to 45.8% Meenakshi et al (11). Diversity in hand hygiene practices, cleaning protocols , its frequency, type of disinfectants used and patient load may be the reason for such varied findings.

The present study showed maximum growth of Gram positive bacteria 79.84% (99/124) as compared to Gram negative bacteria 20.16% (25/124). The predominance of Gram positive bacteria in high touch surface areas were also seen in studies by Getachew et al (81.6%) (12), Endalafer et al (56.3%) (13), Darge et al (68.4%) (14)

Tajedin et al (60.7%) (15) and Maryam et al (52.2%) (16). Gram-positive bacteria generally have a higher resistance to drying out (desiccation) compared to gram-negative bacteria. This enables them to persist on dry surfaces for extended periods, making them more likely to be found on high-touch surfaces in hospitals.

CoNS are the most common nosocomial pathogens and account for hospital acquired infections (17). Our study also shows CoNS (66.94%) as the most common organism isolated from high touch surface areas , similar findings were seen in study by Maphossa et al (18) and Firesbhat et al (19). In our study bed side railings and door handles were the most common site contaminated with bacteria. These are frequently touched by patients, visitors, and healthcare workers, increasing the likelihood of transferring bacteria from person to surface and vice versa. Also these sites may receive less frequent cleaning compared to other surfaces in the hospital environment due to the focus on more visibly soiled areas, this allows bacteria to accumulate and persist on these surfaces. The most common MDROs found on high-touch surfaces in hospital settings can vary depending on factors such as geographic location, patient population, and infection control practices. Some of the most frequently encountered MDROs on high-touch surfaces in hospitals include MRSA, VRE, ESBL, CRE and Acinetobacter baumannii. In this study we encountered MRCONS followed by Carbapenem resistant Klebsiella pneumoniae and Pseudomonas aeruginosa. MDROs on high-touch surfaces can serve as reservoirs for transmission to patients, healthcare workers, and visitors. This increases the risk of healthcare-associated infections (HAIs) and contributes to the spread of antimicrobial resistance within healthcare facilities. Also, MDRO-related infections can result in longer hospital stays, additional treatments, and increased healthcare costs. Contamination of high-touch surfaces by MDROs may contribute to the economic burden associated with HAIs. The study had limitations regarding sample size due to the short duration of the study period.

CONCLUSION

Environmental surveillance in hospitals is a comprehensive approach that involves regular inspections, testing, and analysis of various environmental factors. It helps identify potential risks or hazards and allows for timely interventions to maintain a safe and healthy healthcare environment. Environmental surveillance allows for the early detection of pathogens, including MDROs, on high-touch surfaces. Identifying contamination promptly enables healthcare facilities to implement targeted interventions to prevent the spread of pathogens and reduce the risk of HAIs. Surveillance data on high-touch surfaces can inform risk assessments and prioritisation of infection control efforts. By identifying surfaces that are consistently contaminated or associated with higher transmission risks, healthcare facilities can allocate resources more effectively to target interventions where they are most needed.

Limitation Of Study

The selection of sampling locations within an environment can introduce bias, as certain areas may be more likely to harbour

pathogens than others. Environmental swab studies provide a snapshot of pathogen presence at a specific point in time, but they may not capture temporal variations or trends. Changes in environmental conditions, cleaning protocols, or human behaviour can influence pathogen levels over time, and these factors may not be adequately captured over a limited period of duration.

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