



Comparison of Floor Microbial Flora in Intensive Care Unit Set ups with vs without Shoes

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Abstract

Most of hospitals with intensive care units (ICU) have the policy of removing shoes before entering the intensive care unit set up. It is assumed that it reduces nosocomial infection rates can be as high as 10%. The studies across the world are limited and controversial. We planned the study to identify the common microbials on floor by wearing shoes in Pediatrics intensive care unit (PICU) and not allowing shoes inside neonatal intensive care unit NICU. All bacterial pathogens were reported and compared.

Conclusion: *E.coli, pseudomonas, klebsiella, enterobacter were amongst the common gram negative pathogens in both ICUS, however pseudomonas and enterobacter were serious pathogens identified only in PICU, where shoes were allowed. MRSA was isolated in both the ICUS amongst gram positive groups. Comparison of number of culture was not significant ($P>0.5$).*

Material and Methods

The study was conducted in NICU and PICU set ups of tertiary care centre for a period of 3 months. Ethical clearance was obtained from hospital committee. Medical staff including doctors and nurses only were allowed to work in PICU with shoes, and shoes were not allowed inside NICU. All other staff, sweepers, students, patients, visitors were allowed only after removing shoes in both the icus. Floor samples using sterile culture swab sticks were taken every 3rd day by the microbiologist assisted by nursing staff. Total of 49 swabs were collected for a period of 3 months. Dry cleaning and mopping of floors was done using phenol as disinfectant,

prepared separately for two ICU. Floor swabs were collected after rounds at 12:30 pm simultaneously from two ICUS. Both gram staining, aerobic and anaerobic cultures were done. All protective measures like hand washing, gowns, caps masks, gloves were strictly followed by all.

Results

Total 49 swabs were collected simultaneously from NICU and PICU.

Table 1 show microorganisms isolated from PICU and NICU

Table 2 shows gram stains of microflora isolated.

Table 1 Details of microorganisms isolated from PICU and NICU

Microorganism	PICU	NICU	TOTAL
E.Coli	1(2.04%)	1	2
MRSA	1(2.04)	1	2
Klebsiella	0	1	1
Enterobacter	1(1.02%)	0	1
Pseudomonas	1(1.02%)	0	1

Table 2 GRAM STAIN pattern of microflora isolated from PICU and NICU

Microorganism	PICU	NICU	Total
E.Coli	Gram Negative	Gram Negative	2
Pseudomonas	Gram Negative		2
Klebsiella		GRAM NEGATIVE	1
Enterobacter	Gram Negative		1
MRSA	Gram Positive	Gram Positive	1

Culture positivity rate was 4/49 (8.1%) in PICU and 3/49 in NICU. (6.1%). The results compared were not statistically significant ($p>0.5$). However serious pathogens like Pseudomonas and Enterobacter were isolated only from PICU floor samples.

Discussion

E.COLI, pseudomonas, enterobacter, MRSA were the common isolates from PICU .while pseudomonas and enterobacter was not isolated from NICU. klebsiella was an isolate from NICU but not from PICU. We believe that isolation of serious pathogens like pseudomonas and enterobacter from an area where shoes were allowed cannot be ignored. These microflora have been documented to cause serious nosocomial morbidities in ICU, like septicemia, meningitis, pneumonia, uti⁽⁴⁾. The source of the two pathogens can be from shoes, or can be from shedding from patients/visitors/air /medical instruments/hands /windows /sinks etc. Extension of our study and further studies are needed further to strengthen our findings.

Gupta et al documented MRSA as the predominant organism in 384 floor samples. Ecoli, pseudomonas, klebsiella and enterobacter

species were sporadically isolated in their study. On an average individual sheds 10^6 squares per day^(5,6). Skin squames from patients and staff are likely to be staphylococcus epidermitis and other coagulase negative cocci and bacilli. They make 99% of total floor isolates. In one study dry mops Floor cleaning decreases microbial counts by 55% and white foam by 75%.Constant shedding of skin squames from staff and patients recontaminate the floors within 2 hours in busy ward, so cleaning only temporarily reduces the contamination. They concluded that floor and air colony counts showed no significant difference with or without foot wears

Study by Humphreys H et al 1991 and weightman NC1994 show ordinary shoes, clean shoes, shoe covers do not significantly affect floor colony counts. Air colony counts do not cause disease as it rarely disperse at a distance of more than one metre. Use of laminar air flows and air filters available in modular ICU and operation theaters further reduce air colony counts.

Ayliffe, Collins and lowbury et all 1966 reported 80 percent reduction in bacterial flora after mopping or mechanical scrubbing and 99 % reduction after certain disinfectants. But after 1 hour recontamination occurred heavily. But frequent scrubblings or disinfectants keep the mean level of bacterial contamination lower.

Guidance from centres of disease control and prevention 2003 proclaimed disinfection of floors by regular detergent/water has minimal or no impact on occurrence of health care associated infections.

Kognati et al 2016 recently observed hospital floors are heavily contaminated but are not important source of pathogen dissemination because they are rarely touched, but objects falling on floor like blood pressure cuffs, call buttons, flies, wheel chair scan disseminate infections, other than foot wears. Deshpande et al 2017 found MRSA, VRE, C. Difficile on floor cultures, isolated from 318 floor sited and 159 other sites. They concluded floors in hospitals are underappreciated source of dissemination of

pathogens. Rashid et al (2016) implicated shoes as a potential vector. They identified enterococcus, MRSA, cl. difficile and gram negative bacteria on shoe soles. They concluded that shoe soles can be a likely vector for infectious diseases and effective dissemination strategy is direly needed.

Ali et al 2014 reported rates of infection, mortality and length of stay in ICU on 1151 patients, by allowing shoes for 3 months and abandoning for next 3 months. They found statistically significant difference was seen in terms of length of icu stay. They isolated MRSA, VRE and acinetobactor infections in time period with use of shoe covers. There was no significant difference in mortality for both groups.

Rashid and poblete et al 2018 found UV-C decontamination device on shoe soles significantly reduced e.coli, e fecalis, staphaureus and c. difficile colonization.

Conclusion

We recommend policy of removing shoes outside intensive care units. Though there was no significant diffence in culures numbers isolated from PICU vs NICU, but isolation of serious pathogen like pseudomonas and enterobacter cannot be ignored. We plan to continue our study further to strengthen or defeat our results, we also recommend similar studies to be carried worldwide to reach a conclusion.

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