



## CONTAMINATION OF MICROBIAL PATHOGENS IN OPERATING THEATRES IN KARBALA

Muataz Fouad Hasan Alagha<sup>1</sup>, Noor Flayyih Hasan<sup>2\*</sup> and Sabah Kareem Hamzah Alhussaini<sup>3</sup>

<sup>1</sup>Higher Diploma in Anaesthesiology and ICT College of Medical and Health Technologies, Al- Zahraa University for Women, Karbala, Iraq.

<sup>2</sup>Department of Microbiology, College of Medicine, Kerbela University, 56001, Iraq.

<sup>3</sup>Consultant general surgery Al-Hussein Medical City.



\*Corresponding Author: Dr. Noor Flayyih Hasan

Department of Microbiology, College of Medicine, Kerbela University, 56001, Iraq.

Article Received on 28/06/2024

Article Revised on 18/07/2024

Article Accepted on 07/08/2024

### ABSTRACT

The public and patients repeated and ongoing exposure to nosocomial diseases has been largely attributed to the microbial contamination of hospital environments, particularly in operating rooms (OTs) and other niche areas. Our goal was to determine whether operating rooms were contaminated by microbes. Of Imam Al- Hussein Medical-City Hospital. Staphylococcus aureus was the most often encountered isolation, followed by Pseudomonas aeruginosa and E. coli. Only few health directorates have recorded fungal contaminations, and none have reported anaerobic microorganisms.

**KEYWORDS:** Microbial pathogens, Operating theatre, nosocomial infection.

### INTRODUCTION

The frequency of nosocomial infections (NIs) or hospital acquired infections (HAIs), has increased as a result of microbiological contamination of operating rooms (Okon et al., 2012). Every one of ten admitted patients to hospital, is the incidence of (NIs). A 10% increase in mortality and an extended hospital stay of four to seven days are among the negative patient outcomes that might result from these infections (Reddy et al., 2012). The increased length of stay in hospital is the greater contributor to cost (Pittet D et al., 1994). Pseudomonas spp. and Methicillin-resistant Staphylococcus aureus are two examples of the drug-resistant infections that are commonly acquired in hospitals (Akhtar et al., 2010; Tesfaye et al., 2015). It makes therapy more difficult. Because of the unchecked use of antibiotics, particularly in developing nations, antimicrobial resistance has grown to be a significant global public health concern (Al Laham et al., 2012).

Staphylococcus species, which account for roughly 40% of the bacteria most frequently linked to operating room contamination, (Ensafyef et al., 2009; Edmiston et al., 2005). followed by Enterobacter and E. coli (Al Laham et al., 2012). Surgical site infections (SSIs) are more likely to occur in operating rooms that are not properly sterilized, which will likely result in worse post-operative results for patients. (Napoli et al., 2012; Nasser

et al., 2013). Globally, (SSIs) account for up to 20% of all hospital associated infections (WJ et al., 2001).

Because (SSIs) increase a patient's length of stay in the hospital by 60%, research on microbial contamination in operating rooms is essential (Kitembo et al., 2013).

As a result, the patient and the compassionate medical staff are greatly impacted by the clinical implications of bacterial contamination in the operating rooms. Our goals were to determine the level of microbiological contamination in the operating room (both on the ground and in the air) and the antimicrobial profile of the isolates at Imam Al-Hussein Medical City.

### MATERIALS AND METHODS

The purpose of our research was to detect, through monitoring (March - June 2022) in Imam Al-Hussein Medical-City Hospital, the surfaces in operation rooms and hospital wards being contaminated with microorganisms. Additionally assessed was the possibility of microbes on healthcare personnel' hands, which are currently one of the primary means of disease transmission, especially in hospital settings (Squeri et al., 2016).

The study covered wards and operating rooms that belonged to the following areas: emergency (intensive

care, neonatal intensive care unit), surgical (general surgery, orthopedics, neurosurgery, maxillofacial surgery, thoracic-vascular surgery, gynecology and obstetrics, paediatric surgery, plastic surgery operating units), and medical (internal medicine and paediatrics operating unit).

**Sample Processing**

To revive stressed organisms, specimens in cooked meat medium and peptone water were incubated overnight at 37°C anaerobically and aerobically, respectively. Specimens of cooked beef and peptone water were subsequently subcultured on Sabouraud, MacConkey, and blood agar medium. With the exception of Sabouraud agar plates, settle plates and subcultured Both aerobic and anaerobic cultures were used to incubate plates. Or one night at 37 °C. We checked the plates for signs of development. After 24 hours, the agar plates were re-incubated when no growth was observed. Following a second incubation, the subcultured agar plates and settle plates were thrown out if no growth was observed on them.

**Bacterial Identification**

Conventional techniques utilising Lacto-phenol cotton

blue, Gram's staining technique, and other relevant biochemical tests were used to identify the growth on culture plates. include urease synthesis, citrate utilisation, sugar fermentation tests, motility tests, oxidase, coagulase, and indole. They were carried out in compliance with the Clinical and Laboratory Standard Institute's adopted laboratory standard operating procedures. (CLSI et al., 2008).

**RESULTS**

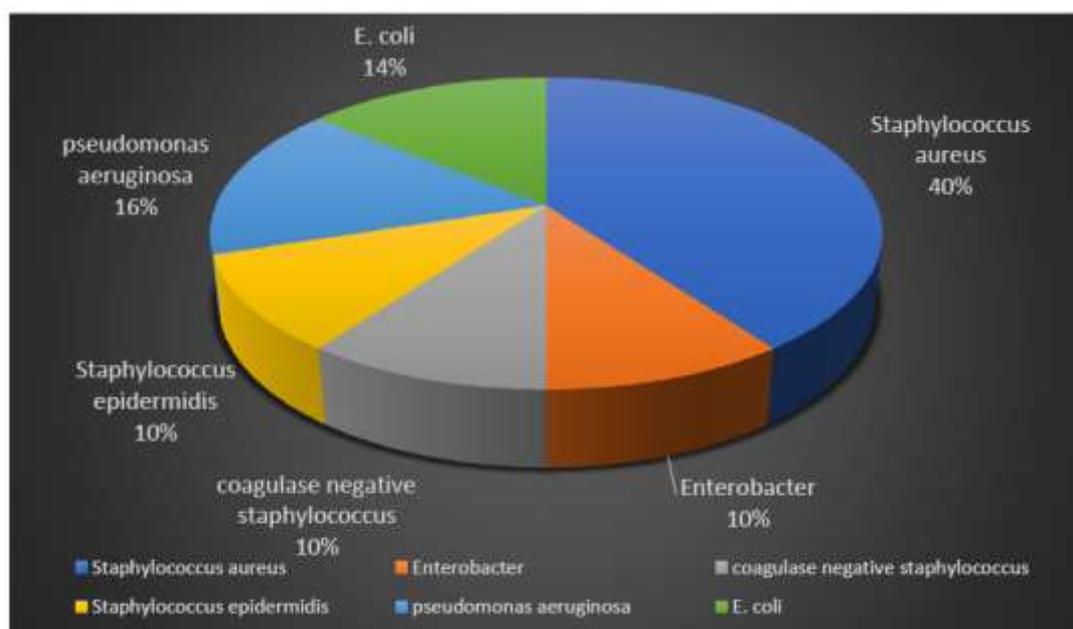
A total of 50 samples(swabs) were collected. These were gathered from four operating rooms (OTs): the obstetric surgical OT, the general private OT, the main general OT (public), and ophthalmology.

Microbial isolates obtained from operating theatres of Imam Al-Hussein Medical-City.

Table 1 The bacteria were found to be both gram-negative and gram-positive. Staphylococcus aureus was the most frequent (40%) followed by pseudomonas aeruginosa accounting for 16%, Enterococcus ssp., Staphylococcus epidermidis were those that were least isolated as 10%.

**Table 1: Frequency of microbial organisms in the operating theatres of Imam Al- Hussein Medical-City hospital.**

Organism	Frequency	Percent
Staphylococcus aureus	20	40.0
Enterobacter	5	10.0
coagulase negative staphylococcus	5	10.0
Staphylococcus epidermidis	5	10.0
pseudomonas aeruginosa	8	16.0
E. coli	7	14.0
Total N (%)	50	100.0



**Figure 1: Percentage of microorganisms by type.**

Distribution of microbial pathogens across different operating theatres of Imam Al-Hussein Medical-City Table 2 The majority of the microbiological infections were found in the ophthalmology theatre, 46.2% The major pathogens in this theatre were Staphylococcus

aureus 46.2% (12) and E. coli (15.4%) (4) Emergency theatre was mostly contaminated with Staphylococcus aureus high as 31.8% (7) and pseudomonas aeruginosa 22.7% (5).

**Table 2: General distribution of microbial pathogens in the different operating theatres of Imam Al-Hussein Medical-City.**

N	Type of bacteria	Neuro surgery	General surgery	Intensive Care	Emergency	Operating room / burns	ENT	Plastic surgery	Ophthamology
1	Staphylococcus aureus	4 36.4%	4 30.8%	7 36.8%	7 31.8%	7 46.7%	4 40.0%	6 31.6%	12 46.2%
2	Enterobacter	0	2 15.4%	3 15.8%	0	3 20.0%		2 10.5%	2 7.7%
3	coagulase negative staphylococcus	0	2 15.4%	3 15.8%	3 13.6%	1 6.7	4 40.0%	1 5.3%	3 11.5%
4	Staphylococcus epidermidis	0	2 15.4%	0	4 18.2%	0	0	1 5.3%	2 7.7%
5	pseudomonas aeruginosa	4 36.4%	2 15.4%	4 21.1%	5 22.7%	3 20.0%	1 10.0%	6 31.6%	3 11.5%
6	E. coli	3 27.3%	1 7.7%	2 10.5%	3 13.6%	1 6.7%	1 10.0%	3 15.8%	4 15.4 %
7	Total N (%)	11 100.0%	13 100.0%	19 100.0%	22 100.0%	15 100.0%	1 100.0%	19 100.0%	26 100.0%

## DISCUSSION

In this study, Staphylococcus aureus (40%), and pseudomonas aeruginosa (16%) were the bacteria that were most isolated. Compared to the operating rooms of Ghana's Edwin Cade Memorial Hospital, where pseudomonas aeruginosa constituted 48.5% of the population, our results are less (Feglo et al., 2014). Most commonly, Bacillus is linked to dusty surroundings, which are prevalent throughout sub-Saharan Africa, in especially the semi-urban and rural regions. Additional microorganisms that were isolated included Enterococcus spp., Viridans Streptococcus, S. aureus, E. coli, P. aeruginosa, and Coagulase Negative Staphylococcus. These results are consistent with those found in post-operative wound swabs from the Mbale Regional Referral Hospital (George et al., 2015). This shows that post-operative wound sepsis may be made more complicated by ambient microbial contamination of operating rooms. (Laham et al., 2012).

The most polluted operating room was that used for ophthalmology (26%), followed by that used for emergency care (22%). Compared to Kiranmai et al.'s findings, which showed decreased contamination (within acceptable levels) in the gynaecological and ophthalmology operating rooms of Mediciti Medical College, Ghanpur, Hyderabad, Telangana, India, our results differ. (Kiranmai et al., 2016). These operating rooms' differing fumigation frequencies and intensities are the cause of the disparity. The ophthalmology theatre at Mbale Regional Referral Hospital does not undergo daily fumigation, unlike the other operating rooms that are assumed to be active. In operating rooms for ophthalmology and gynaecology, Pseudomonas spp. were the most frequently isolated bacteria.

These reports resemble those from Mbarara Regional Referral Hospital., where the predominant isolates from ophthalmology operating rooms were Staphylococcus aureus, Bacillus spp., E. coli, Pseudomonas spp., Aspergillus spp., Rhizopus spp., and Micrococcus spp. It's interesting that the ophthalmology theatre was more contaminated than the general theatre. (Ampaire et al., 2014).

Coagulase: Negative The most prevalent was Staphylococcus (CONS) (40%) in ENT theatre with relation with relation to other operations rooms. Our results are in line with those obtained in the general ward of Baghdad, Iraq (Ensayef et al., 2009). Normal skin flora found on the skin's surface and surgical personnel are potential sources of CONS. (KL et al., 2000).

E. coli was found on 27.3% of the operating beds in the neurosurgery rooms. This could mean the operating bed was contaminated with faces. Given faecal contamination and nosocomial infection transmission, respectively, these findings are extremely important for public health. It has been observed that E. Coli exacerbates wound sepsis, which worsens the prognosis for the patient. (Moremi et al., 2017).

## CONCLUSIONS

Operating rooms contaminated with microbes in Imam Al-Hussein Medical-City hospital surpasses reasonable bounds. Staphylococcus aureus, Pseudomonas aeruginosa, and E. coli. comprise the majority of the pollutants. This would suggest that our operating rooms' sterilization techniques are ineffective and are endangering patients' chances of developing postoperative infections. Surgical rooms, particularly

those used for obstetrics and gynaecology, need to be thoroughly and frequently cleaned. Further research on the connection between surgical site infection and microbial contamination in different operating rooms is also advised, particularly for urgent surgeries.

## REFERENCES

1. Al Laham NA. Distribution and Antimicrobial Resistance Pattern of Bacteria Isolated from Operation Theaters at Gaza Strip. *Journal of Al Azhar University-Gaza (Natural Sciences)*, 2012; 14: 19–34.
2. Akhtar N. Hospital acquired infections in a medical intensive care unit. *Coll Physicians Surg Pak*, 2010; 20(6): 386–90.
3. Ampaire L, Okonye J. Assessment of the current level of sterility in surgical and Gynaecology theatres at Mbarara Regional Referral Hospital. Kigali, in the fourth scientific conference of Rwanda Association of Biomedical Technologists. Kigali-Rwanda: Mbarara University of Science & technology, MUST, 2014.
4. CLSI. Abbreviated Identification of bacteria and Yeast; Approved guideline. Wayne PA: CLSI, 2008.
5. Edmiston CE Jr, et al. Molecular epidemiology contamination of microbial in the operating room environment: is there a risk for infection? *Surgery*, 2005; 138: 573–9.
6. Ensayef S, Al-Shalchi S, and S M, Microbial contamination in the operating theatre: a study in a hospital in Baghdad Eastern Mediterranean Health Journal, 2009; 15(1): 219–23.
7. Feglo P, Afriyie-Asante A. Environmental impact on postoperative wound infections in a privately owned hospital in Ghana. *Afr J Microbiol Res*, 2014; 8(15): 1620–6.
8. George M. Prevalence of bacterial pathogens and their antibiotic susceptibility patterns among patients with post-operative wound infections at Mbale Hospital in SBLS-CoVAB. Makerere: Makerere University, College of Veterinary Medicine, Animal Resources & Biosecurity, 2015; 5(5): a017822.
9. Kitembo SK, Chugulu SG. Incidence of surgical site infections and microbial pattern at kilimanjaro christian medical centre. *Annals of African Surgery*, 2013; 10: 1.
10. Kiranmai S, Madhavi K. Microbiological surveillance of operation theatres, intensive care units and labor room of a teaching hospital in Telangana, India. *International Journal of Research in Medical Sciences*, 2016; 5256–60.
11. KL G. Infection after total hip arthroplasty. *Bone and joint surgery*, 2000; 77A: 1576–88.
12. Laham NAA. Prevalence of bacterial contamination in general operating theaters in selected hospitals in the Gaza strip, Palestine. *Journal of Infection and Public Health*, 2012; 5: 43–51.
13. Moremi N, et al. Surveillance of surgical site infections by *Pseudomonas aeruginosa* and strain characterization in Tanzanian hospitals does not provide proof for a role of hospital water plumbing systems in transmission. *Antimicrob Resist Infect Control*, 2017; 6: 56.
14. Napoli C, Marcotrigiano V, Montagna MT. Air sampling procedures to evaluate microbial contamination: a comparison between active and passive methods in operating theatres. *BMC Public Health*, 2012; 12(1): 594.
15. Nasser AMa, et al. Assessment of surgical site infections from signs, symptoms of the wound and associated factors in public hospitals of Hodeidah city. *Yemen Int J App Sci Tech*, 2013; 3(3): 101–10.
16. Okon KO, Migliori GB. Bacterial contamination of operating theatre and other specialized care unit in a tertiary hospital in northeastern Nigeria. *Afr J Microbiol Res*, 2012; 6: 3092–6.
17. Reddy BR. Management of culture-negative surgical site infections. *J Med Allied Sci*, 2012; 2: 22–6.
18. Squeri R, Genovese C, Palamara MA, Trimarchi G, La Fauci V. “Clean care is safer care”: correct handwashing in the prevention of healthcare associated infections. *Ann Ig*, 2016; 28(6): 409- 415.
19. Tesfaye T, Berhe Y, Gebreselassie K. Microbial contamination of operating Theatre at Ayder Referral Hospital, Northern Ethiopia. *International Journal of Pharma Sciences and Research (IJPSR)*, 2015; 6 (10).
20. WJ M, RL N. Recognition, prevention, surveillance and management of SSI. *Clin Infect Dis*, 2001; 33: 67–8.
21. Pittet D, Taraara D, Wenzel RP. Nosocomial blood stream infections in critically ill patients. Excess length of stay, extra costs, and attributable mortality. *JAMA*, 1994; 271: 1598601.
- 22.