

Microbiological Surveillance of Operation Theatres: One Year Retrospective Analysis of a Tertiary Care Hospital.

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Abstract:

Introduction:

Control of infections in the operation theatre is of utmost importance. Postoperative infections can be caused by a contaminated environment, unsterile equipment, contaminated surfaces, and infected personnel as well as contaminated disinfectants. Microbiological surveillance is an effective tool for identifying and controlling infections.

Objectives:

The purpose of this study is to identify bacterial colonization of surfaces and equipment and to determine the microbial contamination of air in the OTs of a tertiary care hospital.

Materials & Methods:

One year of retrospective analysis of the data obtained from routine microbiological surveillance of the all OTs of the hospital was done. OTs were deep cleaned as per standard CDC guideline⁽¹⁾ and post deep cleaning surveillance swab culture samples were collected. Aerobic bacterial culture of the samples was processed following standard guideline^(1,2). Surveillance swab were collected from the different sites of OTs and immediately transported to the microbiology laboratory. An aerobic swab culture plates were incubated in incubator at 37°C temperature for 48 hours and examined daily for bacterial growth.

Result:

A total of 1920 samples were collected from surfaces and articles of various OTs. Out of this bacterial growth was detected in only 110 (5.7%) samples; out of which majority of growth were detected from the major OT (46/384) followed by general surgery (40/384), OBGY OTs (10/384) ENT OTs (7/384) and Ophthalmology(6/384).

Conclusion:

The study shows that OTs of our hospital showed a very low bacterial contamination rate on surface.

Key Words:

Microbiological surveillance, OTs Surveillance Culture, sterilisation, disinfection.

Introduction:

Microbiological contamination of air and environment in the operation theatres are major risk factor for surgical site and Hospital associated infections. Medical science has evolved tremendously since the time of Louis Pasteur who gave the germ theory of disease. Since then, the prime responsibility of the physician has become the prevention and control of various microbes at every place, especially in health care facilities. Hospital- acquired infections are a major cause of morbidity and mortality in the patients coming to hospitals for various reasons^[3]. The environment of operation theatre (OT) plays a major role in the postoperative recovery of the patients. Infection acquired in OTs leads to increased morbidity and mortality, prolonged length of hospital stay, increased expenditure of patient

and hospital ^[4, 5]. Using good theatre practice, standard cleaning and proper sterilization, infections in the OTs can be minimized.

The present study was conducted to detect any bacterial colonization of surfaces and equipments in the Operation theatres even after cleaning and fumigation of OTs.

Materials and Methods:

One year retrospective analysis of the data obtained from routine microbiological surveillance of the five OTs of the hospital was done. The study was approved by Institutional Ethical Committee. The Surface swabbing procedures used in this study and swab samples were collected from different sites of all 5 OTs. Swab samples were collected by maintaining all aseptic and antiseptic precautions i.e. wearing sterile gloves, masks, and sterile gown for the sample collection to prevent the contamination of media and the surface of the OT being swabbed.

The surface samples were taken after proper sterilization and disinfection of the OTs, before the entry of any surgical and support team. Sterile swabs soaked in nutrient broth were used for sample collection from different sites and equipments (instrument trolley, OT table top, OT lights, OT wall, OT floor, OT door, OT air condition & Microscope) of five OTs of the hospital. They were labeled properly and transported immediately to the microbiology laboratory for processing.

Inoculation was done on Blood Agar and incubated at 37°C for 48 hours under aerobic condition. Bacterial species were isolated and identified by conventional methods.^[6]

Result:

A total of 1920 surveillance swab samples were collected from the different sites of five OTs of the hospital during the study. Out of these, 1152 samples per OT were collected from Major operation theatre, General Surgery and Obstetrics-gynaecology OTs whereas 768 samples were from Ophthalmology and ENT OTs, out of which 5.72 % (110/1920) were found positive for bacterial culture growth and 94.27 % (1810) samples were culture negative.

Table-1. Operation theater wise distribution of n=110 bacterial isolates from surface swabs

| Name of OT | <i>B.subtilis</i> | CONS | <i>Pseudomonas species</i> | <i>Staphylococcus aureus</i> | Percentage |
|-------------------------|-------------------|------------|----------------------------|------------------------------|------------|
| Major Operation theatre | 18 | 04 | 22 | 02 | 46(41.81%) |
| General Surgery | 06 | 02 | 31 | 04 | 43(39.09%) |
| OBGY | 03 | 02 | 03 | 02 | 10(9.09%) |
| Ophthalmology | 01 | 00 | 05 | 00 | 06(5.45%) |
| ENT | 00 | 04 | 01 | 00 | 05(4.54 %) |
| Total Isolates | 28(25.45%) | 12(10.90%) | 62(56.36%) | 08(7.27%) | 110 |

CoNS-Coagulase negative staphylococcus, OT-Operation Theater

Among 110 positive samples from different OTs, Major operation theatre had maximum positivity that is 41.81%, General surgery had 39.09 % of positive samples, OBGY had 9.09 % of positive samples, ophthalmology had 5.45 % of positive samples, ENT had 4.54 % of positive samples.

Table-2: Species-wise distribution of isolates obtained from surface samples

| Sr No | Species isolated | n(%) |
|-------|---|-------------|
| 1 | <i>Psuedomonas species</i> | 62(56.36 %) |
| 2 | <i>B.subtilis</i> | 28(25.45 %) |
| 3 | <i>Coagulase negative staphylococcus(CoNS)</i> | 12(10.90 %) |
| 4 | <i>Staphylococcus aureus</i> | 08(7.27 %) |
| | | 110(100 %) |

Fig-1. Percentage of organism isolates

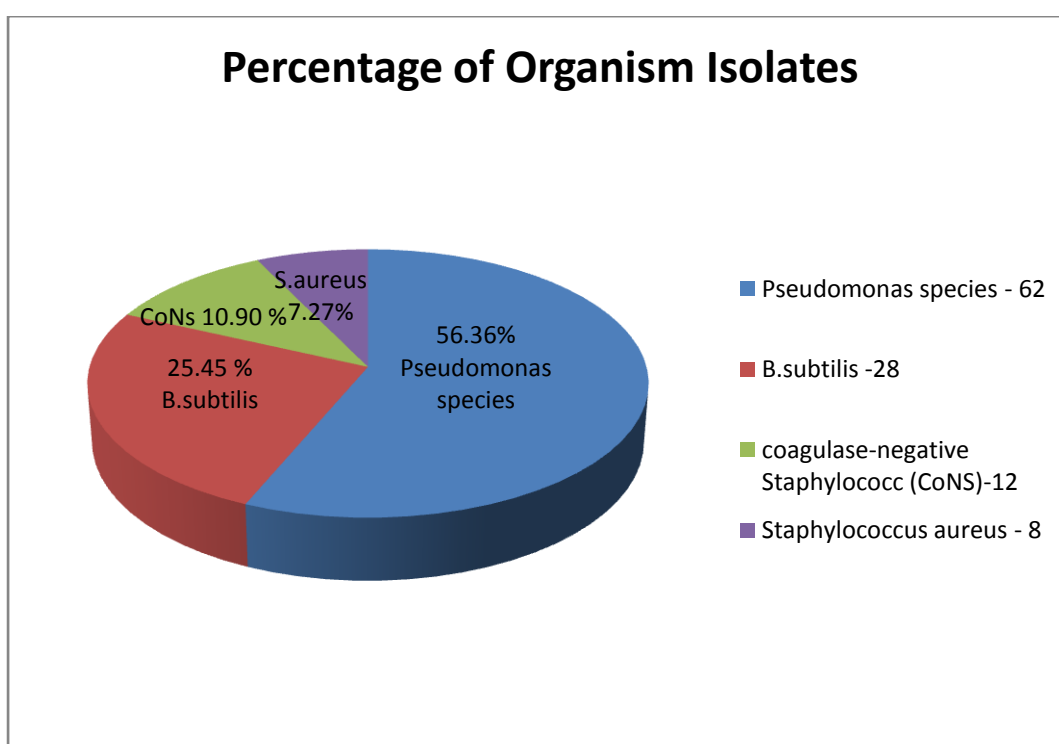


Fig.1 Shows Percentage Distribution of Different Organisms Isolated from the different sites of all OTs. Pseudomonas species was the most common (56.36 %) isolated from samples, followed by B.subtilis (25.45%), CONS (10.90 %) and Staphylococcus aureus (7.27%).

Table -3: Number of organisms colonizing on various surfaces of OTs.

| Organism isolated | Total number of positive swabs on the table top | Total number of positive swabs on the floor | Total number of positive swabs on the wall | Total number of positive swabs on the light | Total number of positive swabs on Microscope | Total number of positive swabs on instrument trolley | Total number of positive swabs on Air-conditioner | Total number of positive swabs on OT door | Total no of positive swabs on all the surfaces |
|-----------------------|--|--|---|--|---|---|--|--|--|
| <i>B.subtilis</i> | 12 | 05 | 01 | 00 | 01 | 06 | 00 | 03 | 28 |
| CoNS | 04 | 03 | 02 | 00 | 00 | 01 | 00 | 02 | 12 |
| Pseudomonas | 11 | 18 | 08 | 07 | 01 | 06 | 07 | 04 | 62 |
| Staphylococcus aureus | 03 | 01 | 01 | 00 | 00 | 00 | 00 | 03 | 08 |
| Percentage % | 32(29.09 %) | 27(24.54 %) | 12(10.90 %) | 7(6.36 %) | 2(1.81%) | 13(11.81 %) | 7(6.36%) | 12(4.54 %) | 110 |

Table 3 shows the sites of OT more prone to get contaminated OT tables top(29.09 % were highly contaminated, followed by OT floor(24.54 %), OT Instrument trolley (11.81 %), OT Wall (10.90 %), OT Light (6.36 %), OT Air conditioner (6.36 %) and OT Door (4.54%) OT Microscope (1.81 %).

Discussion:

Microbial contamination of the Operation Theater environment can be due to a variety of causes, and it leads to postoperative infections that can prolong hospital stays, cause long-term disability, and increase resistance to antibiotics.

Depending on the types of isolated organisms will give information about the types of contamination i.e.

- Isolation of *B.subtilis* suggestive of : contamination with dust particles or improper cleaning of OT environment,
- Isolation of *CONS* suggestive of : contamination of environment with skin commensals bacteria,
- Isolation of *Pseudomonas specie* suggestive of : contamination with hospital tap water.

In our study, a total of 1920 swab samples were taken from five OTs, out of which 110 (5.72%) were found positive for bacterial growth. Out of which majority of growth were detected from the major Operation theatre (46/384) followed by general surgery (40/384), Obstetrics-gynecology OTs (10/384) ENT OTs (7/384) and Ophthalmology (6/384).

In the study by Kiranmai and Madhavi, a total of 48 bacterial species were isolated from 111 swab samples from all OTs and ICUs. The highest contaminated surface was OT table as found in our study. Their study showed that OTs had bacterial CFU rate of air varying from 6 to 72 CFU/M³ which is much less than in our study. The most common isolates were Bacillus species 36 (75%) followed by Micrococcus^[10].

Mandatory teaching and training of all OT staff should be included in standard operative

procedure of OTs. Some studies suggest that the use of alcohol-based gel drastically reduces infection [7]. In addition, all waste from the OT should be collected in closed airtight containers.

Time to time surveillance of the environment of OTs should not be ignored at any cost to assess microbial load and to identify predominant pathogens [8,9].

Corrective Actions were advised to take in OT showing non-significant

1. Cleaning of OT with liquid soap and water after removal of dust on all surfaces.
2. Cleaning OT tables, lamps, trolleys with proper disinfectant.
3. Fumigation of OT.
4. Restrict entry of personnel in OT and wear masks and caps while in OT.

In conclusion, harboring of potential pathogens in OTs of hospital can pose a great risk to patients and patient's relatives.

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Conflicts of interest

There are no conflicts of interest.

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