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Original Research Paper

Microbiology

MICROBIOLOGICAL SURVEILLANCE OF OPERATION THEATRE IN A TERTIARY CARE HOSPITAL IN MEERUT CITY

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ABSTRACT

Background: Microbial contamination of air, surfaces, and articles in OTs is a major cause of surgical site and nosocomial infections. Surgical site and nosocomial infections a significant health risk to hospital patients. Operation Theatre (OT) are acquired infections, which are often caused by antibiotic resistant bacteria poses a significant threat to patients. **Methods:** The study was conducted in the Department of Allied Medical sciences, IIMT University, Meerut and associated IIMT Life Line Hospital, Meerut. Air samples were taken by settle plate method in petri dishes containing blood agar from all operation theatres. **Result:** Out of 847settle plates observed from OTs 192 plates were showing growth of organisms. Emergency OT had maximum positivity that is 12.5%. Out of 192 settle plates positives maximum 62 (32.29%) plates showed colonies of MRSA CONS. **Conclusions:** Harbouring of potential pathogens in OTs in hospital can pose a great risk to patients. Settle plate method will be helpful in predicting the microbial contamination. To prevent any contamination prior HAI develops, hospital needs to develop programmes for the implementation of good infection control practices.

KEYWORDS : Air settle plate, Surveillance, Operation Theatre (OT), Hospital Acquired infection (HAI), Microbiological Surveillance.

INTRODUCTION

Microbial contamination of air, surfaces, and articles in OTs is a major cause of surgical site and nosocomial infections[1]. Surgical site and nosocomial infections a significant health risk to hospital patients. Microorganisms are present in great numbers in moist, organic environments, but some also can persist under dry conditions. Operation Theatre (OT) are acquired infections, which are often caused by antibiotic resistant bacteria poses a significant threat to patients[2]. OT environment plays a significant role in the onset and spread of infection. Good infrastructure do not mean a safe environment. Nosocomial infections are the major cause of patient morbidity and mortality. The most common nosocomial infections are urinary tract infections (33%), followed by pneumonia (15%), surgical site infections (15%), and bloodstream infections (13%)[1]. Many of these pathogens, such as Methicillin-resistant Staphylococcus aureus (MRSA), are now called "superbugs" because they are virtually invincible to standard drug treatments. Monitoring of environmental means the microbiological testing of air, surface and equipment is useful to detect changing trends of types and count of microbial flora. The majority of nosocomial infections are endogenous in origin, that is, they involve the patient's own microbial flora. Invasive procedures, high antibiotic usage and transmission of bacteria between patients due to inadequate infection control measures may explain why OTs are "hot zones" for the emergence and spread of microbial resistance.[4] Biological contaminants occur in the air as aerosols and may include bacteria, fungi, viruses, and pollens. Controlling airborne pathogens in health facilities is not only important for the safety of the patient, but it is also important for hospital.[3]The present study is focused on to evaluate the level of bacterial contamination in operating theatres in hospital. Air samples can be collected in two ways: by Active air samplers or by passive air sampling (the settle plate). Both methods are widely used.

Materials and Methods

The study was conducted in the Department of Allied Medical Sciences (BMLT), College and associated IIMT Life Line Hospital, Meerut. The study period was from February 2020 - January 2020. Air sampling was done by settle plate method. Air and surface samples was taken from all operating theatres of a tertiary care hospital in Meerut. Blood agar plates, sterile swabs were transported to operation theatres in sealed plastic bags.

Settle plates were collected from 16 different operational theatres (OTs) in the hospitals. Total number of 847 Settle plates were studied in a year. Settle plates were collected once in a week from each OT.

Air sampling:-

Multiple blood agar plates were placed at different locations (the operating table, near the doors and the corners) in the OTs to be sampled. The ideal recommendation is the 1, 1, 1 method where plates should be placed at different locations in the OTs one meter away from the side walls, one meter above the floor and for a duration of one hour. Plates were placed on tables and stools about a meters height and 1 meter from the side walls but due to time constraints, they were exposed for 10 minutes only. After exposure, plates were immediately taken to the laboratory and incubated aerobically at 35-37°C for 24 - 48 hours. These plates after incubation at 37°C for 24 h in microbiology laboratory were observed for growth and number of colonies per plate were counted. Colonies were assessed for the growth of potential pathogenic bacteria initially by colony characteristics, haemolysis pattern and microscopic examination of Gram stained smears. Final identification was done following standard bacteriological techniques. Settle plate showing fungus was also noted. LCB mount of fungi was done to identify it

The visible colonies were counted, using hand lens when necessary. The mean number of CFUs of all plates at different areas was taken. The colonies were identified using basic microbiological tests. Further, this colony forming unit (cfu) count/plate was expressed as cfu/m3 by Omeliansky formula.[5]

Reporting of settle plates

- **Formula for conversion of colony count (on settle plate) to counts / m^3**

$$CFU/m^3 = \frac{a \times 1000}{p \times t \times 0.2}$$

a = The number of colonies on Settle plate.
p = The surface measurement of plate used.
t = Time of exposure of settle plate.

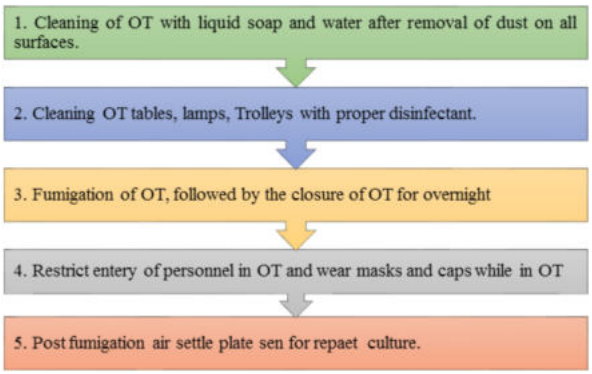
RESULTS

Out of 847settle plates observed from OTs 192 plates were showing growth of organisms and were positive and the report was given Unsatisfactory. [Figure: 1]

Among 192 positives Emergency OT - 24, Eye OT - 22, OT-3 – 16 and OT – 5 shows 17 positive settle plate growth. [Table: 1]

Among 192 positive samples from different OTs, Emergency OT had maximum positivity that is 12.5%, Eye OT had 11.46% of positive samples, and OT 5 had 8.85% of positive samples each. [Table: 2]

Out of 192 settle plates positives maximum 62 (32.29%) plates showed colonies of MRSA CONS, 41 (21.35%) plates showed colonies of *Staphylococcus aureus,* 12 (6.26%) plates showed fungal colonies of *asprgillus fumigatus* and 12 (6.26%) plates showed fungal colonies of *mucor*. [Figure: 3]



Corrective Action were advised to take in OT Showing non-significant.

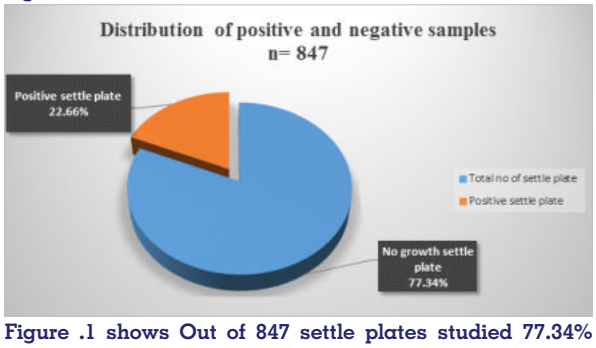


Figure .1 shows Out of 847 settle plates studied 77.34% sample were satisfactory and 22.66% sample was Unsatisfactory

Table. 1 Show Total Number of Settle Plates Showing Positives In different Ots.

Sr. No.	OT Number in Hospital	Number of settle plates observed	Settle plate showing growth (Positive)	Settle plate showing No growth (Negative)
1.	Emergency OT – I,II	58	24	34
2.	Eye OT - I , II	110	22	88
3.	Ortho miner OT	21	4	17
4.	Gynae OT	26	2	24
5.	Labour Miner OT	27	9	18
6.	Surgery Minor OT	55	11	44
7.	OT – 1	55	12	43
8.	OT – 2	55	11	44
9.	OT – 3	55	16	39
10.	OT – 4	55	13	42
11.	OT – 5	55	17	38
12.	Septic – OT	55	7	48
13.	OT – 6	55	15	40
14.	OT – 7	55	14	41
15.	OT – 8	55	7	48
16.	OT – 9	55	8	47
Total		847	192	655

Table. 2 Show Percentage Distribution of all positive Samples from different Ots.

Sr. No.	OT Number in Hospital	Settle plate showing growth (Positive)	Percentage of Positivity (%)
1.	Emergency OT –I,II	24	12.5
2.	Eye OT - I , II	22	11.46
3.	Ortho miner OT	4	2.09
4.	Gynae OT	2	1.05
5.	Labour Miner OT	9	4.68
6.	Surgery Minor OT	11	5.73
7.	OT – 1	12	6.25
8.	OT – 2	11	5.72
9.	OT – 3	16	8.33
10.	OT – 4	13	6.77
11.	OT – 5	17	8.85
12.	Septic – OT	7	3.64
13.	OT – 6	15	7.82
14.	OT – 7	14	7.30
15.	OT – 8	7	3.64
16.	OT – 9	8	4.17
Total		192	100

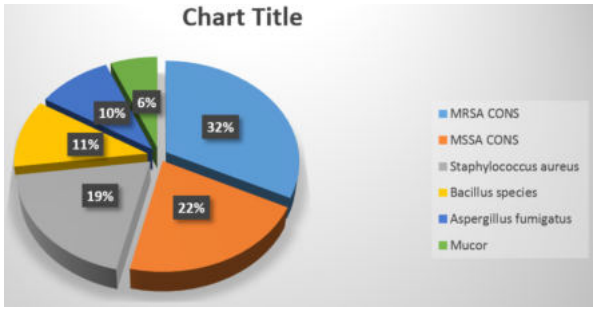
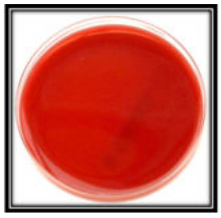
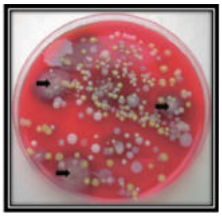


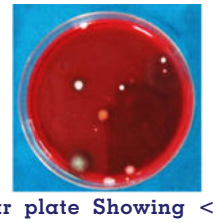
Figure. 2 Percentage of Organism isolates



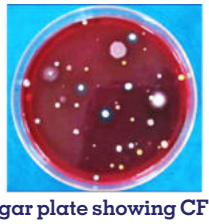
"Control Blood agar showing No Growth"



"Air Settle plate Mix growth"



'Agar plate Showing <15 colonies'



'Agar plate showing CFU>15 Colonies count'

DISCUSSION

Microbial contamination in OT leading to postoperative infections can have serious implications for patients and their families. Any case of suspected hospital-acquired Infection (HAI) is investigated by including cultures from other body sites of the patient, other patients, staff, and environment. Infections prolong hospital stays, create long-term disability, increase resistance to antimicrobials, represent a massive additional financial burden for health systems and cause unnecessary deaths.

In our study out of 847 settle plates studied 22.66% plates were found to be positives. Our findings were similar to the study carried out by M.M Kasdekar[16] who had reported the isolation of positive settle plate in 28%.

CONCLUSION

Harbouring of potential pathogens in OTs in hospital can pose a great risk to patients. High level of microbial contamination indicates the needs for periodic surveillance aimed at early detection of bacterial contamination levels and prevention of hospital acquired infections.

Settle plate method may be regarded as a crude measure of airborne contamination, in place without facilities it can still provide a simple and cost effective way of enumerating the contamination rate of horizontal surface at multiple points. So, settle plate method will be helpful in predicting the microbial contamination.

Routine sampling is strongly recommended for increasing awareness to identify and control all possible sources and types of infections. To prevent any contamination prior HAI develops, hospital needs to develop programmes for the implementation of good infection control practices.[4]

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