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Original Research Paper

Microbiology

MICROBIOLOGICAL SCRUTINY OF OPERATION THEATRE IN MULTI- SPECIALITY HOSPITALS IN GWALIOR, MADHYA PRADESH

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ABSTRACT

Background: Good hospital hygiene is an essential part of infection control programme. Bacterial counts in operation theatres are predisposed by number of individual present, ventilation and air flow methods.

Objective: To determine prevalence rate of microorganisms in Operation Theatre and to find out the incidence of contamination from various locations in operation theatre.

Methods: The study was conducted in the department of microbiology and Pathology Laboratory of Multi- Speciality Hospitals at Gwalior. Air sampling was done, and samples were taken by a sterile swab saturated in nutrient broth from all operation theatres. The samples were administered according to standard operative procedures. Analysis was done the Epi-info 7 software.

Results: Least bacterial colony forming unit (CFU) was revealed by ophthalmology OT 21CFU/mm3 and highest was shown by emergency OT 196 CFU/mm3. Isolated organism was separated into normal flora (CONS, micrococci), contaminant (bacillus species) and pathogenic organism e.g. Staphylococcus aureus, Acinetobacter.

Conclusions: Continuous Scrutiny and laboratory capacity will surely improve infection prevention and control. Routine sampling is strongly recommended for increasing awareness to identify and control all possible bases and types of infections.

KEYWORDS : Microbiological surveillance, Contamination, Operation theatre, Settle plate method

INTRODUCTION-

"Microbiological surveillance" provides data about the issues contributing to infection.[1] Bacterial count in operation theatres are prejudiced by number of individual present, ventilation and air flow methods. In developing countries like India, where there are no uniform guidelines, many OTs are built and preserved according to the individual's knowledge level, availability of funds, technical staff, and equipment's. The environments in the operation theatre are lively and subject to continuous change. Good infrastructures do not mean a safe environment as human make a superior difference in making the environment hazardous. Microbiologists should be conscious of organisms, sites and populations as surveillance cultures should be chosen sensibly to allow meaningful interpretation of results. Environmental monitoring means the microbiological testing of air, surfaces and equipment to perceive changing trends of microbial counts and micro-flora.[2] Surgical-site infection is the leading complication of surgery.[3] Invasive procedures, high antibiotic usage and transmission of bacteria between patients due to inadequate infection control measures may explain why OTs and ICUs are "hot zones" for the emergence and spread of microbial resistance.[4]Lack of adherence to established standards and guidance can result in adverse patient outcomes in health-care facilities. Biological contaminants occur in the air as aerosols and may include bacteria, fungi, viruses, and pollens.[5] It is also suggested that for ultra-clean operating theatres the bioload should be less than 1.0 cfu/m^3 in the centre of an empty theatre and less than 10 cfu/m 3 during an operation and should not exceed 20 cfu/m at the periphery. The rationale behind the study is to find out prevalence rate of microorganisms in operation theatre, to find out the incidence of contamination from various sites in operation theatre.

MATERIALS AND METHODS-

Study Area- Department of Microbiology and Pathology **Laboratory of Multi-** speciality Hospitals, Gwalior.
Study type- Cross Sectional Prospective study

Study population-
Study duration- April 2018 to March 2019
Sampling Technique- Consecutive sampling of the Agar plates

Methodology- Air and surface samples were taken from all operating theatres of a Multi-speciality Hospital. Blood Agar plates, sterile swabs and nutrient broth were transported to operation theatres in sealed plastic bags. Blood agar plates (3 for each OT) with known surface area were taken and noticeable with distinctive numbers, record of the position, duration and time of exposure for each plate is organized. The blood agar plates were uncovered and keeping the lid over the plate at an inclined position. The uncovered plates were exposed for 15 to 30 minutes, then at once the lids were replaced. The plates were packed and taken to the microbiology laboratory. Nurture the plates aerobically for 24 hours at 37 C. Identification of isolates was done by gram staining and standard biochemical tests. 8 Antibiotic sensitivity tests done by Kirby Bauer Disc Diffusion Method under CLSI Guidelines.[6]

In the settle-plate technique the number of microorganisms articulated as cfu/m^3 is estimated using Koch's sedimentation method according to which,

Cfu/m^3 =a X 1000/P X t X 0.2

Where, a = the number of colonies on the petri plate, p = the surface measurement of the of the plate used in cm^2, t = the time of exposure of the petri plate in minutes.

Consent Type- Written Informed consent

Statistical Analysis- Data will be consolidated and entered a Microsoft Excel spreadsheet and then transferred to Epi info version (7.1.3.0. centre for disease control and prevention, Atlanta, Georgia, USA, 2013) software for analysis.

RESULTS-

Table 1- Bacterial Count from different Operation Theatres

Operation Theatre (OT)	Intra OT count	Pre-OT count
Emergency	196	62
Surgery	162	88
Obstetrics & Gynaecology	190	64
Ophthalmology	21	31
ENT	18	29
Orthopaedics	88	105

As per table 1 bacterial count was least in ENT operation theatre both Intra OT (18) AND Pre-OT (29), followed up by Ophthalmology which was 21 in Intra- OT and 31 in Pre-OT. The bacterial count was found to be highest in Emergency OT followed up by OBG OT. (196,62, 190, 64) Surprisingly the Pre-OT bacterial count was found to be highest in Orthopaedics OT. (105)

Table 2- Bacterial Isolates from different Operation Theatre

Operation Theatre (OT)	Intra OT isolates	Pre-OT isolates
Emergency	Staph. Aureus, Bacillus species	Coagulase Negative staph species
Surgery	Bacillus species	Staph aureus
Obstetrics & Gynaecology	Micrococci species	Bacillus species
Ophthalmology	Bacillus species	Bacillus species
ENT	Coagulase Negative staph species	Acinetobacter species
Orthopaedics	Bacillus species	Staph aureus

As per air sampling the bacterial isolates were seen. Bacillus species isolates (Intra-OT) were seen in Emergency OT, Surgery OT, Ophthalmology OT and Orthopaedics OT. While in Pre-OT bacillus species were seen in OBG OT and Ophthalmology OT. Similarly, from surgery OT bacillus and staph aureus were isolated. Bacillus species were the most common isolates from in Intra-OT. Acinetobacter isolates were seen only in ENT pre-OT.

DISCUSSION-

Aerobic cultures on non-selective medium should not exceed 35 colonies forming units (CFU) of bacteria per cubic meter of air in an empty operation theatre and 180 CFU per cubic meter of air during an operation for a conventional theatre. In the present study bacterial count was least in ENT operation theatre both Intra OT (18) AND Pre-OT (29), followed up by Ophthalmology which was 21 in Intra- OT and 31 in Pre-OT. The bacterial count was found to be highest in Emergency OT followed up by OBG OT. (196,62, 190, 64) Surprisingly the Pre-OT bacterial count was found to be highest in Orthopaedics OT. (105) Bacillus species isolates (Intra-OT) were seen in Emergency OT, Surgery OT, Ophthalmology OT and Orthopaedics OT. While in Pre-OT bacillus species were seen in OBG OT and Ophthalmology OT. Only three OTs like ophthalmology OT, ENT OT and urology OT are not exceeding the limit.

Anjali K et al, Mir RF et al, Kiranmai et al and Javed et al also reported in their study that ophthalmology OT and ENT OT was the one with least air contamination.[7,8,9,10] Many studies have been carried out in operation theatres to determine relationship between total bacterial air count in OT and risk of infection. It has been observed that counts in the range of 700-1800/m^3 were related to significant risk of infection and the risk was slight when they were below 180/m^3.[11] According to Pasquarella et al microbiological quality of air may be considered as mirror of the hygienic condition of the operation theatres.[12] The quality of indoor air depends on external and internal sources, such as ventilation, cleaning procedures, the surgical team and their activity.[13] Microbiological surveillance study in OTs of a tertiary care hospital at Lahore by Javed et al, and Mysore by Deepa et al, have reported a significantly higher bacterial air count in the range of 6500- 15730CFU/m 3 and 628-1571 CFU/m 3 respectively.[10,14]Whereas, in contradiction the study conducted by Desai et al showed a low bacterial air count in the range of 20- 75 CFU/m^3 . Settle plate method for air sampling showed highest percentage of occurrence of CONS and Bacillus spp. followed by micrococci while in the study done by Anjali et al Bacillus spp. and micrococci were predominant.[7] Moreover, among the pathogens Staphylococcus aureus and Acinetobacter spp. were isolated, in a study done by Qudiesat et al Staphylococcus aureus was isolated while in a study done by Kiranmai et al E.coli, Klebsiella spp. and Enterobacter spp. was isolated from air sampling.[9,15]

CONCLUSION-

Strengthening surveillance and laboratory bulk will surely improve infection prevention and control. Routine sampling is strongly recommended for increasing awareness to identify and control all possible sources and types of infections. Settle plate's method for air is considered as crude method but in a limited resource setup this method is proved to be more valuable in detecting the contamination level. In future, more and more studies should be encouraged to find out prevalence of type of bacterial isolates.

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