



## BACTERIAL CONTAMINANTS OF OPERATION THEATRE SETTINGS IN PUBLIC AND PRIVATE SECTOR HOSPITALS IN GOJRA.

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**ABSTRACT...** The study aims to recognize bacterial colonization of surfaces and equipment's in operation theaters and to determine the bacteriological contamination of air in OTs in Gojra. **Objectives:** To identify the bacteriological colonization of surfaces, inanimate objects, air, in the operation room facilities and antibiotic susceptibility profile of the isolates at tehsil Gojra hospitals. **Study Design:** One Group Pre and Post-experimental study. **Settings:** Department of Surgery THQ Hospital Gojra. **Period:** 1st January 2019 to 31st July 2019. **Material & Methods:** Operation theatres sampled and left vacant for more than one-hour before sampling. Settle pate method used for sampling of air by using agar plates and swab method for sampling of surfaces and equipment. Bacterial isolates identified by colony morphology. Gram Staining, Antibiotic Susceptibility testing done by disc diffusion technique. **Conclusion:** There is a high hazard for the occurrence of surgical site infections because of the significant level of pollution observed in our study. The results emphasize the need for proper cleaning, scrubbing techniques, improved disinfection and sterilization methods and regular fumigation of operation theatres to prevent the cause of infection and maintain a safe environment for the patients and health care professionals.

**Key words:** Antibiotic Resistance, Bacterial Contaminations, Operation Theatre, Air Sampling, Swab Test.

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### INTRODUCTION

Bacterial contamination of the operating theaters (OT) remains one of the major risk factors responsible for increasing the incidence of surgical sites infections and nosocomial infection. Around 10% of the nosocomial contaminations have genuine results prompting longer term of hospital stay and cost trouble.<sup>1</sup> The main reason for patient mortality and illness are nosocomial infections. Microbiological surveillance is an important part of an infection control program, providing data concerning types, and numbers of bacteriological flora.<sup>2</sup> If sterilization of operation theaters is not sufficient, it lead to worse predictive results of post-operative patients due to surgical site infections.<sup>3</sup>

Source of bacteriological contamination is diverse, from surgical/medical team, theater gowns, movement within the units, foot wares, leakage

of the wounds, gloves and hands, collection bags and transportation of patients.<sup>4</sup> The use of high antibiotic, in invasive procedures and due to insufficient infection control and bacterial transmission between the patients might explain why OTs remain "major zone" for the spread and occurrence of bacteriological resistance.<sup>5</sup>

Microbiological testing of inanimate surfaces and equipment by environmental monitoring is an effective method to detect the changing developments of counts and types of bacteriological flora.<sup>6</sup> To control the numbers and types of microbes, or particulates, in OT air microbiologic air sampling is used.<sup>7</sup> In health facilities controlling airborne pathogens is not only important for the safety of the patient, but it is also important for hospital.<sup>8</sup> Like-wise there is no standard strategy for shaving of the patients and sterile shower before coming into the

theater. Every one of these elements assumes a job in sullyng of the working auditorium and ensuing postoperative diseases.<sup>9</sup> Reduction of bacteriological contamination impact in a hospital setting, depends primarily on developed cleaning and proper decontamination of the hospital environment, especially high-risk areas, as these methods are very important to control the spread of these bacteriological contamination.<sup>10</sup>

Particle counting and microbiological sampling can be accomplished routinely for the assessment of air quality in operation theater.<sup>11</sup> The clinical suggestion of bacterial contamination in the operating theater and overall outcome on infection control in hospital settings is enormous on both the patient and medical health care workers. On the bases of this observation, we decided to evaluate the level of bacteriological infection in the operating theater settings in Tehsil Gojra.

## MATERIAL & METHODS

Operation theatres were selected and left vacant for more than one hour before sampling, to avoid false-positive outcomes due to recent theatre usage. The theater doors kept locked earlier to and during the sampling period.<sup>12</sup>

Settle plate method used for sampling of air by using blood agar plates from four OTs, and including one labor room of THQ Hospital Gojra and two private hospital OTs in Gojra. Blood agar plates were kept open in the OTs and at a height of 1m and 1m from the walls of the rooms. Sampling time was 1 hour.

The contamination of air was measured by calculating the number of CFU (colony forming unit) per cubic meter (CFU/ m<sup>3</sup>) of air.<sup>13</sup> CFU count should be <200/m<sup>3</sup>. It is standard for comparison.

Samples were collected from different sites and equipment of four OTs, and one LR and two private OTs. Sterile samples swabs used in nutrient broth to collect samples. They were placed back into the broth after collection. All the samples were labeled properly and immediately transported to the laboratory of the microbiology department of

Government College University, Faisalabad and incubated 37°C for 4 hours. Swabs were taken from different sites inoculated on Blood agar and MacConkey agar. These culture plates were incubated at 37°C under the aerobic condition for 24 hours.<sup>14</sup>

Bacterial isolates were identified by colonial morphology, gram reaction and standard biochemical tests.<sup>15</sup> Antibiotic susceptibility testing was done by disc diffusion technique.<sup>16</sup>

## RESULTS

An aggregate of 60 examples were assembled. Tests were gathered from the four operation theaters including general operation theater, gynecology operation theatre, eye operation theatre, and one private operation theatre was likewise included. Tests were gathered by utilizing a settle plate strategy and swabbing technique. Out of 60 examples, 15 examples were gathered from every operation theaters. 8 after cleaning or before the beginning of activities and 7 preceding cleanings or at the end of activities.

Out of 60 examples, 49(81.6%) yielded positive bacterial development and the remaining 11(18.3%) were growth negative.

Private operation theater demonstrated the most noteworthy CFU rate of 135 CFU/m<sup>3</sup> and 234 CFU/m<sup>3</sup> in pre and post-operative periods individually and gynecology OT 86 CFU/m<sup>3</sup> and 177 CFU/m<sup>3</sup> in pre and post usable occasions. The least CFU rate was appeared by eye OT and general activity theaters with 35 CFU/m<sup>3</sup> and 82 CFU/m<sup>3</sup> in pre usable periods and 72 CFU/m<sup>3</sup> and 165 CFU/m<sup>3</sup> in post usable occasions.

The prevalence of gram-positive isolates (60%) was higher than gram-negative isolated bacteria (21.6%). The highest percentage of bacteria were from the genus *Staphylococcus*. Out of these *Staphylococcus* spp. 25% (15 out of 60) were *Staphylococcus aureus* and 16.65 (10 out of 60) were coagulase-negative *Staphylococci* (CoNS). Among the *Staphylococci*, *Staphylococcus aureus* were the predominant bacteria followed by the CoNS. The second highest bacteria

isolated were the Bacillus subtilis 16.6% (10 out of 60). The third highest isolated bacteria were E. coli 10% (6 out of 60) and Acinetobacter spp. (5 out of 60, 8.3%) and Klebsiella pneumonia 3.3% (2 out of 60) and Streptococcus spp. 3.3% (2 out

of 60).

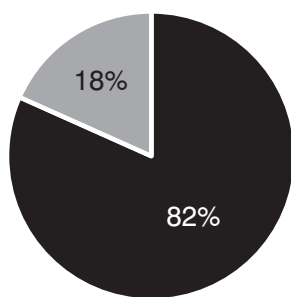
The most common bacterial genera that were recovered are staphylococcus and Bacillus subtilis.

Sample Collection Place	Wall	Floor	Suction Machine	Anesthesia Machine	Bed	OT Light	Air	Instrument	Grand Total
General OT	2	2	2	2	2	2	2	1	15
Gynecology OT	2	2	2	2	2	2	2	1	15
Eye OT	2	2	2	2	2	2	2	1	15
Private OT	2	2	2	2	2	2	2	1	15
Grand total	8	8	8	8	8	8	8	4	60

Table-I. Sample collection place and site.

Operation theatres	Acineto-bacter spp	Bacillus spp	CoNS	E. Coli	K. pneumo-niae	S. aureus	Strepto-coccus spp	Grand Total
Eye OT	0	3(5%)	2(3.3%)	0	1(1.6%)	3(5%)	0	9(15%)
General OT	1(1.6%)	1(1.6%)	2(3.3%)	2(3.3%)	1(1.6%)	4(6.6%)	0	11(18.3%)
Gynecology OT	2(3.3%)	4(6.6%)	2(3.3%)	1(1.6%)	0	4(6.6%)	1(1.6%)	14(23.3%)
Private OT	2(3.3%)	2(3.3%)	3(5%)	3(5%)	0	4(6.6%)	1(1.6%)	15(25%)
Grand total	5(8.3%)	10(16.6%)	9(15%)	6(10%)	2(3.3%)	15(25%)	2(3.3%)	49(81.6%)

Table-II. Operation theatre wise distribution of samples n=60 and bacterial isolates from operation theatres.



■ Growth +ve ■ growth -ve

Figure-1. Prevalence in samples.

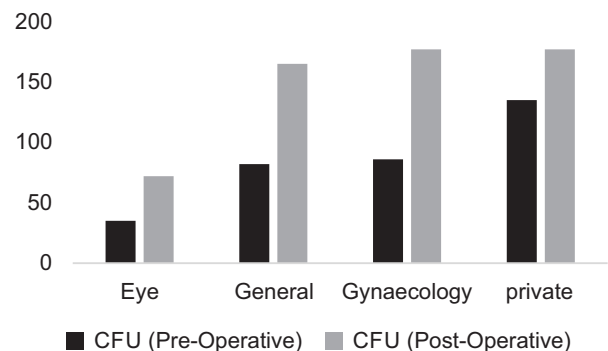


Figure-2. Mean CFU/m<sup>2</sup>/h values for each theatre before surgery and during the last surgical procedure.

**DISCUSSION**

Qaisar, Akhtar<sup>17</sup> They conducted a study to estimate the level of bacterial contamination of equipment's, air, and surfaces in operation theaters in tertiary care hospitals in Lahore. They used settle plates method for air samples, for other articles and surfaces swabs were taken. Sucker machine and OT air showed high bacteriological contamination. Besides, surfaces of OT showed less bacterial contamination. They finally

concluded microbiological surveillance play a very important role in the reduction of bacterial contamination and it will reduce postoperative infections.

Tesfaye, Berhe<sup>18</sup> Studied that microbial contamination of the operating theater continued to increase the prevalence of nosocomial infections. There were five types of bacteria isolated with the highest prevalence of coagulase-

negative Staphylococci (68; 53.5%) followed by Staphylococcus aureus (42; 33.1%). Methicillin resistance S. aureus (MRSA) accounts for 7.7% of the S. aureus isolates. In general, the results indicate proper cleaning-fumigation of operating theater significantly reduced the microbial contamination, and bacterial strains such as CoNS and S. aureus have a greater propensity to cause contamination in OT. Therefore, efforts should be made to ensure strict infection control practices in the OT.

Mishra and Wadhai<sup>19</sup> described the spread of bacterial contamination and its rate in operation theaters and they also find out how it contributes to the nosocomial infections of various hospitals of Wardha city (M.S), India. In this study, they collected samples for air open plate technique and swab method for surface and articles, and they further isolated and identified the bacterial types. The pathogens of bacteria like Staphylococcus spp. Coagulase-negative Staphylococcus spp. and Pseudomonas spp. were found. In the samples of air in Operation Theater, bacterial contamination was very high.

Al-Abbas<sup>20</sup> Conducted a study in Bayero University Kano, Nigeria. The isolates of clinical importance observed were Coagulase Negative Staphylococcus (COANS) spp. (34.5%), P. aeruginosa (26.2%), Non-hemolytic Streptococcus spp. (14.5%), Proteus mirabilis (10.3%), E. coli (8.3%), S. cholerasius (4.1%) and Staphylococcus aureus (2.1%). The pattern of bacteria most frequently isolated was similar in the three operating theaters. Constant disinfection of surfaces and theater items under a strict infection control policy will check the transmission of infectious agents from these sources.

Johnson, Adekunle<sup>21</sup> Studied that indoor air contamination of the operating theaters is one of the major sources of life-threatening nosocomial infections for patients undergoing certain surgical procedures. Airborne microbial samples were collected using the gravitational method and the total bacterial counts (TBC) and total fungal counts (TFC) per cubic-meter were determined before and after surgery. Indoor TBC and TFC

after surgery was significantly higher than before surgery. Staphylococcus spp. and Aspergillus spp. were one of the bacteria and fungi species isolated respectively. The study implicated the indoor environment of the operating theaters as a source of contamination.

## CONCLUSION

There is a high hazard for the occurrence of surgical site infections because of the significant level of pollution observed in our study. The results emphasize the need for proper cleaning, scrubbing techniques, improved disinfection and sterilization methods and regular fumigation of operation theatres to prevent the cause of infection and maintain a safe environment for the patients and health care professionals.




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