

## Pattern And Sensitivity Test Against Bacteria In The Air At Ob/Gyn Operating Room Of Central Surgery Installation In Central General Hospital (Rsup) Haji Adam Malik Medan

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**ABSTRACT: Introduction and Objective:** The incidence of nosocomial infections in Indonesia is in quite high number. The most common phenomenon is surgical wound infections, while it is getting worse by the increase of bacteria resistance due to the excessive and inappropriate use of antibiotics. This study aims to find pattern and sensitivity test against bacteria in the air at Ob/Gyn Operating Room, Central General Hospital (RSUP) H.Adam Malik. The research result expected to be use in order to find bacteria sensitivity against many antibiotics mostly used as prophylaxis of pre-operation and become reference whether the antibiotics are necessary and the type that should be used.

**Method:** This study used descriptive observational design, while the research sample was contaminant bacteria taken from Ob/Gyn Operating Room in pre-operation for 2 weeks (10 working days) with "settled down plate" technique using Blood Agar medium. The research sample also taken from bacteria of patient's wound swab that undergo surgery. Cultured bacteria were stained with Gram staining and sensitivity test conducted to the several types of antibiotics. The observation carried out in the Laboratory of Microbiology Faculty of Medicine, University of Sumatera Utara, Medan.

**Result:** There is bacterial contamination in the air of operating room. The largest bacteria contaminant is Coagulase-negative Staphylococcus, Klebsiella pneumoniae, and Bacillus subtilis where the average growth rate during culture process is 12 colony-forming units (cfu)/plate (24 hours) and 19 cfu/ plate (48 hours). Sensitivity test shows that mostly used antibiotics are still sensitive, except Cefazoline that shows resistance. From 11 patients that conducted by wound swab, only 2 patients show bacteria growth.

**Conclusion:** There is bacterial contamination found in the air of operating room so that the used antibiotics in pre and post surgery still needed.

**KEYWORDS:** Nosocomial Infection, Surgical Wound Infection, Bacteria, Resistance, Sensitivity, Antibiotics

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### I. Introduction

Infection disease is main cause of morbidity and mortality in the world. One of reasons for high number of morbidity and mortality due to infection caused by nosocomial infection. Nosocomial infection or hospital-acquired infection can be defined as infection acquired or gained in the hospital by inpatients for other reasons despite infection. Infection occurred to the patients in hospitals or other health facility institutions where the infection does not found while the patients go to hospitals; however, it appears after going out or being inpatient for certain period in hospitals. According to World Health Organization (WHO), about 8.7% from 55 hospitals in 14 countries come from Europe, Middle East, South-East Asia and Pacific show that nosocomial infection in South-East Asia is about 10%.

The increase of nosocomial infection number affected by 3 main cases, antibiotics utilization and old treatment facilities, many hospital staffs that fail to follow basic infection control program such as washing hand before contacting to the patients, and patient condition in hospitals that vulnerable to the infection. Surgical operating is one of procedures in hospitals that able to raise pathogen bacteria involvement in hospital environment to the human body. Therefore, operating room or operating theatre in each hospital should meet the standard that been established in order to prevent bacterial infection to the patient body during surgical process. Every operating room building in hospitals is a place to conduct surgical activities, both elective and acute, in which it needs sterile condition and other special conditions. Standard requirements for health operating room have been established in the decision of Direktur Jenderal Pemberantasan Penyakit Menular dan Penyehatan Pemukiman (General Director of Infectious Disease Eradication and Healthy Housing) No. HK. 00.06.6.44 Year

of 1995 about Requirements of Operating Room Construction in Hospitals. The result of swab test at surgical operating room and tools used at the room, which conducted by Microbiology installation Central General Hospital (RSUP) H.Adam Malik in 2011 and 2013, it was found *Candida sp* at two surgical operating room as well as pathogen bacteria of *Klebsiella oxytoca*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, and *Acinetobacter sp* at surgical tools, thus it means that requirement of sterility to the surgical operating room and instruments still unable to be met.

The aim of this study is to know pattern of bacteria in the air at ob/gyn operating room in Central General Hospital (RSUP) Haji Adam Malik as well as to know bacteria sensitivity to the many antibiotics mostly used as pre-operation prophylaxis in Ob/Gyn Department RSUP H Adam Malik, thus it can be used as reference in order to determine whether or not it needs prophylaxis antibiotics and what antibiotic type that should be used.

## II. Method

This research was observational descriptive research conducted in ob/gyn operating room of central surgery installation in Central General Hospital (RSUP) Haji Adam Malik. Culture and resistance test conducted in Microbiology Laboratory, Faculty of Medicine, University of Sumatera Utara. The study conducted for two weeks. The research sample was contaminant bacteria in the air at ob/gyn operating room of central surgery installation in Central General Hospital (RSUP) Haji Adam Malik that taken before surgical operation (pre-operation) in the room. Number of sample determined by total sampling during the research period. Sample determination technique used in this study was “settled down plate” by using Blood Agar medium in Petri dishes placed around operating table and left it open for 60 minutes. As comparison, it was also taken by sample of surgical wound swab from patients undergo operating procedures in ob/gyn operating room Central General Hospital (RSUP) Haji Adam Malik during the research period. The result of cultured bacteria then conducted by gram staining and sensitivity test using many antibiotic types.

## III. Result

**Table 4.1** Pattern of Bacteria in the Air at Ob/Gyn Operating Room of Central Surgery Installation in Central General Hospital (RSUP) Haji Adam Malik Medan for 10 workdays

No.	Air Observation	Number of Colony (cfu/plate)	of	Microscopic	Identification Result
	Day/Date	24 hours	48 hours		
1	Day I	9	11	Coccus Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
2	Day I	9	10	Coccus Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
3	Day II	9	10	Coccus Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
4	Day II	9	14	Coccus Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
5	Day III	20	30	Coccus Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
6	Day III	23	36	Coccus Gram	<i>Coagulase-negative</i>

				(+) Basil Gram (-) Basil Gram (+)	<i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
7	Day IV	10	20	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
8	Day IV	8	13	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
9	Day V	15	20	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
10	Day V	10	18	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
11	Day VI	13	20	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
12	Day VI	11	16	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
13	Day VII	8	13	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
14	Day VII	11	15	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
15	Day VIII	12	16	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
16	Day VIII	11	15	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>
17	Day IX	13	19	<i>Coccus</i> Gram (+) Basil Gram (-) Basil Gram (+)	<i>Coagulase-negative</i> <i>Staphylococcus</i> <i>Klebsiella pneumonie</i> <i>Bacillus subtilis</i>

18	Day IX	9	17	Coccus Gram (+) Basil Gram (-) Basil Gram (+)	Coagulase-negative Staphylococcus Klebsiella pneumoniae Bacillus subtilis
19	Day X	11	19	Coccus Gram (+) Basil Gram (-) Basil Gram (+)	Coagulase-negative Staphylococcus Klebsiella pneumoniae Bacillus subtilis
20	Day X	14	20	Coccus Gram (+) Basil Gram (-) Basil Gram (+)	Coagulase-negative Staphylococcus Klebsiella pneumoniae Bacillus subtilis

From Table 4.1 above, it can be seen that there is bacteria contaminant in the air at Ob/Gyn Operating Room of Central Surgery Installation in Central General Hospital (RSUP) Haji Adam Malik, both gram positive and gram negative bacteria. In which, average growth rate of bacteria colony while it is cultured for the firsts 24 hours is 12 cfu/plate and 19 cfu/plate after 48 hours.

**Table 4.2** Result of Antibiotics Sensitivity Test Against Bacteria Found in the Sample

Antibiotics	Type of Bacteria	
	<i>Coagulase-negative Staphylococcus</i>	<i>Klebsiella pneumoniae</i>
<i>Amikacin</i>	S	S
<i>Ampicillin</i>	S	S
<i>Amoxicillin</i>	S	R
<i>Levofloxacin</i>	S	S
<i>Cefotaxime</i>	S	S
<i>Ceftazidimie</i>	S	S
<i>Cefuroxime</i>	S	R
<i>Chloramphenicol</i>	S	S
<i>Ciprofloxacin</i>	S	S
<i>Clindamycin</i>	S	R
<i>Cotrimoxazole</i>	S	S
<i>Erythromycine</i>	S	S
<i>Imipenem</i>	S	S
<i>Gentamycin</i>	S	S
<i>Kanamycin</i>	S	S
<i>Meropenem</i>	S	S
<i>Ofloxacin</i>	R	S
<i>Oxacillin</i>	S	S
<i>Tetracycline</i>	S	S
<i>Amoxicilline + clavulanic acid</i>	R	R
<i>Ceftriaxone</i>	S	S
<i>Vancomycin</i>	S	R
<i>Cefazoline</i>	S	R

From Table 4.2 above, it can be concluded that antibiotics generally used for pre-operation prophylaxis in Ob/Gyn Department such as Ampicillin, Cefotaxime, Ceftriaxone are still effective to be used due to bacteria found in the room proven as sensitive to the antibiotics mentioned above. However, for Cefazoline antibiotic from first generation of Cefalosporin group is not recommended to be used due to it is proven to be resistance to the *Klebsiella pneumoniae* bacteria.

**Table 4.3** Culture Result of Patient’s Wound Swab Undergoes Surgical Procedures in Ob/Gyn Operating Room during the Research Period

No	Culture Result	Antibiotic Resistance
1	No bacteria growth	-
2	No bacteria growth	-
3	No bacteria growth	-
4	No bacteria growth	-
5	No bacteria growth	-
6	No bacteria growth	-
7	No bacteria growth	-
8	No bacteria growth	-
9	No bacteria growth	-
10	Bacteria growth of <i>Klebsiella oxytoca</i>	<i>Cefazoline, Cotrimoxazole, Tetracycline</i>
11	Bacteria growth of <i>Klebsiella pneumoniae</i>	<i>Cefazoline, Cotrimoxazole, Tetracycline</i>

From Table 4.3 above, it can be seen that from 11 patients undergo operating process, only 2 patients found bacteria growth in their surgical wound, *Klebsiella pneumoniae* and *Klebsiella oxytoca* bacteria.

#### IV. Discussion

Many factors may cause air contamination by bacteria such as tool sterility in operating room, either medical tools or non-medical tools such as operating lamp, anesthesia machine and instrument table. Besides that, medical officer behavior to the prevention of nosocomial infection remains inappropriate to the established procedures. In addition, daily routine cleaning in operating room also not enough to keep operating room sterility. It may be caused by disobedience of cleaning service officers to the established procedures, in which daily routine cleaning procedures in operating room including: cleaning operating table, instrument table, EKG cable, diathermy machine, cleaning spot of dirt on the wall, mopping floor using disinfectant liquid that not used for other operating room, cleaning operating lamp, and cleaning footwear used in operating room daily. In fact, many procedures above are not conducted daily, thus it needs monitoring process and improvement from medical officer behavior in operating room. Many cases may cause air contamination by bacteria in Ob/Gyn Operating Room of Central Surgery Installation Central General Hospital (RSUP) Haji Adam Malik such as: right angle connection between wall to wall, where it should not be right angle, but it should be curved in order to ease cleaning process as well as to make the air flows appropriately. The doors that still not meet standard established by Ministry of Health such mentioned in “Technical Guidance of Operating Room in Hospital” issued by Direktorat Bina Pelayanan Penunjang Medik dan Sarana Kesehatan (Directorate of Medical Supports and Health Facilities Service Development) in 2012, in which it is mentioned that doors should be created in certain ways thus the doors can be opened and closed only by foot-switch or elbow or even by sensor, however, in the condition when the door motion electricity is error then it may be opened manually. The doors are not allowed to be opened, both during surgical operation and between surgical operation to other surgical operation. Although it has been completed with humidity and temperature control, air conditioner unit may become source of microorganisms come from the filters. Those filters should be replaced for certain period. In fact, those air filters are not replaced and only conducted by cleaning process sometimes. The operating room has no ventilation. Whereas, according to technical guidance issued by Ministry of Health, ventilation in operating room should be filtered and controlled ventilation. Air change and air circulation will result in fresh air and prevent anesthesia gas collection in the room. There is no instrument in order to keep positive pressure in the operating room. According to guidance by Ministry of Health, it is mentioned that pressure in each operating room should be larger than in corridors, sub-sterile rooms, and washing hand rooms (positive pressure). Positive pressure reached by supplying air from diffuser on the ceiling to the room. The air flowed through return grille placed  $\pm$  20 cm above the floor surface. Microorganisms in the air may enter to the rooms, except positive pressure in the room is maintained. Based on Technical Guidance of Air System Facilities in Hospital Buildings issued by Ministry of Health, it is recommended the use of HEPA (High-Efficiency Particulate Air) filter that has Dioctyl phthalate (DOP) filter with filtration efficiency of 99.97% in certain area. From the result of sensitivity test towards Cefazoline antibiotic, which is first generation of Cefalosporin group, it is not recommended to be used due to it is proven to be resistance to the *Klebsiella pneumoniae* bacteria. However, if the antibiotic must be used, then it should be combined with other group antibiotics such as Gentamycin. In this research, as comparison, it was also conducted sample taking of surgical wound swab from patients undergo operating procedures in Ob/Gyn Operating Room of Central Surgery Installation in Central General Hospital (RSUP) Haji Adam Malik during the research period. From this surgical wound swab taking, it is only obtained that 2 patients found by bacteria growth in the surgical wound, *Klebsiella pneumoniae* and *Klebsiella oxytoca*. It can be caused by many things and may not directly related to the air contamination in the operating room due to

different bacteria type found. Contamination may be occurred around patient's home and factor of lack personal hygiene.

### **V. Conclusion**

From the research result, it is obtained bacteria pattern in the air at Ob/Gyn Operating Room of Central Surgery Installation in Central General Hospital (RSUP) Haji Adam Malik is type of *Staphylococcus coagulase* negatif, *Klebsiella pneumoniae*, and *Bacillus subtilis*. Therefore, antibiotic utilization, both pre and post-operation, is heavily recommended in order to prevent operating or surgical wound infection.

Antibiotics proven to be sensitive to the bacteria type in the air at Ob/Gyn Operating Room of Central Surgery Installation in Central General Hospital (RSUP) Haji Adam Malik such as Ampicillin, Cefotaxim, Ceftazidime, Ceftriaxone, and Cefoperazone. While, Cefazoline is no more recommended due to it is resistance to the *Klebsiella pneumoniae* bacteria.

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