Microbial patterns in the operating room and outpatient room (Pedodontic Room) Dental Hospital Hasanuddin University

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Abstract

Objective: Therefore, researchers want to conduct research to identify microorganisms in the operating room and outpatient room (pedodontic room) of the Dental Hospital of Hasanuddin University.

Material and Methods: This research uses cross sectional (transversal) design. Total sample is two samples, one sample for outpatient room (pedodontic room) and one sample for the operating room. Sampling using MAS (Microbiological Air Sampler). Samples were calculated using a colony counter then performed gram staining and biochemical tests. Data analysis using univariate analysis.

Results: Airborne bacteria in Pedodontic room is 224 CFU/m³ and the operating room obtained an average of 686 CFU/m³ airborne bacteria. Types of dominant bacteria in the operating room are sphingomonas paucimobilis, aeromonas salmonicida, and alloiococcus otitis, while in the pedodontic room sphingomonas paucimobilis, staphylococcus cohnii ssp urealyticus, and staphylococcus aureus.

Conclusion: Airborne in the operating room of Dental Hospital of Hasanuddin University is still contaminated with organism and has not met the minimum standard of bacteria, while the air in the pedodontic room is good and in accordance with the prevailing standards.

Keywords: Operating room, Outpatient room (pedodontic room), Pattern of microbes

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Introduction

According to the Regulation of the Minister of Health of the Republic of Indonesia Nomor 1173/ MENKES/PER/X/2004 concerning Dental Hospital, Dental Hospital, hereinafter referred to as Dental Hospital Hasanuddin University is a health service facility that carries individual dental health services for treatment and recovery services without neglecting health improvement services and disease prevention carried out through outpatient, emergency and medical treatment services. Dental Hospitals must meet the requirements of buildings, facilities, and infrastructure as well as equipment in accordance to their designation. Some facilities and infrastructure that must be owned by the hospital are outpatient and operating rooms.1

Outpatient rooms are an important unit because they can determine the quality of a hospital. Almost all hospitals in developed countries are now improving the quality of care for outpatients, this is due to the number of outpatients that are much larger than inpatients.2 Outpatient services are divided into two, namely executive outpatient services and regular outpatient services.3

The hospital operating room or Operatie Kamer (OK) is a special unit in the hospital that functions as a place to perform elective and acute surgery, as a place to perform elective and acute surgery, which requires sterile conditions and other special conditions.4,5 The operating room has a high potential to cause nosocomial infections in hospital, especially surgical wound infections. Transmission of infections that occur depends on the number of microbes, individual susceptibility to contact time, virulence of infectious agents, and inverse ratio of body endurance.6,7 Large numbers of bacteria are present in the operating room that originates from the surgical team and results from activities during surgery. During the operation, many surgical team members were around the operating table, creating a situation of undesirable pollution concentrations in areas with high sensitivity.7

The rooms in the building of the hospital operating room can be divided into 5 (five) zones:7 Zone 1, Low Risk Level (Normal): This zone consists of the reception area (administration and registration room), patient family waiting room, janitor and dirty utility room. This zone has a number of dust particles per m³). Zone 2, Moderate Risk Level (Normal with Pre Filter): This zone consists of a room to get rest for doctors and nurses, plaster room, pantry officer, patient
Nosocomial infections can be caused through direct, indirect, airborne (airborne infection), and vector borne (vector borne infection), and for Southeast Asia nosocomial infections and for Southeast Asia pending on differences in patient population, health care facility settings, and country differences.

Pathogenic microorganisms that cause nosocomial infections can be bacteria (Staphylococcus aureus, Clostridium, escherichia coli, Pseudomonas spp. etc), viruses (hepatitis B, hepatitis C, etc.), parasites and fungi (Candida albicans, Aspergillus spp.). these microbes can be everywhere like; air, water, floors, medical and non-medical objects. Therefore, the possibility of spreading infection directly, indirectly, airborne (airborne infection), and vector borne disease or through vector (intermediary) need to be considered and controlled. The principle in preventing and controlling the occurrence of nosocomial infections is to contain elements to eliminate agents and reservoirs, inhibit transmission of infections, and protect the host from infection. The operating room which is not maintained its sterility will have an impact on surgical wound infection in patients who can be known postoperatively Therefore, researchers want to conduct research to identify microorganisms in the operating room and outpatient room (pedodontic room) of Dental Hospital of Hasanuddin University.

Material and Methods
This study uses descriptive observational method. Performed in May 2020 at the Makassar Center for Health Laboratory. This research was validated by Ethics Dental Hospital Hasanuddin University with the number 0036/PL.09/KEPKFKG-RSGM UNHAS/2020 and sample was taken in the operating room and outpatient room (pedodontic room) of Dental Hospital Hasanuddin University. Sampling is done by using a Microbiological Air Sampler tool which contains PCA media (Plate Count Agar) by means of MAS turned on and left in the middle of the room for 10 minutes and then closed tightly. Samples obtained were taken to the laboratory and incubated for 24 hours at a temperature of 37°C. After 24 hours, the number of colonies was calculated by direct observation using colony counter in each sample. The next step is purification of bacteria using Trypticase Soy Agar Medium. Inoculation of bacteria on the agar medium by scraping the surface of the agar medium in quadrant streak way. Subsequently incubated for 24-48 hours at 37°C. After that, bacteria identified with gram staining and bacterial types were identified using vitek 2 compact.

Results
Air sampling conducted in the operating room and Pedodontics room of Dental Hospital Hasanuddin University.

Based on table 1 above it is known that the number of bacteria in the operating room of the Dental Hospital Hasanuddin University is three times more than the pedodontic room. Based on table 2 bacteria that have been identified are as many as five types of bacteria. There is one type of bacteria that is the same between the operating room and pedodontic room, namely sphingomonas paucimobilis. The identified bacteria
gomonas paucimobilis. The identified bacteria are the dominant bacteria from each room. This shows that the types of bacteria found in the operating room are mostly different from the types of bacteria found in the pedodontic room.

**Discussion**

From the results of research conducted at the Makassar Central Laboratory of Health Laboratory, researchers grouped research data based on the amount and type of bacteria.

### Amount of bacteria

Shows that the average microbial air in the pedodontic room is 224 CFU/m³. This is according with the standards set by the Minister of Health of the Republic of Indonesia in Kepmenkes Number 1204/MENKES/SK/X/2004, the number of airborne microbes for treatment rooms is 200-500 CFU/m³. The sampling procedure in the pedodontic room is also according with the Kepmenkes No.1335/MENKES/SK/X/2002 concerning operational standards for taking and measuring hospital room air quality samples, is the sampling time in the treatment room is done after cleaning the room.9

In the operating room, the average airborne microbes were 686 CFU/m³. This does not meet the microbial air standards by the Minister of Health of the Republic of Indonesia, which is 10 CFU / m³ for the operating room. In contrast to the research about the factors that influence the high number of microbes in the operating room of PKU Muhammadiyah Bantul Hospital in 2017 which got 14,917 CFU/m³ for airborne microbes. The number of microbes is very much different from the microbial numbers of air obtained in the operating room of Dental Hospital Hasanuddin University. Non-compliant airborne microbial numbers can be influenced by several factors, namely the physical environment (in animate), biological environment (animate)10 and other factors that come from outdoors.

Based on research the physical and microbial air environment in Makassar Hajj Hospital, it was stated that based on 4 environmental factors measured (temperature, lighting, humidity, and occupancy density) only air spaces in the room are related directly with the microbial density of the room. Air humidity is a representation of water vapor in the air. The higher the humidity, the higher the moisture content in the air. High water vapor plays an important role in bacterial growth, because water vapor is a survival medium for bacteria in the air. The standard humidity for the operating room is 45–60%.11

In addition to being caused by physical

### Table 1  Amount of bacteria in the operating room and pedodontic room of Dental Hospital Hasanuddin University

<table>
<thead>
<tr>
<th>Room</th>
<th>Amount of bacteria (CFU/M³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Room</td>
<td>686</td>
</tr>
<tr>
<td>Pedodontic Room</td>
<td>224</td>
</tr>
</tbody>
</table>

### Table 2  Types of bacteria in the operating room and pedodontic room of Dental Hospital Hasanuddin University

<table>
<thead>
<tr>
<th>Room</th>
<th>Types of bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Room</td>
<td>Sphingomonas paucimobilis, Aeromonas salmonicida, Alloicoccus otitis, Sphingomonas paucimobilis</td>
</tr>
<tr>
<td>Pedodontic Room</td>
<td>Staphylococcus cohnii ssp urealyticus, Staphylococcus aureus</td>
</tr>
</tbody>
</table>

**Figure 1** Growth results of bacterial colonies in the operating room

**Figure 2** Growth results of bacterial colonies in the pedodontic room
environmental factors, the presence of microbes in the air is also influenced by the biological environment, namely the transmission or spread of microbes that includes hospital officials and patients who can transfer microbes. The pattern of spreading microbes can also come from outdoors during winds. The transmission of microbes can also be from decaying organisms, dead plants, and animal carcasses. Mushroom fungi pollen can become borne for microbes from outside and enter the room with wind gusts.

**Types of bacteria**

It is found that the dominant bacteria in the operating room are sphingomonas paucimobilis, aeromonas salmonicida, and alloiococcus otitis, whereas in the pedodontic room sphingomonas paucimobilis, staphylococcus cohnii ssp urealyticus, and staphylococcus aureus. Both rooms have the same type of dominant bacteria Sphingomonas paucimobilis. This is different from the research on the identification of aerobic bacteria in the air of the operating room of the Instalasi Bedah Sentral (IBS) Prof. Dr. R. D. Kandou Manado which gets bacteria staphylococcus albus and bacillus subtilis in operating room.

Sphingomonas paucimobilis (previously known as Pseudomonas paucimobilis) is an aerobic gram-negative bacillus. These bacteria are everywhere in the natural environment (especially in water and soil). These bacteria have also been found from various sources in the hospital environment, including hospital water systems, respiratory therapy equipment, and laboratory instruments. S paucimobilis was first reported to cause infection in humans in 1979. This bacterium has been isolated from blood, sputum, urine, wounds, bile, cerebrospinal fluid, vagina, and cervix.

Aeromonas salmonicida is a facultative anaerobic gram-negative bacterium. This is considered a major pathogen in various fish and not in humans because they cannot grow at 37°C. The optimal temperature needed for growth is 22-25°C. In 90% of strains, virulence is found to be lost if cultivated at 30°C and above. However, in a culture plate and broth which was incubated twice at 37°C each time the same type of colony was isolated, it was identified as A. salmonicida by vitek 2 compact.

Alloiococcus otitis is a gram-positive bacterium newly known and associated with otitis media with emulsions (OME) and chronic otitis in children. According to research of species A. Otitidis can be an agent that causes bacterial endocarditis (bacterial endocarditis).

Staphylococcus cohnii ssp urealyticus is a coccus positive-gram aerob bacteria, skin colonizer, and one of the subspecies of staphylococcus cohnii. Staphylococcus cohnii consist of two main subspecies, namely staphylococcus cohnii ssp cohnii and staphylococcus cohnii ssp urealyticus. Staphylococcus cohnii ssp urealyticus responsible for catheter-related bacteremia, surgical prosthesis such as spinal fixation, acute cholecystitis, brain abscesses, endocarditis, pneumonia, urinary tract infections, and septic arthritis.

Staphylococcus aureus is one of the most widespread pathogens in the hospital. Based on research was found that the type of bacteria in hospital staff in Jakarta that causes infection in hospitals is Staphylococcus aureus. S. aureus is a relatively mild cause of infection that can be life threatening. Relatively mild infections include skin infections and otitis media. Life-threatening infections include pneumonia, bacteremia and endocarditis. S. aureus infection can also be caused by direct contamination of the wound, for example post-surgical wound infection or infection after trauma.

**Conclusion**

Based on research that has been carried out in the operating room and pedodontic room of Dental Hospital Hasanuddin University and the Makassar Center for Health Laboratory, researchers can conclude that: The air in the operating room of the Dental Hospital Hasanuddin University is still contaminated with organisms and has not met the minimum standards of bacteria, while the air in the pedodontic room is good and in accordance with applicable standards; The types of bacteria that have been identified in the Dental Hospital Hasanuddin University operating room are sphingomonas paucimobilis, aeromonas salmonicida, and alloiococcus otitis, while the pedodontic room is sphingomonas paucimobilis, staphylococcus cohnii ssp urealyticus and staphylococcus aureus.

**Acknowledgment**

None.

**Conflict of Interest**

The authors report no conflict of interest.

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