

# Examination Of Physical Environment and Staphylococcus Aureus In Hasanuddin Makassar University Hospital

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## ABSTRAK

Humans need some main material for survival, one of which is air. The physical environment and air quality of a hospital room that does not meet health requirements can cause health problems for patients, workers who work in hospitals or visitors to hospitals. Be aware of the effects that bacteria will cause in the air on the environment and human health. So it is necessary to do a physical examination so that prevention and control efforts can be carried out properly. This study aims to determine the quality of the physical environment (temperature, humidity, and lighting) and identification of Staphylococcus aureus air bacteria in three rooms on an outpatient installation at Hasanuddin University Hospital. This research is an observational elite with cross-sectional approach. The population this study were all Staphylococcus aureus bacteria identified in the cup. The method of this research is direct measurement at the location of the study consisting of identification of the presence of Staphylococcus aureus bacteria, temperature, humidity, and lighting. Sampling was done by researcher own, Staphylococcus aureus bacteria examination carried out by a third expert Bacteriological Laboratory Medical Faculty of Hasanuddin Makassar. The results of this study indicate the quality of the physical environment of temperature and humidity is still not appropriate if you look at the standard requirements for environmental health of the Hospital, but for the lighting parameters are in accordance with the standards. Then to identify the bacteria showing the results of the entire room, there are Staphylococcus aureus bacteria. Conclusion that the examination of the physical environment and identification of air bacteria in Hasanuddin University Hospital has not met the standards and the presence of Staphylococcus aureus bacteria. Recommended that the Hospital be more able to apply disinfectant, especially in rooms in outpatient installations.



## INTRODUCTION

The realization of the quality of a healthy environment is an essential part of the health sector. Air as an important environmental component in life needs to be maintained and upgraded so that it can provide support for living things to live optimally (Wulandari, 2013). Humans need some main material for survival, one of that is air. Air is an important component of breathing for the survival of humans and various other living things. The chemical, biological and physical composition of air has a direct effect on the quality of breathing (Abdullah et al., 2011).

Air is grouped into outdoor air and indoor air. Indoor air quality greatly affects human health, because almost 90% of human activity is indoors (Fitria et al., 2008). Biological air pollution is very important, especially if you are in Rum Hospital (Dacarro et al., 2003). Sanitation in hospitals that is an effort to improve health and control the environment can risk causing disease, so one of the scope of hospital sanitation activities is controlling physical environmental factors including temperature, humidity, and lighting in the hospital (Muntaha et al., 2016). One of the health facilities responsible for improving health status is the Hospital. Hospitals are not only a place to seek healing, but also are a source of various diseases that feel from patients and visitors with career status, through the intermediary pathogenic bacteria in the air (Dwi, 2016).

Transmission of microorganisms to humans occurs with certain mechanisms, for example with wind

blows, water droplets or et droplets, splashes of coughing or sneezing, conversations, and contact with the floor surface (Abdullah et al., 2011). The management of the room and the hospital environment must also be kept clean, moisture, irradiation and ventilation, and need to periodically monitor the presence of room bacteria, especially in outpatient installations because it is a potential unit of transmission and at risk of causing infection quickly (Harun et al., 2017). The microorganisms that roam most in the air of the hospital environment are bacteria and fungi (Palawe et al., 2015).

The presence of microorganisms in the room is also influenced by temperature, humidity, lighting (Rachmatanri, 2015). This is because each microorganism has an optimum temperature. Where at this optimum temperature, microbial growth takes place quickly. Temperature affects microbial cell division. The growth of microorganisms occurs at temperatures around 30°C. Then at a temperature that is not in accordance with the needs of bacteria can cause cell damage (Waluyo, 2009). Similar to the level of humidity needed by bacterial microorganisms in the growth process generally requires high humidity, the required humidity is above 60% (Jawetz, 2005). As well as lighting in the room can affect the growth of microorganisms or bacteria. The presence of indoor light sources can inhibit bacterial growth.

Hospital air quality that does not meet health requirements can cause health problems for patients, workers who work in hospitals and visitors to



hospitals (Depkes RI, 2002). Research earlier about the numbers of germs and bacteria Studies conditioned by Shiferaw et al (2016) at the Teaching Hospital in Ethiopia East Africa, showed that of the 29 rooms were checked, 182 identified bacteria with an average of 3.42 species of bacteria/living room with the highest number of germs is 12053 - 18311 CFU/m<sup>3</sup>. The dominating bacterial species are *Staphylococcus aureus*, *Pseudomonas* spp, *Escherichia coli*, and *Salmonella* spp.

Nosocomial infection control is primarily directed at protecting patients, given that patients who are treated are generally more vulnerable or weak physically and psychologically due to their illness (Raharja, 2015). Nosocomial infections in a hospital can occur in a number of ways, one of that is through water-borne, namely through air and inhalation (Lantang, 2012). Hasanuddin University Hospital is a hospital located in Makassar-South Sulawesi, a hospital under the Ministry of Research, Technology and Higher Education. And as a health service institution that organizes individual services in full, that provides inpatient, outpatient, emergency and other services.

Based on reported data on the results of microbiological tests on November 29, 2018 on seven rooms at Hasanuddin University Hospital, it was shown that Identification of bacteria, several bacteria have been identified, namely *Staphylococcus aureus*, *Acinetobacter* sp, and *Pseudomonas* sp. So it is important to research the air in the room at the hospital. Recognizing

the effects that will be caused by germs and bacteria in the air on the environment and human health. So it is necessary to examine the physical environment and identify the presence of bacteria so that prevention and control efforts can be applied properly.

## **METHOD**

### ***Research Design and Location***

This research was conducted at Hasanuddin University Hospital in three rooms on outpatient installations, namely poly room 1 (Intern), poly room 2 (ENT), and poly room 3 (General). This is because outpatient installation is a treatment/treatment service that almost every day has quite a lot of patient visits with various disease complaints and has patients with different ages, and vulnerable immune systems ranging from toddlers to older people.

### ***Population and Sample***

The population in this study was *Staphylococcus aureus* in three rooms, namely room 1, room 2, and room 3 in the outpatient installation in 2019 identified in the cup. The sample of this study was 3 cups as a medium for identification of *Staphylococcus aureus* bacteria and 3 rooms as physical examination sites (temperature, humidity, and lighting).

### ***Data Collection***

The variables studied in this study were physical parameters (temperature, humidity, and lighting) and *Staphylococcus aureus* bacteria. The method used in sampling by using the metode accidental sampling members of the population, namely how to



obtain a sample by chance or bacteria taken in conducting the research. The process of measuring physical parameters (temperature, humidity, and lighting) and sampling of bacteria carried by the researchers themselves, but *Staphylococcus aureus* bacteria sample inspection carried out by a third expert Bacteriological Laboratory Medical Faculty of Hasanuddin Makassar. Percent officer has previously been coordinated with relevant parties in order to obtain accurate results.

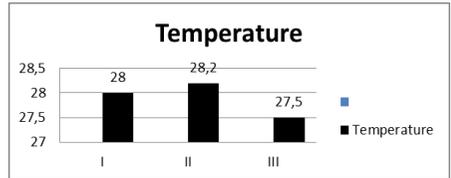
**Data Analysis**

The analyst is data for bacterial examination conducted by the Laboratory of Bacteriology Medical Faculty of Hasanuddin University Makassar. Data that has been obtained later univariate analyzed to see the distribution of each variable, namely physical quality (temperature, humidity, and lighting) and the presence of bacteria in three rooms. Furthermore, the data were analyzed bivariately to determine the relationship between variables with the person correlation test.

**RESULTS**

Figure 1 showed that the quality of the physical environment in temperature p has different spaces. It can be seen that the s hoot highest in room 2 with a value of 28,2 °C, and the lowest temperature a da in room 3 in the amount of 27,1°C, It can be concluded that when viewed on a standard health requirements of the hospital environment by Decision RI Minister of Health No. 1024 /Menkes/SK/X/2004

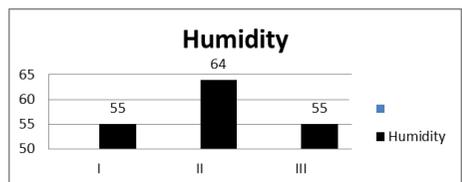
the temperature in the room is still ses three uai that is in the range of 27.1°C to 28.2°C should range between 22 °C-24 °C.



**Figure 1 . Physical Examination of Temperature in Three Rooms in an Outpatient Installation**

*\* The highest temperature percentage is in room 2 of 28,2 oC.*

Figure 2 shows that the quality of the physical environment of humidity, in each space is different. It can be seen that the highest humidity exists in the second with a value of 64%, and lowest humidity is in the room 2 and 3 by 55%. So that it can be concluded that the humidity in rooms 1 and 3 are appropriate, but in room 2 the humidity level is not appropriate if you look at the hospital's environmental health requirements according to



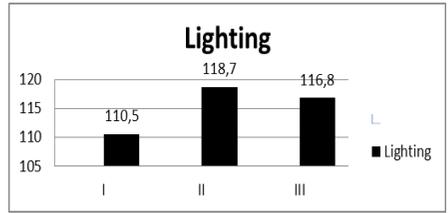
**Figure 2 . Physical Moisture Examination in Three Rooms at Outpatient Installation**

*\*Percentage the highest humidity is in room 2 by 64 %*



Decree of the Minister of Health of the Republic of Indonesia No. 1024/MENKES/SK/X/2004, that is in the range of 55 % to 64%, whereas n should be in the range of 40% -60%.

Figure 3 showed that the quality of the physical environment of lighting, there are different spaces. It can be seen that the lowest lighting exists in the first with an average score of 110,5 Lux and the highest illumination in the room 2 at 118,7 Lux. So that it can be concluded that when looking at the hospital's environmental health requirements according to Decree of the Minister of Health of the Republic of Indonesia No. 1024/MENKES/SK/X /2004 are appropriate, ranging from 100 Lux - 200 Lux.



**Figure 3. Physical Examination of Lighting in Three Rooms at Outpatient Installation**

\* The highest percentage of lighting level is in room 2

Table 1 showed identification of the presence of *Staphylococcus aureus* bacteria in each room. It can be seen in the room 1, room 2, and 3 results are positive or indoor airborne bacteria *Staphylococcus aureus* contained in each test chamber.

**Table 1. *Staphylococcus aureus* air bacterial examination results In Three Rooms in an Outpatient Installation**

Number of Test Rooms	<i>Staphylococcus aureus</i> Air Bacteria Inspection Results for Each Room		
	I	II	III
Room 1	Positive	Positive	Positive
Room 2	Positive	Positive	Positive
Room 3	Positive	Positive	Positive

\* It was identified that *Staphylococcus aureus* air bacteria are good in three rooms in outpatient installations.

**Table 2. Relationship Test Results Between Physical Environment (temperature, humidity, lighting) With *Staphylococcus aureus* Bacteria**

Variable	<i>Staphylococcus aureus</i> air bacteria	
	n	P-Value
Temperature	3	0,001
Humidity	3	0,001
Lighting	3	0,001



Table 2 showed the relationship between the physical environment and the presence of *Staphylococcus aureus* bacteria use the person correlation test. It can be seen that the p-value (0.001) then it can be interpreted that there is a relationship between physical environmental parameters (temperature, humidity, lighting) in the presence of *Staphylococcus aureus* bacteria.

## DISCUSSION

Based on the results of the study it was found that the quality of the physical environment (temperature, humidity, lighting) and *Staphylococcus aureus* bacteria. The three rooms on the installation of the outpatient sample in this study exceeded standards per the terms poor living conditions Health's hospital environment. This is evidenced by the presence of bacteria in each room that is influenced by the contribution of the physical environment actor. Conditions in temperature, humidity and air lighting allow the germs to remain in the air. Each micro-organism has a different optimum temperature to grow and develop.

The results of temperature measurements during the study showed that the average optimum temperature was in the range of 27,5°C to 28,2 °C. Germs that grow and develop in the temperature range are included in the group of mesophils (microorganisms that like at moderate temperatures) with optimal growth temperatures between 20°C to 45°C. then for indoor air humidity levels in this study that is in the range of 55% to 64%. This is in line

with the research of Fitria et al (2008) that the high relative humidity of the air can increase the growth of microorganisms. These microorganisms can enter the body through the air.

In addition, high humidity can also cause the nasal mucous membranes to become dry, making it less effective in blocking microorganisms. According to Jawetz (2005) the level of humidity needed by microorganisms in the growth process generally requires relatively high humidity above 60%. So that the higher humidity in the room causes the presence of *Staphylococcus aureus* bacteria. The level of indoor lighting in this study ranged from 100 Lux to 200 Lux. Low levels of lighting in the room can affect the growth of bacterial microorganisms, lighting is less a condition favored by germs and bacteria because it can grow well in dark conditions. The existence of high light sources in the room can inhibit the growth of germs and bacteria. So the lighting must be good both day and night.

While the presence of pathogenic bacteria, namely *Staphylococcus aureus* in this study before being given treatment because these bacteria are normal flora in humans. According to Jawetz (2005) Colonies of *Staphylococcus aureus* occupy the anterior part of the nose and are present in human skin. This species is pathogenic and causes a number of infections that attack healthy individuals. So this is in line with Wikansari's (2012) study that said that *Staphylococcus aureus* bacteria can also be found in clothing, in the environment around the hospital, and can also be



through air entering through the door of the room.

## **CONCLUSION AND SUGGESTION**

It was concluded that the quality of the physical environment (temperature, humidity, and lighting) in this study also affected the number of air germs and the presence of *Staphylococcus aureus* bacteria, high temperature and air humidity can increase the growth of germs and bacteria, and the level of room lighting

is fewer conditions favored by germs and bacteria. Therefore, it is recommended that the Hospital be more able to apply disinfectant treatment, especially in the outpatient installation room to destroy airborne bacteria in space, so as not to increase and still meet the hospital's environmental health requirements. and can improve the quality of the physical environment with regular and regular monitoring.



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