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RESEARCH ARTICLE

Analysis of Microorganism in Air Conditioner (Ac) and Non-Air Conditioned Rooms on the Incidence of Sick Building Syndrome in Workers

Mulyadi[1], Ratnasari Dewi[2]*, Ain Khair[3], Dwi Rachmawati[4], Nurisyah[5]

[1,3] Department of Environmental Health, Poltekkes Kemenkes Makassar, Indonesia
[2,4,5] Department of Pharmacy, Poltekkes Kemenkes Makassar

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***Corresponding Author:**

ratnasdw70@gmail.com

ABSTRACT

Microorganisms are found in air-conditioned and non-air-conditioned rooms because. These microorganisms will cause Sick Building Syndrome. This study aims to determine whether there is a relationship between microorganisms in air-conditioned and non-air-conditioned rooms with the incidence of Sick Building Syndrome in workers. This study is an analytical observational study with a cross sectional approach that provides an overview of the relationship between microorganisms in air-conditioned and non-air-conditioned rooms with the incidence of Sick Building Syndrome in workers. The research location includes the location of the examination and observation of samples conducted at the Makassar Health Laboratory Center, and the location of sampling and observation of samples. Sampling for workers was carried out using a questionnaire and sampling for microorganisms was carried out randomly. The research implementation includes sampling, laboratory examination and data processing and analysis. The results showed, presence of microorganisms in air-conditioned and non-air-conditioned rooms did not show a significant relationship with the incidence of Sick Building Syndrome in workers, and the characterization of microorganisms present in air-conditioned and non-air-conditioned rooms consistently met the established health standards.

INTRODUCTION

Microorganisms are widespread in nature, because animal and vegetable food products are not sterile and are generally contaminated by various types of microorganisms. Microorganisms can live and reproduce in all rooms, both air-conditioned and non-air-conditioned rooms [1–3].

The use of air conditioners (AC) can increase work productivity, but can be a place for microorganisms to grow and develop if they are rarely cleaned, this results in poor indoor air quality and causes complaints such as red eyes, sore eyes, dry skin, itchy skin, dry cough, shortness of breath, feeling of heaviness in the chest, headache diarrhea, diarrhea and difficulty concentrating [4].

Indoor air quality is a serious problem that must be addressed because it has a negative impact on human health [4,5]. In developed countries, the annual death rate from indoor air pollution is projected to be 67 percent in rural areas and 23 percent in urban areas, while in developing countries, the death rate from indoor air pollution is 9 percent in urban areas and 1 percent in rural areas [6,7]. According to the research on factors inside the building, 52 percent of the space is not well ventilated, 17 percent is contaminated from inside the structure, 11 percent is contaminated from outside the

structure, 5% is contaminated by bacteria, 3% is contaminated by the environment building materials themselves, and 12% have no known problems [8].

Apart from causing death, the most frequent impact of air pollution is SBS. The term high building syndrome (Sick Building Syndrome), because this case occurs in skyscrapers [4]. However, SBS can be experienced not only by skyscrapers, but also by office buildings that have poor air quality. SBS is a situation where residents experience health and comfort problems but no cause of illness can be identified [9,10].

Sick building syndrome (SBS) is defined as a condition that occurs in people who work or live in modern buildings and who suffer from complaints such as fatigue, headaches, lack of concentration, and irritation of the skin and mucous membranes.[11].

Microorganisms found in air-conditioned rooms and non-AC rooms because they do not meet one or more of the requirements for an office and industrial work environment in the form of a temperature between 18°C and 28°C, humidity between 40 and 60%, minimum lighting of 100 lux, bacteria count <700 colonies/m3 [12,13].

By looking at the potential for the presence of microorganisms in air-conditioned and non-AC rooms which can cause sick building syndrome, the authors intend to examine: Is there a relationship between microorganisms in air-conditioned and non-AC rooms with the incidence of Sick Building Syndrome in workers in Makassar city.

MATERIALS AND METHODS

Types of research

This research is a descriptive analytical study with a Cross Sectional approach which provides an overview of the relationship between microorganisms in air-conditioned and non-air-conditioned rooms and the incidence of Sick Building Syndrome in workers in the city of Makassar.

Research sites

Location of inspection and observation of samples

The location for examination and observation of samples was carried out at the Environmental Health Department Laboratory of the Makassar Health Polytechnic.

Location of sample collection and observation

Sampling for workers was carried out using a questionnaire and sampling for microorganisms was carried out randomly in air-conditioned and non-air-conditioned rooms where workers worked.The Makassar Al Hidayah Foundation oversees 4 schools, namely TK, SD/MI, SMP/MTs, SMA/MA. Makassar Al Hidayah Foundation is located at Jl. Abd. Kadir No. 29, Balang Baru, Kec. Tamalate, Makassar City, South Sulawesi 90224 Telephone: 0813-4253-3185 Province: South Sulawesi

Research time

1. The preparation stage includes observations to prepare research proposals and data collection in January – April 2022.
2. The implementation phase includes sampling, laboratory examination and data processing and analysis which will be carried out in March - October 2023.

Research variable

1. Independent variables are variables that influence the dependent variable, namely microorganisms in air-conditioned and non-air-conditioned rooms, namely temperature, humidity, lighting, germ numbers, dust levels, smoking habits,
2. The dependent variable is the variable that is influenced by the independent variable, namely the incidence of Sick Building Syndrome in students

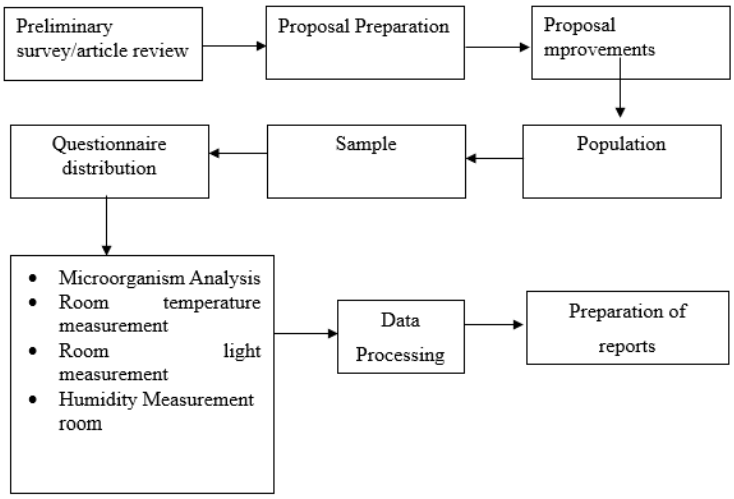
Operational definition

1. Microorganisms are organisms that are so small that a microscope is needed to observe them.
2. An air-conditioned room is a room that uses artificial ventilation in the form of air conditioning. Components examined were temperature, humidity 40-60%, lighting, bacterial counts based on the requirements of the office and industrial work environment in the form of temperature 18°C - 28°C, humidity 40-60%, minimum lighting 100 lux, bacteria count less than 700 colonies/m3.
3. A non-air-conditioned room is a room that uses natural ventilation in the form of windows. Components examined were temperature, humidity 40-60%, lighting, bacterial counts based on the requirements of the office and industrial work environment in the form of temperature 18°C - 28°C, humidity 40-60%, minimum lighting 100 lux, bacteria count less than 700 colonies/m3.
4. Sick building syndrome(SBS) is suffering from 1 or more symptoms caused by poor air quality in the building space at least 2 times a week and the symptoms disappear or decrease when leaving the building. Health problems in the form of sore eyes, red eyes, eyes, sneezing, itching: irritation, dry cough, itching, dry cough, easy headache, difficulty concentrating, coughing, shortness of breath, feeling of heaviness in the chest, dry skin, itchy skin and diarrhea diarrhoea. SBS was detected with a questionnaire.

Data analysis

The data obtained from the results of the examination were statistically tested using the Pearsen correlation test and were carried out manually and presented in the form of tables, graphs and narratives.

Research Flow



Declaration of Helsinki

Not applicable.

RESULTS AND DISCUSSION

Results

This research is an analytical research with a cross sectional approachdescription of the relationship between microorganisms in air-conditioned and non-air-conditioned rooms and the incidence of Sick Building Syndrome in workers in the city of Makassar.

Univariate analysis

This sampling was carried out in March – July 2023 in Al Hidayah Makassar Foundation (for non-AC rooms) and Makassar Bosowa University (for non-AC rooms).

Table 1 Frequency distribution of subject characteristics for AC and non-AC rooms.According to the threshold value referred toPermenaker Standard No 5 of 2018that the maximum number of colonies in the room was 700 CFU/m3, the result was that of the 5 class samples examined, the number of colonies in all classes met the requirements.

Table 2 shows that the characteristics of the research sample, based on age, were dominated by the age of 36-59 years, based on the sex of women more than men. While the examination results found more without symptoms of sick building syndrome.

Table 3 shows that the percentage of respondents with SBS symptoms based on age group was more experienced by the 15-35 year age group (27.3%). Meanwhile, based on gender, the percentage of women affected by SBS was higher (22.5%) than men (20.0%).

Table 4 shows the majority of respondents without symptoms of sick building syndrome, both in air-conditioned and non-AC rooms.

Bivariate analysis

Table 5 shows that there is no relationship between air-conditioned and non-AC rooms to eventssick building syndrome.

DISCUSSION

Univariate analysis

Results of measuring the quality of the number of colonies from 5 rooms (2 AC rooms and 5 non-AC rooms). The lowest number of microorganisms was obtained from the air-conditioned meeting room at 120 CFU/m3, and the highest number was obtained from the air-conditioned PWK room at 320 CFU/m3. However, all of them meet the requirements according toPermenaker Standard No 5 of 2018that the maximum number of colonies in the room is 700 CFU/m3

The percentage of respondents with SBS symptoms based on age group was more experienced by the 15-35 year age group (27.3%).This research is in line with Rosalia's research[5]which states that there is a relationship between age and the incidence of SBS.

The percentage of respondents with SBS symptoms based on gender, the percentage of women affected by SBS (22.5%) is not much different from men (20.0%).This research is in line with Rosalia's research[5]which stated that there was no relationship between gender and the incidence of SBS in Depok City BPJS Health employees. This research is not in line with Yuniastuti & Joegijantoro's research[14]which stated that there was a relationship between gender and the incidence of SBS

Bivariate analysis

Sick building syndrome is not only influenced by the number of microorganisms in the room, it is related to various factors such as temperature and humidity[15], lighting[16], and indoor dust concentration[17]. Apart from the room factor, sick building syndrome is also associated with other factors such as the length of use of the computer, a history of allergies[18].

Sick Building Syndrome (SBS) is a disorder that causes people who live or work in certain buildings to experience unpleasant health problems. Although there are various elements that can influence the development of SBS, not all of them clearly correlate with the number of microorganisms in the structure. several studies have shown that there are several factors that influence the development of SBS, and that these factors may not all be related to the number of bacteria present.

Although indoor air quality and the presence of microorganisms can impact human health, a clear relationship between bacterial load and SBS is not always established, according to several studies. Rosalia also reported no relationship between microorganisms and the incidence of SBS[5]which states that there is no significant relationship between the physical quality of indoor air and individual factors and the incidence of SBS in employees. Meanwhile, the opposite results were reported [14] which states that there is a significant relationship between the physical quality of the air and the incidence of SBS in employees.

However, it is important to remember that the results of this study may not be widely generalizable due to the variability of environmental conditions and research methodology used. Although there is no definite correlation between the number of microorganisms and SBS, it is still important to maintain indoor air quality and identify other factors that may contribute to the health of building occupants.

The limitation of this study is that it did not examine other factors related to SBS such as room temperature, humidity, lighting, so these factors need to be examined in the following year.

CONCLUSION

Based on the research objectives and the results of the research analysis, it can be concluded as follows:

1. There is no relationship between microorganisms in air-conditioned or non-AC rooms with the incidence of Sick Building Syndrome in workers in the city of Makassar.
2. The description of microorganisms in AC and non-AC rooms all meet health standards

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DISCLOSURE STATEMENTS

No potential conflict of interest was reported by the author(s).

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