FACTORS RELATED TO SYMPTOMS SICK BUILDING SYNDROME IN EMPLOYEES AT OK UNIT OF MARINE HOSPITAL CILANDAK SOUTH JAKARTA

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Abstract

Sick building syndrome (SBS) is a set of health problems associated with air quality in a building or room where complaints are not specific to residents in the building. Some symptoms are experienced, such as mucous membrane symptoms, general symptoms, and skin symptoms. Many factors can cause symptoms of SBS, such as individual employee characteristics and physical factors of the room. Conditions in Unit OK of Cilandak Marine Hospital, the office uses Heating Ventilation and Air Conditioning (HVAC), the floor uses carpet, the outer wall is tightly closed (air tight), and the results of measurements of airborne bacterial colonies range from 946 - 1304 CFU / m3, (exceeding TLV). Complaints experienced by employees are eye irritation, dry skin, headaches, coughing, and runny nose. The purpose of this study was to find out what factors are associated with sick building syndrome symptoms in employees in the OK unit of Marine Cilandak, South Jakarta. Retrieving data by conducting interviews and observations (on gender, age, smoking habits, working period, working hours, nutritional status); take measurements (on temperature, humidity, number of bacteria); and conducting documentation studies. The method of taking air samples using the active method, namely impingement sampling. Then the sample is cultured with spread plate method. Then the data were analyzed using laboratory tests and statistical tests (cross sectional). The nine variables, which correlated statistically significantly was the period of work (p value = 0.019; OR 3.636) and room temperature (p value = 0.013; OR 4.386). Factors related to SBS are work period and room temperature.

Keywords: Sick Building Syndrome, symptoms, airborne bacterial colonies, CFU/m3

1. INTRODUCTION

Sick building syndrome (SBS) is known since 1970. Occupational medicine in 1980 introduced the concept of SBS as a health problem due to the work environment associated with air pollution, IAQ (indoor air quality), and poor ventilation of office buildings. The term Sick Buiding Syndrome (SBS) was then introduced by experts in Scandinavian countries in the early 1980s. The term SBS is also known as building sickness, building related occupation complaint syndrome, non specific building-related illness, office eye syndrome, sick office syndrome, and tight building syndrome (Spengler, 2001). This syndrome is commonly found in a skyscraper room. According to the Environmental Protection Agency (EPA, 1998), Sick Building Syndrome (SBS) is a syndrome that arises because someone is in a building whose symptoms are not specific and cannot be identified. Sick building syndrome can also be interpreted as a set of health problems associated with air quality in a building or room where complaints are not specific to residents in the building.

The World Health Organization WHO in 1984 reported that 30% of new buildings around the world complained to workers that they were linked to the IAQ. Worldwide, 2.7 million people

die from air pollution, 2.2 million of which are due to indoor air pollution or indoor air pollution (Utami, 2005). Sick building syndrome occurs due to poor building design, operation and maintenance (Heimlich, 2009). People are said to suffer from SBS if they have complaints of approximately 2/3 of a set of symptoms, such as lethargy, nasal congestion, dry esophagus, headache, eye itching, painful eyes, dry eyes, runny nose, tense eyes, aches , neck or back pain, at the same time. To enforce the presence of sick building syndrome (SBS), various complaints must be felt by around 20% -50% of users of a building, and the complaint usually stays for at least two weeks (University of North Carolina at Chapel Hill, 2002).

National Institute of Occupational Safety and Health (NIOSH) in 1997 stated that 52% of respiratory diseases were related to SBS due to poor ventilation of buildings and the performance of air conditioners (AC) as a result of rarely being cleaned (EPA, 2009). In 1983 the World Health Organization (WHO) determined several characteristics commonly found on SBS, namely the building was equipped with a closed ventilation system, using textile finishing materials in the building, coordinates, carpets, tightly closed outer walls (air tight). The possibility of SBS can also be caused by a decrease in indoor air quality, exposure to chemicals and dust from outside and indoors, microorganism contamination (bacteria, fungi), interior decoration, ventilation systems, room cleanliness, and indoor environmental factors (temperature, humidity , pencahayan). Factors related to SBS, including gender, age, years of service, smoking habits, nutritional status, air quality, ventilation, lighting, and the use of various chemicals in the building, were very potential causes for the emergence of SBS (Burge, 1987)

Research on 350 employees from 18 offices in Jakarta for 6 months (July-December 2008) showed a decrease in the health of indoor workers due to air polluted by free radicals (chemicals), originating from indoor or outdoor and 50% of people working in office buildings tend to experience SBS. The Occupational Safety and Healthy Act (OSHA) study obtained from 446 buildings, causes of indoor air pollution due to inadequate ventilation (52%), equipment / materials in buildings (7%), outdoor pollution (11%), microbes (5%)), building materials / office equipment (3%), and unknown (12%). Symptoms that occur are not specific, in the form of headache, irritation of mucous membranes, eyes and nasopharynx, coughing, tightness, rhinitis and other symptoms, but it is not a specific disease and the cause is not clearly known (Menzies, 1997).

Several studies have shown, Wawolumaya (1996) in the Indonesian Public Health Magazine states that a study in Australia reported that SBS can be associated with the accumulation of bacteria, viruses and other microorganisms in air conditioning channels, cooling towers or cooling towers of drains and others. which is included in the building's cooling system. The American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE, 2004) states that a good standard of ventilation is the availability of a minimum of 15 ft3 / m (cfm) air from outside the building for one person, with 20 cfm / person in the workspace and up to 60 cfm in another room, depending on the activity that usually occurs in that place. Examples of pollutants that can pollute a room such as cigarette smoke; ozone from photocopiers and printers; volatile organic compounds derived from carpets, furniture, paint, cleaning agents, dust, carbon monoxide, formaldehyde, etc.

A study by the Bureau of Labor Statistics in the United States stated that in the US in 1994, of all workers who worked in hospitals, 40% of them were doctors, nurses, pharmacists and their assistants suffering from SBS (Wichaksana, 2002). The results of 450 studies on problematic buildings and buildings carried out by NIOSH (National Institute of Occupational Safety and Health) found that 52% of SBS events were caused by inadequate ventilation, 17% due to contamination in buildings, 11% contamination originating from from outside the building, 5% due to bacteria or fungi, 3% due to materials and materials from the building and 12% due to unknown

reasons. From the results of research in offices, a study of modern office buildings in Singapore reported that 312 respondents found 33% experienced symptoms of SBS. Their complaints are generally 45% fast, 40% congestion, 46% headache, 16% redness of the skin, 43% dry throat, 37% eye irritation, 31% weak (Lim S, 1989, in Ramlah, 2009). Whereas in Makassar, research on SBS conducted by Rina (2008) showed that all the variables studied were related to the incidence of SBS, namely female sex with an incidence of (82.2%), age with a young group with an incidence of (87 , 7%), working period> 5 years with the number of occurrences of (91.9%), length of work> 8 hours / day with the number of occurrences of (89.7%), and the effect of abnormal humidity with the number of events. Research on SBS, on the temperature variable of respondents who experienced SBS worked at abnormal temperatures at temperatures of <18 and> 2, namely 67.0%.

To reduce the impact of health complaints due to being in a closed air-conditioned room, it is advisable to open a room window for 1 hour in one working day, and maintain body condition by drinking warm water when the body starts to feel cold or use a jacket while working (Asrul, 2009). According to Seppanen et al. in Spengler (2001), it is said that the prevalence of SBS can decrease by increasing ventilation speed, which is 20L / sec per person. In 2003 a research study was conducted on call center workers, saying that workers who sit close to the window will work faster around 6-12%, and have fewer health problems than their coworkers (Aston, 2007).

2. METHODS

This research is a quantitative study, using a cross-sectional study design, in the OK Unit, Cilandak Marine Hospital, South Jakarta and conducted in June 2017. The population in this study is all employees remain in the OK Unit, not including office boy and security guard. The total population is 242 people, sampling is done by stratified random sampling technique, based on indoor employees, the total sample obtained is 70 people. The variables studied were gender, age, smoking habits, years of service, working hours, nutritional status, humidity, room temperature, and the number of airborne bacterial colonies. With data sources, namely primary data obtained through observation; questionnaire; and measurement of humidity, room temperature and the number of airborne bacterial colonies. The method of taking air samples using the active method, namely impingment sampling. Then the sample is cultured with spread plate method, as well as documentation study. Data were analyzed using laboratory tests and statistical tests (univariate and bivariate). The instruments used were questionnaires, scales, sewing meters, 13 megapixel camera, thermometer, hygrometer, pentagram cup, BA and MCA agar media for bacterial growth media that can distinguish pathogenic bacteria based on the effect of bacterial hemolytic exotoxins on red blood cells, incubators to incubate (grow) microorganisms, such as bacteria, fungi and other microbial cells under certain conditions, microscopes to see the shape of bacteria in micro form.

3. RESULTS AND DISCUSSION

Characteristics of respondents. The following is the distribution and frequency of the respondents' characteristics (gender, age, smoking habits, years of service, hours of work, and nutritional status) can be seen in the table below:

Table 1. Characteristic Distribution of Respondents in the OK Unit, Marine Hospital, Cilandak (n=70)

Variable	n	%
Gender		
• Man	41	58.6
• Woman	29	41.1
Age		
• < 24 – 35 year	34	48.6
• 36 – 55 year	36	51.4
Smoking habit		
• Smoke	31	44.3
• Do not smoke	39	55.7
Years of service		
• <10 years	37	52.9
• ≥ 10 year	33	47.1
Working hours		
• Normal 8 hours	30	42.9
• Overtime >8 hours	40	57.1
Nutritional status		
• Normal IMT 8.0 - 25.0 Kg	25	35.7
• BB More BMI 23-27.4 Kg	33	47.1
• Obesity BMI 27.5 -> 33 Kg	12	17.2

It is known that the percentage of respondents' sexes is almost balanced, but more are male respondents 58.6%. Employees aged 36-55 years were more than those aged <24-35, which was 41.4%. Non-smoking employees are more than those who smoke, which is 55.7%. Employees whose tenure is ≤ 10 years more than those with a working period of ≥ 10 years, which is as much as 52.9%. Employees who carry out overtime> 8 hours more than those who do not overtime, which is 57.1%. And employees who have more BB nutritional status with BMI 23-27.4 kg more than normal and obese, which is 47.1%.

Characteristics of work environment. The frequency distribution values of the characteristics of the work environment include temperature, humidity, and airborne bacterial colonies, in this study, illustrated in the table below.

Table 2. Distributions of Characteristic of Work Environment (Temperature, Humidity, Air Bacterial Colony) in the OK Unit, Marine Hospital, Cilandak (n=70)

Room Name	Humidity (C) Standard ≤ 25,5°C	Temperature (%) Standard ≤ 70%	Number of airborne bacterial colonies (colonies per m3) Standard <700 CFU
R. OK 1A	29.4	56	1083
R. OK 1B	28.4	55	946
R. OK 1C	28.4	55	1304
Hall A	26.3	67	373
Hall B	26.9	68	374
Hal C	27.4	67	333
RR 1A	29.1	65	394
RR 1B	27.6	55	458
RR1C	28.5	48	408
CSSD A	27.8	50	619
CSSD B	25.7	47	469
CSSD C	25.2	48	424
R. Cuci Tangan	25.5	51	308
R. Baju Operasi	26.8	47	270
R. Sandal	23.9	50	162
R. Arsip	27.8	47	836

The room that shows the number of airborne bacterial colonies exceeding NAB is R OK 1A at 1083 CFU / m3 with a temperature of 29.40C and humidity of 56%; R OK 1B is 946 / CFUm3 with a temperature of 28.40C and humidity of 55%; R OK 1C is 1304 / CFUm3 with a temperature of 28.40C and humidity of 55%; and R archive of 836 / CFUm3 with a temperature of 27.80C and humidity of 47%.

SBS event. Aditama (1992) states that SBS can only be considered if more than 20% of building residents experience complaints. The results of data analysis showed that the percentage of SBS events was almost balanced, but more were respondents who did not experience SBS 55.7%, while respondents who experienced SBS were 44.3%. The most SBS complaints that were felt were 38.7% coughing, followed by 32.2% cold complaints, 12.9% dry skin and headaches, and 3.2% eye irritation.

Table 3. Distribution of Sick Building Syndrome and Complaints of Experiencing Respondents in the OK Unit, Marine Hospital, Cilandak (n=70)

Variable	n	%
Sick Building Syndrome		
• Not Experience	39	55.7
• Experience	31	44.4
Sick Building Syndrome Complaints		
• Eye iritation	1	3.2
• Dry skin	4	12.9
• Headache	4	12.9
• Coughs	12	38.7
• Cold	10	32.2

Characteristics of Respondents and SBS Events. The six respondent characteristics variables analyzed by sectional sectionalist with SBS events, it turns out that the results of the study show that only the working period variables are related to p value = 0.019 which means that there is a significant relationship between years of service and the incidence of SBS. The OR value obtained is 3,636 (95% CI 1,348 - 9,809) meaning that the respondent with a tenure of ≥ 10 years has as many as 3,636 times to experience SBS events compared to respondents with a work period of <10 years.

Table 4. Relationships Characteristic of Respondents with Sick Building Syndrome in the OK Unit, Marine Hospital, Cilandak

Variable	Experiencing		Not Experiencing		p-value	OR
	n	%	n	%		
Gender						
• Man	22	53.7	19	46.3	0.102	-
• Woman	9	31.0	20	69.0		
Age						
• < 24 – 35 year	18	52.9	16	47.1	0.240	-
• 36 – 55 year	13	36.1	23	63.9		
Smoking habit						
• Smoke	10	32.3	21	67.7	0.118	-
• Do not smoke	21	53.8	18	46.2		
Years of service					0.019	3.636
• <10 years	11	29.7	26	70.3		1.348 – 9.809

Variable	Experiencing		Not Experiencing		p-value	OR
	n	%	n	%		
• ≥ 10 year	20	60.6	13	39.4		
Working hours						
• Normal 8 hours	10	33.3	20	66.7	0.176	-
• Overtime >8 hours	21	52.5	19	47.5		
Nutritional status						
• Normal IMT 8.0 - 25.0 Kg	9	30.6	16	64.0	0.433	-
• BB More BMI 23-27.4 Kg	15	45.5	18	54.4		
• Obesity BMI 27.5 -> 33 Kg	7	53.3	5	41.7		

Table 5. Relationships between Characteristic of Work Environment and Sick Building Syndrome in the OK Unit, Marine Hospital, Cilandak

Variable	Experiencing		Not Experiencing		p-value	OR
	n	%	n	%		
Air Temperature						
• < 25.5ºC	6	23.1	20	76.9	0.013	4.386 1.475-13.045
• ≥25.5ºC	25	56.8	19	43.2		
Humidity						
• Standard <70%	6	23.1	20	76.9	0.013	4.386 1.475-13.045
• Not according to standard≥70%	25	56.8	19	43.2		
Number of Bacterial colonies						
• 700 CFU	12	37.5	20	62.5	0.419	-
• ≥ 700 CFU	19	50.0	19	50.0		

From the three characteristics of the work environment analyzed by cross sectional with SBS events, it turns out that the results show that the related variables are air temperature and air humidity with P value 0.013 means that there is a significant relationship between air temperature and air humidity with SBS events. OR values obtained 3,636 (95% CI 1,348 - 9,809) means that respondents who work at room temperature ≥ 25,5 0C and humidity ≥ 70% have a chance of 4,386 times to experience SBS events compared to respondents who work in a room temperature <25, 5 0C with humidity <70%.

This study showed that the respondents who experienced the most symptoms of SBS were 53.7% male respondents and 31.0% female respondents, with P value = 0.102 meaning that there was no significant relationship between sexes with SBS symptoms. These results are in line with Hartoyo's (2009) study which showed that male respondents experienced more symptoms of SBS compared to female respondents, because male respondents had more hours worked per day than women. But Ruth's (2009) study with multiple correlation tests showed different things that women were more at risk and more experienced SBS than men. In theory, women more often report symptoms than men because women are more sensitive and sensitive to responding to symptoms (Gomzi and Bobic, 2009). Women often feel psychosocial disorders and along with that SBS complaints increase (Stenerg et al., 1993). The Swedish Office Illness Project (Sundell, 2010) also says that women have a greater risk of experiencing symptoms of SBS, which is 35% compared to men who are only 21%. This is because the body size and muscle strength of female workers is relatively less than that of men, biologically women experience menstrual cycles, pregnancy and

menopause, and are socially, culturally, that is due to the position of mother in the household and tradition as a reflection of culture (Suma'mur , 1999).

Respondents who experienced symptoms of SBS based on this study were 52.9% aged <24 - 35 years and 36.1% aged 36 - 55 years. Basically, age affects the immune system, the older the age, the lower the stamina of the body. Young age plays a role in causing SBS symptoms and complaints. Symptoms of SBS are more commonly found in employees aged 30–39 years and tend to be younger (Ericksson 2006). That may be because when the age reaches 21 to 30 years, it is a productive age, in this age employees are usually required to show their optimal work performance, so that existing stamina can decrease (Laila, 2011). Besides that, it is also caused by a healthy worker effect, where at a younger age, a healthier person tends to be able to feel symptoms that are simpler compared to old age, which usually do not pay attention to mild symptoms because they pay more attention to the symptoms of chronic diseases as they age. et al., 1998).

The results of this study are not in line with the theory put forward by Manuaba and NIOSH, where the old age group is vulnerable to the incidence of SBS. Manuaba (1992) explains that the age of an employee is very influential on the level of risk of occurrence of a work-related illness including the incidence of SBS. The process of getting someone's fruit causes a reduction in work ability caused by changes in the functions of the body's instruments, the cardiovascular system, and the hormonal system. While research conducted by NIOSH (2011) states that age is associated with an increase in the incidence of SBS because age is related to endurance. The older a person's age, the lower the body's resistance (Apte et al, 2000).

This study obtained results of P value = 0.240, meaning that there was no significant relationship between age and symptoms of SBS. Winarti (2003) showed the same results that age factors did not have a significant effect on the incidence of SBS symptoms with P value> 0.05.

The analysis of the relationship between smoking habits and SBS events in this study showed that more non-smoking respondents (passive smokers) experienced symptoms of SBS, which was 53.8% compared to respondents who smoked, namely 32.3%. With p value = 0.118, it means that there is no significant relationship between smoking habits and the incidence of SBS. Several Winarti et al (2003) studies, Oktora (2008) showed the same results with this study, that the smoking habit factor was not proven to be related to SBS physical symptoms.

Cigarette smoke issued by a smoker generally consists of pollutants in the form of carbon monoxide and particulates (Pudjiastuti, 1998). Passive smokers are more sensitive to carbon monoxide, namely when the concentration of carbon monoxide is 30 ppm in the air, the symptoms of SBS have occurred, namely dizziness. Conversely, active smokers will only experience the symptoms of SBS if the concentration of carbon monoxide in the air is 50-250 ppm (NIOSH, 2001). ETS (Environmental Tobacco Smoke) is dynamic. ETS is a complex mixture of thousands of chemical compounds, causes various irritations, and ETS also causes some acute symptoms typical of SBS, such as eye, nose and throat irritation (Sundell et al., 1994). Based on the Swedish study in mid-1990 it was found that there was an increase in symptoms of SBS with Environmental Tobacco Smoke (ETS). In a study by Mizoue (1998) conducted in 1281 employees with varied professions in Japanese cities showed that ETS exposure was the main determinant of SBS in the work population with a high prevalence of smokers and some workplaces with smoking bans.

The results of cross tabulation in this study between tenure and SBS events indicate that 60.6% of respondents whose working period ≥ 10 years' experience more SBS events, while respondents whose employment period <10 years is only 29.7%. The P value obtained is 0.019 which means that there is a significant relationship between the years of service of employees and the incidence of SBS. The value of OR 3,636 (95% CI 1,348 - 9,809) means that the respondent with a tenure of ≥ 10 years has as many as 3,636 times to experience SBS events compared to respondents with a

work period of <10 years. This is in line with the research conducted by Amriani (2004) in Makassar which states that respondents with a working period> = 10 years are more at risk of SBS. The longer the employee works in a place, the more likely they are to be exposed to physical and chemical work environment factors that can cause health problems or work-related illnesses, especially SBS, which in turn can lead to a decrease in employee productivity. The long working period of employees in the building affects the level of exposure of respondents to pollutants in space.

This study shows that 52.5% of respondents who overtime experience SBS more than respondents who work normally, which is only 33.3%. With the p value obtained 0.176, it means there is no statistically significant relationship between working hours and the incidence of SBS.

Duration of work is one of the factors that can affect the incidence of SBS because employees spend their time in the building with a lot of work and piled up coupled with inadequate room conditions (Rani, 2011). Gomzi (2009) also said the same thing, that the duration of work hours in the building can affect the incidence of SBS complaints, for example, officers whose working hours are longer than officers who have shorter working hours tend to be more at risk of SBS. The longer a person is in a room, the greater the potential to be exposed to certain room conditions, so the potential for the appearance of SBS symptoms will be higher (Redlich et al., 1997). The length of a person works well in a day is generally 6-10 hours. The rest (14-18 hours) is used for family and community life. Therefore, resting for approximately thirty minutes after 4 hours of continuous work is very important, both for the restoration of physical and mental abilities as well as energy replenishment whose source comes from food (Khaizun, 2013).

Respondents in this study who experienced symptoms of SBS were more prevalent in respondents with nutritional status obesity BMI 27.5 -> 33Kg, which was 53.3%. While respondents who did not experience symptoms of SBS were more common in respondents whose normal nutritional status was BMI 18.0 - 25.0 kg, which was 64.0% and whose nutritional status was more than BMI 23 -> 27.4 kg, which was 54.4 %.

Nutritional status is one of the factors of work capacity, if the condition of nutrition is good then workers will be able to work well too. If the condition of malnutrition, it can reduce work efficiency, making it more susceptible to Sick Building Syndrome. This phenomenon is closely related to the adequacy of the body's need for balanced nutrition which will increase the body's resistance to environmental conditions that are not conducive. Under normal conditions humans have self-protection against bacterial infections, namely through the body's immune system. The human body needs a balanced diet that provides enough nutrients, minerals and vitamins for the function and effectiveness of the immune system (Chandra, 2007). Individual immune systems are influenced by hormone status, age and nutritional status (Hedlund, 1995).

The results of the statistical test in this study obtained p value = 0.433, meaning that there was no significant relationship between nutritional status and symptoms of SBS. Lisyastuti (2010) also obtained the same results, the results of statistical tests showed that there was no significant relationship between the nutritional status of respondents with the incidence of SBS physical symptoms.

The results of cross tabulation in this study between the temperature and the incidence of SBS it turned out that as many as 56.8% of respondents who experienced symptoms of SBS worked in a room temperature of ≥ 25.5 0C. Likewise, the cross tabulation between the humidity and the symptoms of SBS got the same results, ie as much as 56.8% of respondents who experienced symptoms of SBS worked in a room that had humidity ≥ 70%. Based on the test results, obtained the same p value of 0.013 (<0.05) means that there is a significant relationship between temperature and humidity with the incidence of SBS, with a value of OR 4.386 (95% CI 1.475 - 13.045) which

can be interpreted statistically that the respondent who work with rooms with a temperature of ,5 25.5 0C and room humidity ≥ 70% have a chance of 4,386 times to experience SBS events compared to respondents who work with room temperature <25.5 0C and humidity <70%.

The National Institute for Occupational Safety and Health (NIOSH, 2001) recommends that temperatures should not exceed 26 ° C for men and 24 ° C for women. In some sources, the recommended temperature is 20-24 ° C for winter and 22-26 °C for summer. In a report from the European Commission, it shows that temperatures between 20 and 26 °C are temperatures that are suitable for the work environment. The air temperature plays a role in the comfort of work because the human body produces heat which is used for basal and muscular metabolism. But of all the energy produced by the body only 20% is used and the rest will be disposed of into the environment. Temperatures that are too high or too low can affect one's concentration and work ability (Oktora, 2008). Some of the results of the study by Hartoyo (2009) and Setyaningsih (2003) show that there is a significant effect between temperature and SBS symptoms.

Department of Health (2002) states that air humidity is relatively low, which is <20% can cause dryness of membrane mucous membranes, while high humidity will increase the growth of microorganisms. In addition, lower humidity in this case> 30% has an effect on the incidence of Sick Building Syndrome. Rooms with a number of microorganisms below the threshold, must still be considered because the number of microorganisms in any amount of space is an air contaminant in space.

In this study, the results of the correlation test showed that as many as 50.0% of respondents who experienced SBS worked in a room which measured ≥700 CFU of airborne bacterial colonies, P value obtained was 0.419 meaning that there was no significant relationship between the number of bacterial colonies air in the workspace with SBS events on the respondent. Several studies have shown that there is no significant relationship between the number of colonies of microorganisms in room air and symptoms of SBS (Sulistiowati, 2001; Marmot, 2006). So even Lunau (1990) showed no significant correlation between the presence of bacteria and fungi with the occurrence of symptoms of SBS. However, the study states that a significant correlation occurs in the ability of microorganisms found in the air to produce toxins. Kolstad (2000) obtained the same results that there was no significant relationship between the number of colonies of microorganisms especially fungi on the incidence of SBS in non-industrial work environments.

SBS is a collection of symptoms caused by poor indoor air quality, for which complaints must be felt by around 20% -50% of users of a building, and these complaints usually persist for at least two weeks (University of North Carolina at Chapel Hill, 2002). Determination of symptoms of SBS refers to the SBS indicator cited from EPA Indoor Air Facts No.4 (1998). Respondents in this study complained about some of the symptoms of SBS that were felt while at work and would disappear on their own after leaving the workplace, such as 38.7% coughing, 32.2% colds, dry skin and headaches 12.9%, and eye irritation 3.2%.

Sick Building Syndrome (SBS) according to the American National Institutes of Health is a term used to describe a situation when the occupants of a building experience an uncomfortable disease or effect when spending a long time in a building. The causes of SBS vary, including indoor air quality contaminated by free radicals (chemicals) because of poor air ventilation, pollutants that pollute the room such as cigarette smoke, ozone from photocopiers and printers, volatile organic compounds derived from carpet furniture, paint, cleaning materials, dust, gas CO, etc. Some of the symptoms felt by employees with SBS, such as the appearance of irritation in the eyes, nose and throat, respiratory tract, asthma, skin reactions, less specific hypersensitivity reactions, mental fatigue, headaches, nausea, dizziness, fatigue, difficulty concentrating, as well as the presence of certain odor odors that smell. This symptom is felt by employees who are inside the building for a

certain period of time. Complaints will improve and decrease after leaving the building and reappearing while in the room.

Jackson et al (1991) state that SBS complaints are very vague and often overlooked because they are considered as common cold or flu. The statement supports the results of research conducted by EPA (1998) which states that the symptoms and disorders of SBS are non-specific diseases, but show certain standards, for example how many times a person has a certain period of time suffering from respiratory problems. Complaints are only felt when working in the building and naturally disappearing on weekends or holidays.

4. CONCLUSION

The conclusion in this study is the percentage of SBS events in Unit employees is OK, Marine Hospital is almost balanced, but more is not experienced SBS 55.7%, while those experiencing SBS are 44.3%. The most SBS complaints that were felt were 38.7% coughing, followed by 32.2% cold complaints, 12.9% dry skin and headaches, and 3.2% eye irritation. Based on the results of the sectional cross test, individual factors associated with SBS events were years of work (p value = 0.019), while those not related were sex (p value 0.102), age (p value 0.240), smoking habits (p value 0.118) , working hours (p value 0.176), and nutritional status (0.433). The work environment factors associated with SBS events are air temperature and air humidity (p value 0.013), while for the number of bacterial colonies it is not related (p value 0.419).

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