

Relationship Between Physical Conditions Of Houses Building With Pneumonia Disease Events in Children Participants Of Poor People in The Makassar City, South Sulawesi, Indonesia

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Abstract: Pneumonia disease is one type of disease that many causes death at toddlers' age in various regions in the world, including Indonesia, even Makassar City. This disease is often found in areas that have poor physical environment quality. One indicator of environmental quality is the physical condition of the house. Therefore, this paper aims to illustrate the relationship between the physical conditions of the house building with the incidence of pneumonia disease in toddlers of the poor in Makassar City. This study included observational analytic with the case-control approach, is epidemiological study design studying the relationship between exposure (factor research) and disease, in this case, the exposure is ventilation, humidity, natural lighting, against pneumonia by comparing case group and control group based on the status of exposure. The method of analysis used is Chi-Square test with the degree of significance ($\alpha = 0.05$). The results showed that there was a relation between ventilation area (p-value = 0.007), humidity (p-value = 0.001), and natural lighting (p-value = 0.007) with incidence of pneumonia in poor children in Makassar City area. Therefore, improving the physical condition of the building (wide ventilation, humidity, and natural lighting) is necessary optimized, so that pneumonia disease does not develop, especially in slums in Makassar City.

Keywords : Pneumonia Disease; Ventilation Area; Humidity; Natural Lighting; Makassar City

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I. INTRODUCTION

The development of health as stated in the national health system is an effort of health management implemented by the Indonesian people in order to get healthy life for every society to realize the optimal health status¹. However, in line with the multidimensional crisis in various sectors of life as a result of the emergence of the economic crisis that plagued the Indonesian nation today, various problems continue to emerge as an obstacle factor in order to achieve development in the health sector, one of the most important problems that occurred several years most recently, the low level of environmental health of settlements caused by high population growth coupled with unavailability of adequate housing, and the development of unplanned settlements and did not pay attention to the health aspect, especially the housing environment [1].

The Indicator of the health status of a population can actually be seen from the healthy level, sickness, and death of the population. The sickness and mortality rates for unhealthy household residents are usually dominated by diseases caused by germs, such as pneumonia.

Pneumonia is an acute infection of the lung tissue (alveoli) that can be caused by various microorganisms such as viruses, fungi, bacteria, chemical exposure or physical damage from the lungs, as well as indirect effects of other diseases [2]. According to a World Health Organization (WHO) report (2013), pneumonia is one cause of death in children around the world [3]. This is not only happening in developing countries but also in developed countries like the United States, Canada, and other European countries. For example, in the United States, there are two million to three million cases of pneumonia per year with an average death rate of 45,000 [4].

In Indonesia, the number of cases of pneumonia in infants in 2016 reached 568,146 cases with the number of deaths from pneumonia reached 598 toddlers or by 0.11% with details in the 1-4 age group slightly higher that reached 468 toddlers or 0.13% group of infants aged under 1 year which reaches 130 toddlers or equal to 0.06% [5].

Makassar City as one of the largest cities in Indonesia, also did not escape the incidence of Pneumonia disease. As an illustration, the number of cases of patients with Pneumonia disease in Makassar City found and handled as many as 508 cases with details of male toddlers as many as 297 cases and 211 cases of female

toddlers [6]. The emergence of the incidence of Pneumonia disease is one of them is suspected due to the development of the city of Makassar which is currently an attraction for the community to move the space to meet the needs of life from village to city (urbanization). This, of course, creates urban dynamics, changes in land use, and the emergence of slums with various limitations of supporting facilities and infrastructure indicating the existence of pockets of poverty in this city. The data shows the number of citizens living below the poverty line by 2016 reaches 66,780 people or 4.56 percent of the total population in Makassar [7].

The poor generally have a relatively low level of livelihood and health compared to people whose lives are sufficient [8]. Imagine, the condition of the home environment of many poor people still do not meet the health requirements. The dense and slum environment conditions make the house insufficient ventilation and lighting so that it can cause high humidity that allows for breeding and transmission of diseases caused by bacteria, viruses, and fungi [9]. In line with this, Notoatmodjo (2003) said that the vast house ventilation does not meet the health requirements will affect the health of residents, this is because the process of exchanging airflow from outside into the house is not smooth, so the bacteria that cause pneumonia disease in the house cannot get out [10]. Ventilation also causes increased humidity of the room due to the process of liquid evaporation from the skin, therefore high humidity of the room will be a good medium for the proliferation of bacteria that cause disease Pneumonia.

From the explanation, it is clear that the emergence of Pneumonia disease in children under five caused by the physical condition of unhealthy house building as well as close to each other to make obstruction of the ventilation and window of the house so that natural lighting produced by the sun cannot enter the community home.

II. MATERIAL AND METHODS

This type of study is an observational analytic case-control approach, which is the design of epidemiological studies that examine the relationship between exposure (research factors) and disease, in this case the exposure is ventilation, moisture, natural lighting against pneumonia by comparing case groups and control groups based on status of exposure [11]. The sample size in this paper is taken using the Slovin formula [12]. With the number of samples in this study that meets the criteria of 98 children under five, consisting of 49 children under five who come from the group suffering from pneumonia disease and 49 children under five who come from the control group of children under five who do not suffer from pneumonia.

The data obtained in the field are grouped into primary and secondary data. Secondary data is data that refers to information collected from existing sources such as literature, previous research, and supporting sources in this study. While primary data is data that refers to information obtained from respondents through measurement, observation and direct interviews related to research variables [13].

The dependent variable in this article is the incidence of pneumonia. While the independent variables (independent variable) is the area of ventilation, humidity, and natural lighting. In detail, the variables are shown in Table 1.

Table 1. Research Variabels

Variable	Definition	Objective Criteria
Pneumonia Disease	Infectious diseases or inflammation of lung organs caused by bacteria, viruses, fungi or other parasites experienced by respondents based on examination results by doctors recorded in the medical record	Not suffering: If no family member has ever had pneumonia on the basis of the results of the examination by the doctor recorded on the medical record Suffering: If in the family there are one or more family members who have suffered from pneumonia based on the results of examination by doctors recorded in the medical record
Ventilation	The air holes are made in the respondent's homeroom which functions as a place of change of air which is measured using the gauge in the form of a meter with the nominal measurement scale.	Not eligible: If ventilation area is less than 10% of floor space. Eligible: If the vent area is greater than or equal to 10% of the floor space.
Humidity	A condition of room temperature in the respondent's house that influence the decrease of body resistance of respondents measured using	Not eligible: If the humidity in the respondent's house is less than 40% or more than 60%. Eligible: If the humidity in the

	measuring instrument in the form of hygrometer with nominal scale measurement.	respondent's house is in the range of 40% - 60%.
Natural Lighting	Lighting by sunlight into the respondent's home is measured using a measuring instrument in the form of lux meter with nominal measuring scale.	Not eligible: If the natural lighting in the respondent's house is less than 60 lux or more than 120 lux. Eligible: If the natural lighting in the respondent's home is in the range of 60 lux - 120 lux.

To analyze the relationship between home ventilation, air humidity, and natural lighting with the incidence of pneumonia is done using univariate analysis and bivariate analysis. Univariate analysis was conducted to find out the description of the frequency distribution of both independent variable, dependent variable, and description of respondent characteristic. Meanwhile, bivariate analysts use Chi-Square test statistic test with continuity correction with 95% significance level ($p < 0.05$) with the help of IBM SPSS Statistic software.

III. RESULT

3.1. Univariate Analysis

The Univariate analysis aims to obtain a picture of the distribution of variables studied by using the frequency distribution. Based on the interviews of 98 samples, the respondent characteristic data are shown in table 2.

Table 2. Respondent Characteristics

Respondent Characteristics	Frequency	Percentage
Gender		
Male	56	57.1
Female	42	42.9
Age		
1 – 12 months	16	16.3
13 – 24 months	13	13.3
25 – 36 months	26	26.5
37 – 48 months	40	40.8
Over 48 months	3	3.1
Pneumonia Disease		
Not Suffering	49	50
Suffering	49	50
Ventilation		
Not eligible	76	77.6
Eligible	22	22.4
Humidity		
Not eligible	80	81.6
Eligible	18	18.4
Natural Lighting		
Not eligible	56	57.1
Eligible	42	42.9

Table 2 shows that the characteristics of under-fives in most cases and control samples were males as many as 56 people (57.1%) and the least were females as 42 people (42.9%). The most characteristic of the ages were children under the age of 37 - 48 months, 40 persons (40.8%) and the least were children over 48 months old 3 people (3.1%). Characteristics of children under five who had suffered pneumonia as a sample of 49 cases (50%) and never had pneumonia as a control sample of 49 people (50%). Characteristics of the widest ventilation of most houses that do not meet the requirements are 76 people (77.6%) and the least is the eligible building ventilation area of 22 people (22.4%). The most abundant house building humidity characteristic is 80 people (81.6%) and the least is eligible for house ventilation that is 18 people (18.4%). Natural lighting characteristic of house building of case sample and control sample at most that did not fulfill the requirement

that was 56 people (57.1%) and the least was that fulfill the condition of house building ventilation that is 42 people (42.9%).

3.2. Bivariate Analysis

Bivariate analysis is intended to determine the relationship between home ventilation, humidity, and natural lighting with the incidence of pneumonia in children under five in Makassar. Type of statistical test used is Chi-Square with the provision when the value of $p \leq 0.05$ then the results of statistical calculations significant (significant) means H_a accepted and H_0 rejected. Conversely, if the value $p > 0.05$ means the results of statistical calculations are meaningless (not significant) means H_0 accepted and H_a rejected. The results of bivariate analysis as follows:

3.2.1 The Relationship between House Ventilation with Pneumonia Occurrence

Based on the result of analysis by using Chi-square statistic test about the relation between house ventilation with the incidence of Pneumonia in the toddler can be seen in Table 3.

Table 3. The Relationship between House Ventilation with Pneumonia Incidence

Ventilate	Pneumonia				Total	p	
	Yes		No				
	n	%	n	%	N	%	
Not Eligible	16	76	5	24	21	100	0.007
Eligible	33	43	44	57	77	100	
Amount	49	50	49	50	98	100	

Table 3 shows that out of 21 respondents who have an inadequate ventilation area, there are 16 toddlers who suffer from pneumonia (76%) and 5 toddlers who do not have pneumonia (24%). Of the 77 respondents who had eligible ventilation area, there were 33 respondents who suffered from pneumonia (43%) and 44 toddlers who did not suffer from pneumonia (57%).

Based on the result of analysis between ventilation area to pneumonia incidence in toddler by using Chi-Square test got value p-value (0.007) less than 0.05 then H_a accepted. This means that there is a relationship between the area of ventilation and the incidence of pneumonia in toddlers of the poor in Makassar City.

3.2.2 The Relationship between Air Humidity and Pneumonia Occurrence

The relationship between the air humidity of the house and the incidence of pneumonia in the toddlers of the poor in Makassar City is shown in Table 4.

Table 4. The Relationship between Humidity Houses with Pneumonia Incidence

Humidity	Pneumonia				Total	p	
	Yes		No				
	n	%	n	%	N	%	
Not Eligible	17	81	4	19	21	100	0.001
Eligible	32	42	45	58	77	100	
Amount	49	50	49	5	98	100	

Based on Table 4 it is known that from 21 respondents who have insufficient home air humidity, there are 17 toddlers who suffer from pneumonia (81%) and 4 toddlers who do not suffer from pneumonia (19%). And from 77 respondents who have air humidity of eligible home, there are 32 toddlers respondents who suffer from pneumonia (42%) and 45 toddlers respondents who do not suffer from pneumonia (58%).

From the result of analysis between home air humidity to the incidence of pneumonia in toddler by using Chi-Square test got value p-value (0.001) less than 0.05 then H_a accepted. This means that there is a relationship between the humidity of the home air with the incidence of pneumonia in toddlers of the poor in Makassar City.

3.2.3 The Natural Lighting Relation with Pneumonia Occurrence

Based on the results of the analysis by using Chi-square statistical test of the relationship between the natural lighting of the house with the incidence of pneumonia in toddlers of the poor in the city of Makassar, it can be seen in Table 5.

Table 5. The Natural Lighting Relation with Pneumonia Occurrence

Natural Lighting	Pneumonia				Total		p
	Yes		No		N	%	
	n	%	n	%			
Not Eligible	20	71	8	29	28	100	0.007
Eligible	29	41	41	59	70	100	
Amount	49	50	49	5	98	100	

Based on Table 5 it can be seen that from 28 respondents who have natural home lighting that is not eligible there are 20 toddlers of respondents suffering from pneumonia (71%) and 8 toddlers of respondents who do not suffer from pneumonia (29%). Whereas from 70 respondents who have natural home lighting that meets the requirements, there are 29 toddlers respondents who suffer from pneumonia (41%) and 41 toddlers of respondents who do not suffer from pneumonia (59%).

The result of analysis between the natural lighting of the house to the incidence of pneumonia in toddler by using Chi-Square test got value p-value (0.007) less than 0.05 then H_a accepted. This means that there is a relationship between the natural lighting of the house with the incidence of pneumonia in toddlers of the poor in Makassar City.

IV. DISCUSSION

4.1 Age and Gender of Respondents

The results of the study showed that the age most suffering from pneumonia was 37 - 48 months (3-4 years). This is because personal hygiene children are not good. In addition, at that age children like to play with friends who might just then suffer from pneumonia. This situation will be exacerbated by the hot and dusty city environment. As a review of Maru and Ahmad in Jakarta; Maru et al. in Makassar City. the results of the study show that the increase in temperature over the past 10 years is significant [14,15,16,17]. This is due to the increasing lack of natural forests and green open space (RTH) in the City [18,19]. it will also impact on the low quality of clean water [20,21,22].

This condition is not in accordance with research conducted Oktaviani & Maesaroh that the disease most often affects children aged less than 3 years, especially infants less than 1 year and some studies also indicate that children at a young age will suffer more pneumonia than age [23]. Furthermore, Oktaviani & Maesaroh explained that females were more commonly affected by this disease than males, this is not in accordance with the results of research found in Makassar who suffered more pneumonia is a boy of 56 people (57 %) suffers from pneumonia.

4.2 The Relationship between Home Ventilation with Pneumonia Incidence

The results of the study showed that people with pneumonia have house ventilation that fulfills the requirement of 33 houses and home ventilation which do not meet the requirements of 16 houses. This is evidenced by the value of $p = 0.007$ smaller than the value of $\alpha (0.05)$, thus there is a relationship between home ventilation with the incidence of pneumonia disease in toddlers.

Based on the observation, it is known that the average respondent's window is made of glass that can not be opened so that the process of air exchange in the house is not smooth. In addition, there is also a vent that is the too small size of the recommended ventilation size should be 10% of the floor area. This result is in line with Yusuf & Sulistriyorini research results, in Penjarangan Sari Village, which concludes that the house ventilation in Penjarangan Sari Village is not open during the day [24].

Good ventilation allows fresh air to easily enter the house so that the incidence of pneumonia will be reduced. While poor ventilation can cause high air humidity that allows for the development of bacteria, especially pathogenic bacteria.

4.3 The Relationship Between Moisture with the Incidence of Pneumonia

In the result of statistical analysis with Chi-square test to see the relation of house humidity with the incidence of pneumonia disease in toddlers in Makassar city obtained value $p = 0.001$ smaller than the value $\alpha (0.05)$, thus there is the correlation between house humidity with incident pneumonia disease in toddlers. From the results of data analysis obtained respondents who suffer from pneumonia has a house moisture that meets requirements as many as 32 homes and humidity homes that do not meets the requirements of 17 homes.

Humidity is considered good if it meets 40-60% and is bad if it is less than 40% or more than 60%. Humid houses allow rats and cockroaches to carry bacteria and viruses that can all play a role in triggering respiratory illness and can multiply within the home [25]. According to Notoatmodjo, the air humidity in the house to be a good medium for the growth of bacteria that cause pneumonia [10].

4.4 The Relationship between Natural Lighting with Pneumonia Incidence

In the result of statistical analysis with a Chi-square test to see the relation of natural lighting of house with the incidence of pneumonia disease in toddlers in Makassar city obtained value $p = 0.007$ smaller than value α (0.05), thus there is relationship between natural lighting of house with the incidence of pneumonia in toddlers. This supports the results of Nindya & Sulistyorini research, in Sidomulyo Sidoarjo Village which concluded that the natural lighting of the house is influenced by ventilation or window of the house that is not open during the day [26].

From the results of data analysis obtained respondents who suffer from pneumonia has a house moisture that meet terms as many as 29 houses and houses ventilation that do not meet the requirements of 20 houses. According to the observation of the researchers found that the incidence of pneumonia can generally be caused by windows that are less widespread and rarely opened during the day, as well as residential areas including densely populated so that the boundary between one house to another is so narrow that minimize the possibility of sunlight to get into home. The lack of sunlight that enters the house is a good place to live and breed the seeds of disease. The results of this study in accordance with the concept of Suyono & Budiman that adequate lighting, be it natural light (sunlight) and artificial light (light) is very important because it can kill pathogenic bacteria in the house, TBC [27].

V. CONCLUSION

The results of the study and discussion show that pneumonia disease in Makassar City is generally occurs in children aged 3-4 years old. Meanwhile, the future of the nation depends on the quantity and quality of a country's children. Furthermore, this study also found that there is a significant relationship between the area of ventilation, humidity, and natural lighting to the incidence of pneumonia in children under five in Makassar. Based on these two things, there should be serious steps taken by the government, especially the local government, to always pay attention to and improve the physical condition of the region, through good spatial arrangement, and monitoring the implementation of various development of houses or offices in the area, which can be monitored through the granting of permits to build a building.

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