



RESEARCH ARTICLE

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The Relationship Between The Physical Environment of The House and The Incidence of Pneumonia in Children

Eka Rosina Korelia

Magister Student at Department of Environmental Health, Faculty of Public Health, Airlangga University, Indonesia

Email: ekarosina.ek@gmail.com

ABSTRACT

In 2013, based on data of morbidity cases (data from January to March 2013) in Kediri Health Center, West Lombok, West Nusa Tenggara, URI (Upper Respiratory Tract Infection) was the highest incidence of of ten major diseases most commonly suffered by the community in Kediri Health Center. Based on the register Child Medical Center book in Kediri Health Center on January to March of 2013, patients with URI pneumonia and non Pneumonia on children under five years was 702 children. This study aims to analyze the relationship of physical environmental factors of the house with the incidence of pneumonia on children under five years. This research uses descriptive analytic design with crosssectional approach. Data analysis used univariate and bivariate analysis with Chi Square. Obtained the result that the habit of smoking in the house (POR = 5.379); natural ventilation (POR = 22,685), room occupancy density (POR = 13,000), room humidity level (POR = 5,429), floor type (POR = 1.097), wall type (POR = 1.70) with Pneumonia incidence. There was a relationship of smoking habit in the house, natural ventilation, room density, and humidity level, while the type of floor and type of wall have no relation with the occurrence of Pneumonia. As a reference in evaluating the program in the preparation of pneumonia prevention activities plan for children under five years and coordination with related party handling housing improvement.

Keywords: Physical Environment of House, Pneumonia, Children under five years

INTRODUCTION

URI or *Upper Respiratory Tract Infection* disease still becomes an important health problem because it causes high enough mortality of infant and children for approximately 1 in 4 deaths that occurred. According to experts, the immune system of children under five years is very different from the immune system of adults. Respiratory diseases during childhood can also cause disability until adulthood. Even pneumonia is a health problem in the world because of high mortality, not only in developing countries but also in advanced countries such as the United States, Canada, and European countries (Misnadiarly, 2008).

According to Health Ministry of Indonesia, in 2008, West Nusa Tenggara Province was in the first place of Pneumonia event in Indonesia which was about 56.6%. West Nusa Tenggara Provincial Health Office reported that the number of Pneumonia events in 2007 was 55,752 cases wherein more than 70% spread over four districts/cities for 14,247 cases (25.5%) in West Lombok, 9,877 cases (17.7%) in East Lombok, 9,828 cases (17.6%) in Mataram City and 9,741 cases (17.4%) in Central Lombok District. Based on the Neonatal and Infant Activity Report (29 days - 1 year) of West Lombok District in 2011, Pneumonia was the fourth cause of death with 13 cases (9%) in infants aged 29 days to <12 months. The physical environment of the house is one of the factors associated with the incidence of pneumonia. In a population study it was mentioned that poor environmental conditions proved to be a risk factor associated with the incidence of pneumonia. The development of the spread of disease illustrates the specific role of the environment against the occurrence of disease and outbreaks that have long been expected to influence the environment against the disease. In terms of environmental health science, the disease occurs because of the interaction between humans and their environment (Cahyaningrum, 2011).

Kediri Health Center, West Lombok, West Nusa Tenggara, has 10 working areas: Kediri, South Kediri, Montong Are, Gelogor, Rumak, Jagaraga Indah, Dasan Baru, Banyu Mulek, Lelede and Ombe Baru. On Health Profile of Kediri Health Center in 2011 mentioned that in work area of Health Center of Kediri, the number of

healthy house was 8,202 from 14,488 number of existing house with percentage equal to 56,61%. Meanwhile, according to data of morbidity cases in Kediri Health Center, West Lombok, West Nusa Tenggara, in 2013 (data from January to March 2013) URI was the highest incidence of ten most common diseases suffered by the community in Kediri Health Center. Based on the register of Child Medical Center in Kediri Health Center, West Lombok district, in January to March 2013 patients with URI pneumonia and non Pneumonia in infants were 702 children.

Based on the occurrence of Pneumonia occurring in the work area of Kediri Health Center, West Lombok regency, West Nusa Tenggara Province, it is necessary to conduct a research to reveal the relationship of physical environmental factors of the house with the incidence of Pneumonia on children in the work area of Kediri Health Center. The formulation of the problem in this study is the physical environment of the house is one of the factors causing the incidence of pneumonia on children and research hypothesis is exist a correlation between the physical environment of the house with the incidence of pneumonia on children under five years.

METHODS

The type of this research was observational research. This research used descriptive analytic design with cross sectional approach that was research that observation or measurement variable once and simultaneously at the same time (Riyanto, 2011). This research was conducted in the work area of Kediri Health Center West Lombok, West Nusa Tenggara. The population in this study was all children under five years with URI Pneumonia and non Pneumonia in the work area of Kediri Health Center, West Lombok, West Nusa Tenggara Province recorded in register of Child Medical Center from January 2013 to March 2013 which amounted to 702 children.

The samples were 87 children under five years old with simple random sampling technique. Data collection was committed in two ways, secondary data was obtained through Health Profile data of Kediri Health Center in 2011 and primary data was obtained through interview and observation of respondent's physical environment. Data obtained was analyzed by using statistical program. Statistical analysis used was chi square analysis and Odds Ratio (OR).

RESULTS

Table 1. Distribution of infectious disease on children in work area of Kediri Health Center, West Lombok, Province of NTB in 2013

No	Incidences	Frequency	Percentage
1	Pneumonia	33	37.9
2	Non Pneumonia	54	62.1
	Total	87	100

Table 2. Distribution of patients by age group in the work area of Kediri Health Center, West Lombok District, West Nusa Tenggara Province in 2013

No	Age	Frequency	Percentage
1	0 – 1 Year	43	49.4
2	2 – 3 Years	37	42.5
3	≥ 4 Years	7	8.1
	Total	87	100

Table 3. Distribution of the number of patients by sex in work area of Kediri Health Center, West Lombok Regency of NTB Province in 2013

No	Sex	Frequency	Percentage
1	Male	49	56.3
2	Female	38	43.7
	Total	87	100

Table 4. Distribution of physical environmental factors of house patients in work area of Kediri Health Center, West Lombok, Province of NTB in 2013

No	House Physical Environment	Frequency	Percentage
1	Smoking habit inside the room		
	Smoking outdoors and away from children	27	31.03
	Smoking inside the house	60	68.96
2	Natural Ventilation of Children		
	Qualified	45	51.72
	Not Qualified	42	48.27
3	Residential Density (Children Room)		
	Qualified	49	56.32
	Not Qualified	38	43.67
4	Home Floor Type		
	Qualified	82	94.3
	Not Qualified	5	5.7
5	Humidity Level (Children Room)		
	Qualified	22	25.3
	Not Qualified	65	74.7
6	Wall Home Type		
	Qualified	81	93.1
	Not Qualified	6	6.9

The patient's physical environment observed was the habit of smoking in the house, children room ventilation, residential density of children room, floor type, humidity level, and wall condition. The study was conducted both in the family room and in the children room.

Distribution of smoking habit in the home was obtained that 27 patients (31.03%) were eligible (smoking outside the home and away from children) and 60 patients (68.96%) were ineligible (smoking in house and close to children under-five years).

Measurements in the ventilation area of the children room showed that 45 patients (51.72%) require conditions with the ventilation area more than 10% from the floor area and 42 patients (48.27%) are not eligible with the ventilation area less than 10% from the floor area.

Room density which is qualified in 8m² for 2 people was 49 people (56.32%) and unqualified 8m² for 2 people was 38 patients (45.67%).

Most of the type of patient's home floor had fulfilled the requirement wherein 82 patients (94.3%) and only 5 patient (5.7%) with the type of floor of patient was not qualified.

Meanwhile, based on the calculation of the humidity level for children, 22 patients (25.3%) were eligible or qualify with room humidity level ranging between 40% -60% and 65 patients (74.7%) were not eligible with humidity level ranging from 60% to 75%.

And for the type of wall of respondent's house, 81 patients (93.1%) were eligible and the other was only 6 patients (6.9%) who did not meet the requirements.

Table 5. Correlation between Smoking Habits in the House and Pneumonia Occurrence on Children in the Work Area of Kediri Health Center, West Lombok District of NTB Province 2014

	Dependent	Pneumonia	Non Pneumonia	Total
Independent				
Smoking inside the house		29	31	60
Smoking outside the house		4	23	27
Total		33	54	87

Chi-square test obtained $\chi^2 = 8.886$ with $df = 1$ and $\alpha = 5\%$ (0.05) got $p = 0.05$ then $p < \alpha$ mean there is correlation between smoking habit in house with incidence of pneumonia on children.

Table 6. Correlation between children room ventilation and pneumonia occurrence at under fives in work area of Puskesmas Kediri, Regency of West Lombok, Province of NTB Year 2014

Independent	Dependent	Pneumonia	Non Pneumonia	Total
Children room ventilation is not qualified		29	13	42
Children room ventilation is qualified		4	41	45
Total		33	54	87

Chi-square test obtained from $\chi^2 = 33.394$ with $df = 1$ and $\alpha = 5\%$ (0.05) obtained $p = 0.00$ hence $p < \alpha$ mean there is relation between ventilation with children at work event of Pneumonia on children.

Table 7. Correlation between residential density and pneumonia occurrence on children in the work area of Kediri Health Center, West Lombok, NTB Province 2014

Independet	Dependent	Pneumonia	Non Pneumonia	Total
Residential density is qualified		26	12	38
Residential density is not qualified		7	42	49
Total		33	54	87

Chi-square test obtained is $\chi^2 = 26,641$ with $df = 1$ and $\alpha = 5\%$ (0.05) got $p = 0.00$ then $p < \alpha$ mean there is correlation between density of children room with incidence of pneumonia on children.

Table 8. Correlation between home floor type and pneumonia occurrence on children in Kediri Health Public Work Area, West Lombok, NTB Province 2014

Independent	Dependent	Pneumonia	Non Pneumonia	Total
Home floor type is qualified		2	3	5
Home floor type is no qualified		31	51	82
Total		33	54	87

Chi-square test obtained is $\chi^2 = 0.010$ with $df = 1$ and $\alpha = 5\%$ (0.05) got $p = 1.000$ so $p > \alpha$ mean there is no correlation between home floor type with incidence of pneumonia on children.

Table 9. Correlation between humidity rate of children room and pneumonia occurrence in Work Area of Kediri Health Center, West Lombok, NTB Province 2014

Independent	Dependent	Pneumonia	Non Pneumonia	Total
Humidity is qualified		30	35	65
Humidity is not qualified		3	19	22
Total		33	54	87

Chi-square test obtained $\chi^2 = 7.382$ with $df = 1$ and $\alpha = 5\%$ (0.05) obtained the $p = 0.01$ hence $p < \alpha$ mean there is relation between room floor type of children with the incidence of pneumonia in work area of Kediri Health Center.

Table 10. Home wall type with pneumonia occurrence on children in Kediri Health Publi Work Area, West Lombok of NTB Province 2014

Independent	Dependent	Pneumonia	Non Pneumonia	Total
Home wall is qualified		3	3	6
Home wall is not qualified		30	51	81
Total		33	54	87

Chi-square test obtained values $\chi^2 = 0.399$ with $df = 1$ and $\alpha = 5\%$ (0.05) obtained $p = 0.669$ then $p > \alpha$ means there is no relationship between type of children room floor with the incidence of pneumonia in the work area of Kediri Health Center.

Table 11. Home physical environmental factors as causes of pneumonia on children in the Work Area of Kediri Health Center, West Lombok of NTB Province 2014

Independent Variable	Dependent Variable (URI Incidence)				Total		OR	X ²
	P	%	BP	%	N	%		
Smoking Habitual inside the house								
Smoking inside the house								
Smoking outside the house	29	33.3	31	35.6	60	100	5.379	8.886
	4	4.6	23	26.4	27	100		
Children natural ventilation								
Unqualified	29	33.3	13	14.9	65	100	22.68	33.394
Qualified	4	4.6	41	47.1	22	100	5	
Residential Density of Children room								
Unqualified								
Qualified	26	20.9	12	13.8	66	100	13.00	26.641
	7	8.0	42	48.3	21	100		
Home Floor type								
Unqualified	2	40	3	60	5	100	1.097	0.010
Qualified	31	37.8	51	62.2	82	100		
Humidity Density of children room								
Unqualified								
Qualified	30	46.2	35	53.8	65	100	5.429	7.38
	3	13.6	19	86.4	22	100		
Wall condition								
Unqualified	3	50	3	50	6	100	1.700	0.399
Qualified	30	37	51	63	81	100		

The home physical environment factors observed includes the habit of smoking in the house, natural ventilation of children room, residential room density, type of house floor, humidity level of children room, and wall condition of house. Based on observations that researchers have done, the habit of smoking in the house with $x^2 = 8.886$ and $OR = 5.379$, natural ventilation of children room with $x^2 = 33.394$ and $OR = 22.685$ residential room density wherein x^2 count = 26.641 and $OR = 13.00$, type of home floor with $x^2 = 0.010$ and $OR = 1.097$ humidity level of children room where $x^2 = 7.4$ and $POR = 3.5$, and last one is wall type with $x^2 = 0.399$ and $OR = 1.700$.

DISCUSSION

In this research, found that 33 patients (37.93%) were children with URI Pneumonia and 54 patients (62.07%) were children with URI non Pneumonia. Non-Pneumonia classification included a group of children with a cough that did not show symptoms of increased breathing frequency and did not indicate the pull of the wall lower chest inside. Thus, the classification of non-pneumonia includes other URI diseases outside of Pneumonia such as cough not pneumonia. URI is a common disease on children, because the body's defense system is still low. The incidence of cold and cough diseases on children in Indonesia is estimated at 3 to 6 times per year, which means an average children gets coughs cold as much as 3 to 6 times a year (Misnadiarly, 2008).

In this research, it can be seen that the age group 0 - 1 year at most were 43 patients (49.4%), then 37 patients (42.5%) in the age group 2 - 3 years and the least is the age group more than 4 years was 7 respondents (8.1%). Age factor is one risk factor of URI occurrence on children especially URI Pneumonia. The older the age of children who suffer from pneumonia, the smaller the number of death is due to pneumonia than young children (Yuwono, 2008). Risk factors that increase incidence and children mortality rate is the age of children under two months old (Kepmenkes No.1537.A, 2002).

In a research, the ratio of sex should be taken into account, because if a disease frequency on male is higher than female, it does not always show that males are greater risk of disease occurrence. This occurs because of differences in sex ratios in the population and sample studies. There are some complaints or symptoms of a particular disease in male that is more visible than women (Halim, 2012).

In this research, it can be seen that 49 patients (56.32%) were male and 38 patients (43.68%) were female. The results of this research is appropriate with the opinion that male are at risk of URI (Halim, 2012).

According to Health Ministerial Decree of Indonesia No. 1537.A / Menkes / SK / VII / 2002 male sex is risk factors that increase the incidence of pneumonia.

The Correlation between Smoking Habits in the House and Pneumonia Occurrence

The correlation between smoking habits in the house and Pneumonia occurrence on children in working area of Kediri Health Center, West Lombok of NTB province in 2014, according to Aditama (1997) quoted by Halim (2012), cigarettes are harmful to health, because when cigarettes are burned they will release about 4000 chemicals, such as nicotine, carbon monoxide, nitrogen oxide, methanol, benzene, coumarin, hydrogen cyanide, acetilen, and etc. The particle components of cigarettes are nicotine and tar. Nicotine is an addictive substance, a substance that can cause addictions, while tar contains carcinogens. Cigarette smoke is called the main smoke, while the smoke coming out from the burning tip of the smoked by people around smokers is called secondhand smoke. In fact, a burning cigarette produces second-hand smoke twice as much as the main smoke because it keeps continuing as long as the cigarette is being burnt on.

Based on statistical test in this research, it was found that smoking habit in the house had a relationship with the incidence of pneumonia on children. This result is consistent with the theory that cigarette smoke can cause persistent irritation of the respiratory tract, which can lead to susceptibility to various diseases, including pneumonia. Cigarette smoke is known to settle in home with inadequate ventilation so that it can be inhaled by passive smokers. Cigarette smoke is not a direct cause of pneumonia on children, but it is an indirect factor that can cause lung disease that will weaken the immune system of children (Yuwono, 2008).

Correlation between natural ventilation of children room and Pneumonia occurrence on children

Ventilation is the entrance of fresh air into the room, and the way out for dirty air. The existence of ventilation in the home is beneficial for air circulation in the house beside it reduces the humidity. Based on the theory, good ventilation allows air to move freely so that air can change continuously (Halim, 2012). Poor ventilation can lead to smoke and dirty air trapped inside the house, and can withstand the humidity inside the house causing fungus.

The criterion for good ventilation in this study is more than 10% of the floor area size. The ventilation area referred to in this research is the area of ventilation covering the venting area and the width of the window divided by the floor area. Based on the statistical test in this research, found that the ventilation of the children room had correlation towards the incidence of pneumonia on children. The results of the research indicate that the risk of children exposed to pneumonia will increase if staying in the house whose vents are not qualified.

The unqualified ventilation of the house is due to the small type of house. Ventilation is found more only at the front of the house. While on the side already coincide with the wall of a neighbor's house. Home ventilation is related to the humidity of the house, which supports the life-force of viruses and bacteria. According Notoatmodjo (2003) sunlight can kill bacteria or viruses, so that adequate shine will reduce the risk of pneumonia (Yuwono, 2008).

Correlation between residential density of children room and Pneumonia occurrence on children

Residential density can lead to stale room conditions and difficulty breathing of family members because of fresh air in the room for inadequate breathing needs (Halim, 2012). Based on the statistical test in this research, found that the residential density of children room has correlation to the incidence of pneumonia.

The results of this research indicate that the risk of children are affected by pneumonia will increase if staying at home with many people. The residential density which is not qualified is due to the width of the house which is not proportional to the number of people lived in the house. A narrow home area with a large number of family members leads to an unbalanced ratio. Density of this residential allows bacteria and viruses can be transmitted through the breathing of the people in the house.

Correlation between floor type of children room and Pneumonia occurrence on children

The qualified floors are floor made of plaster, tiles, even better if using Ceramics. While the unqualified floor is a floor made of soil, because the floor is made of soil will be dusty during the dry season and muddy during the rainy season. Dusty and wet floors can become a breeding ground of disease and cause health problems. Dust generated from the floor can be inhaled and attached to the respiratory tract, when accumulated, it can cause decreased lung elasticity and difficulty in breathing. Ground floor can affect the growth of pathogenic microorganisms (Halim, 2012). Based on the statistical test in this research, researcher found that the type of floor of the house has no correlation with the incidence of pneumonia on children.

The result of this research showed that there is no correlation between the types of floor and the incidence of pneumonia in the work area of Kediri Health Center, although the type of floor as one of the physical environment of the house that becomes one of the risk factors causing the occurrence of pneumonia on children. Most of the floors of respondents have been using fine plaster and ceramic. However, there are other factors that need to be taken into consideration, namely the cleanliness of the floor that is not included in this category of research. This is related to the behavior of the inhabitants of the house to clean the floor which affects the low amount of dust or microorganisms on the floor. The correlation between the type of floor and the incidence of pneumonia on children is indirect. It means that the type of dirty floor and the bad condition of children nutritional status enable children so vulnerable to suffer the disease.

Correlation between humidity density of children room and Pneumonia occurrence on children

Air humidity in the house according to health requirements based on Health Ministerial Decree of Indonesia No.1077/Menkes/Per/2011 is between 40% - 60%. Based on the statistical test in this research was found that the humidity in children room has correlation with the incidence of pneumonia.

The results of this research showed that the risk of pneumonia on children will increase if living in a humid house. The results showed that most of the humidity levels in the children's room more than 60% were 65 respondents (74.71%). Humidity is a good medium for the development of pneumonia. Humidity in the house can cause fungus on clothes, walls, and any place that is considered as humid place. Fungus can release spores that can cause health problems for humans who inhale it and destroy the place of growth. According to Conant and Fadam (2008) Diseases that can be caused by fungi such as difficulty breathing, headache, skin irritation, and can trigger asthma attacks and allergies (Halim, 2013).

Correlation between wall type of children room and Pneumonia occurrence on children

The qualified walls are wall equipped with ventilation, waterproof, and easy to clean. In this research, qualified walls are walls made of bricks or non-combustible materials, while unqualified walls are walls made of flammable or bamboo walls (Halim, 2012). Based on the statistical test in this research, it was found that the type of floor of the house has no correlation with the incidence of pneumonia.

This result indicates that the type of wall has no correlation with the incidence of pneumonia on children in the working area of Kediri Health Center. There are 81 respondents in this research have a qualified wall condition which is made of non-combustible material. Therefore Physical Environmental Factors as dominant causes of Pneumonia on children in the Work Area of Kediri Health Center, West Lombok of NTB Province in 2013.

Based on observations that researchers have committed, natural ventilation in children room is the most dominant environmental factor as the cause of pneumonia with $\chi^2 = 33.394$ and $POR = 22.685$. While in second place there is residential density with $\chi^2 = 26.641$ and $POR = 13.00$, then the habit of smoking with $\chi^2 = 8.886$ and $POR = 5.379$. The last is the humidity level of children room where in $\chi^2 = 7.38$ and $POR = 5.249$.

For the type of floors and walls conditions, based on data analysis, it has no correlation with the occurrence of Pneumonia. The amount of risk of patients with Pneumonia can be seen from the POR value of each variable. Based on the calculation, in the natural ventilation of children room, the POR is 5.2, it means that children living in home with unqualified ventilation have a 5.2 times greater risk of suffering Pneumonia than children living in the house with qualified ventilation. Similarly with air pollution by cigarette smoke with the value of $POR = 4.16$ then children who live in the environment contaminated with cigarette smoke have 4.16 times greater risk of exposure to pneumonia than children living in the environment which is not polluted by cigarette smoke. For room density ($POR = 4.7$) and humidity ($POR = 3.5$), children who live in homes with room density and unqualified humidity are 4.7 times greater and 3.5 times more likely to be affected Pneumonia compared to children living in homes with adequate room density and humidity.

In the wall type variable, the value of $POR = 1.700$ which means that the children who lives in the house with unqualified wall has a risk 1.700 times greater affected by Pneumonia compared to children who live in the house with qualified wall. While the type of floor of the house has no effect which means that it is neutral because of the value of $POR = 1.09$.

CONCLUSION

Based on the results, it could be concluded that there are correlation between the smoking habit inside the house, natural ventilation, residential density, humidity density of the children room with the incidence of pneumonia. The ventilation of children room become most dominant factor.

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