The Relationship between Respiratory Infections and Healthy Homes in Children Under Five, Indonesia 2013

Hubungan antara Infeksi Saluran Pernapasan dan Rumah Sehat pada Balita, Indonesia 2013

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Abstrak

Lingkungan berperan sangat penting dalam penyebaran penyakit, terutama pada balita. Rumah sehat diyakini dapat membantu menurunkan prevalensi penyakit, terutama infeksi saluran pernafasan akut (ISPA) pada balita. Artikel ini memaparkan hubungan antara rumah sehat dan ISPA pada balita. Analisis menggunakan data Riset Kesehatan Dasar (Riskesdas) 2013 dan Potensi Desa (PODES) 2014, di 33 provinsi di Indonesia. Sampel adalah balita dengan jumlah 59.175 orang, dibedakan menjadi pernah didiagnosis ISPA atau tidak dan tinggal di rumah yang dikategorikan sehat atau tidak. Indikator rumah sehat disusun sesuai dengan Pedoman Teknis Penilaian Rumah Sehat yang dikeluarkan oleh Kementerian Kesehatan Dirjen P2M & PL dan Kepmenkes No. 829. Terdapat 15 variabel yang membentuk 3 kelompok komponen penyusun rumah sehat. Penilaian kriteria rumah sehat menggunakan nilai dan bobot sesuai pedoman. Terdapat 2 variabel komponen yang tidak dapat dimasukkan dalam komposit rumah sehat yaitu perilaku membersihkan lantai dan membuang kotoran anak ke toilet akibat keterbatasan data. Analisis data menggunakan regresi logistik. Proporsi rumah sehat di Indonesia masih rendah. Sebanyak 23,2% (n = 13.744) rumah tangga dengan balita dinyatakan sebagai rumah sehat, dan 26% (n = 15.364) balita didiagnosis ISPA. Ditinjau dari letak geografis, kawasan di pulau Sumatera merupakan yang tertinggi untuk persentase rumah tangga dengan balita yang memenuhi kriteria rumah sehat. Ditemukan perbedaan risiko sebesar 1,13 kali lebih besar balita menderita ISPA pada rumah tangga yang terpapar pencemaran udara dalam rumah baik pada rumah sehat maupun bukan rumah sehat. Pencemaran udara dalam rumah mempengaruhi kejadian ISPA pada balita. Diperlukan pengaturan penggunaan bahan bakar memasak dan sumber penerangan dalam rumah yang ramah lingkungan.

Kata kunci: balita, ISPA, rumah sehat

Abstract

Environment plays a very important role in the spread of disease, especially in children under five. Healthy homes are believed to help reduce the prevalence of disease, especially acute respiratory infections (ARI) in infants. This article describes the relationship between healthy home and ARI in children under five. The analysis used the data of Basic Health Research (Riskesdas) 2013 and Potential Villages (PODES) 2014, in 33 provinces of Indonesia. The sample is 59,175 children under five, distinguished to have been diagnosed with or without ARI and with or without staying at healthy home. Healthy home indicators are prepared in accordance with the Healthy Home Technical Guidelines published by the Ministry of Health. There are 15 variables that make up 3 groups of components of healthy homes. The criteria assessment uses value and weight according to the guidelines. There are 2 component variables that could not be included in the composite healthy home due to data limitations, which are the behaviour of cleaning houses and toileting children. Data analysis using logistic regression. The proportion of healthy homes in Indonesia is still low. A total of 23.2% (n = 13,744) of households with under-fives children were declared as healthy homes, and 26% (n = 15,364) infants were diagnosed with ARI. Based on geographical location, Sumatera is the highest percentage of households with children

under five who meet the criteria of healthy homes. A risk difference was found to be 1.13 times greater for children under five with ARI in households exposed to indoor air pollution in both healthy and non-healthy homes. Air pollution in the home affects the incidence of ARI in infants. Regulation of the use of cooking fuel and friendly home lighting source is necessary.

Keywords: children under five, healthy home, ARI

Introduction

Environment plays a very important impact on public health. Some studies suggest that about a quarter of the total disease worldwide and a third of the disease in children is caused by environmental factors. At the same sources, WHO cites that as many as 24% of them has lost productivity, and 23% of deaths in the world are caused by environmental factors. It reaffirms the relationship between the environment with the presence of disease. These diseases are diarrhea, respiratory infections, and malaria. Diseases spread by this environment are more prevalent in developing countries than developed countries.

Children are the most likely group die from disease-based environment and reach more than 4 millions, mainly in developing countries. Infant mortality due to this environment is also 12 times higher in developing countries compared to developed countries, where this case illustrates that public health can be achieved if supported by a healthy environment.[1]

Acute Respiratory Infection (ARI) is a leading cause of morbidity and mortality of infectious diseases in the world. Nearly two million childhoods die from ARIs each year, 98% due to lower respiratory tract infections.[2,3] According to Liu, ARI was found mainly in countries with low and middle per capita income, the mortality rate was very high in infants, children, and elderly people. Similarly ARI was one of the main causes of consultation or hospitalization in health care facilities, especially on the part of the child care.[3]

Home sanitation is closely associated with morbidity rates of infectious diseases, especially respiratory infection. Settlement environment greatly affects the occurrence and spread of ARI. Developments spread of diseases, specifically describe the role of the environment on the occurrence of the disease. In terms of environmental health sciences, disease occurs because of the interaction between man and his environment.[4,5]

Various factors may affect the increasing prevalence of ARI in young children, but when viewed specifically on the environment, the environmental factors that generally affect the incidence of ARI is primarily a residential house. When viewed in more detail on these factors are population density, ventilation and absence of daylight,[6] presence of overcrowding,[7] indoor air pollution and cooking fuel,[8,9] and housing conditions.[10]

According to Riskesdas data, there was an increase trend in pneumonia period prevalence (1 month) from 2.1% (2007) to 2.7% (2013) in Indonesia. Meanwhile, there was almost no significant reduction in ARI prevalence; 25.5% (2007) to 25% in 2013.[11]

Some of the strategies in an effort to reduce the prevalence of ARI through environmental control also has a lot to do, such as promoting education about safe storage of drinking water, environmental sanitation and personal hygiene, use of fuel and better handling of hazardous materials in the home and work environments. Cross-sector cooperation is also important to do in order to improve the quality of human life.

This article aims to determine the incidence of ARI in infants by healthy homes in Indonesia according to technical guidelines for healthy homes. It is expected to understood the connection between a healthy home which includes components to build a home with respiratory disease eradication program, the efforts can be more effective and targeted. As mentioned above, many studies have looked at the relationship between home conditions and ARI events. The main difference that is the focus of our study in this article highlights the healthy settlement, not only the conditions in the home but also the neighborhood around which we value the role of determining the health status. So, health is not only seen from inside a home but maintaining the health around the house is also an important thing.

Methods

This analysis used a secondary data in Basic Health Research (Riskesdas), which was a national health survey that gathered by the National Institute of Health Research and Development (NIHRD). Besides, it used Potential Village (PODES) 2014 which had been

conducted by the Central Bureau Statistic (BPS).

The study design of this analysis was accordance to Riskesdas's design which was a descriptive epidemiological study (cross-sectional).

This latest data of Riskesdas – which had been held in 2013 -- had covered 497 districts / municipalities in 33 provinces in Indonesia. As well as Riskesdas, PODES had conducted in 2014 that included 73,709 villages spread over districts / cities throughout Indonesia.

Sample selection of Riskesdas consisted of three phases, the first phase was selecting the census blocks in each district / city, the second stage was choosing a building census of each census block, the third stage was choosing the household of each selected census building. PODES was not sampled but considered as the collection of whole as part of a census conducted by BPS.

Riskesdas had total sample of 1,027,763 household members. Used two different sample calculation formula, this analysis required minimal sample of 719 samples. However, after merging and cleaning data, based on criteria of analysis, we achieved total sample by 59,175 children under five years.

About 50 variables were needed from two set questionnaires of Riskesdas and one set of PODES for analysis. For indicators of housing, those variables were taken from household questionnaire at Blok VIII (environmental health) and Blok IX (economic and settlement), while variables for respiratory infection were taken from individual questionnaire at Blok A (communicable diseases). Thus, for other environment indicators such as air pollution, were taken from PODES.

Based on conceptual framework, there were two big group as independent variables which associated with one dependent variable (respiratory infection). Those were physical aspect (healthy home, outdoor pollution and indoor pollution), and economic aspect (family economic status, and ownership of property).

The operational definition of acute respiratory infection (dependent variable) was the incidence of ARI disease based on the diagnosis of health personnel. The use of the diagnosis of health workers as a reference for determining the incidence of illness in this study and not symptoms, because based on Article 35 paragraph (1) of Law Number 29 Year 2004 that mentioned the authorities to determine the disease was the health provider (doctor) through diagnosis.[12]

Focus on healthy home indicators, according to Health Minister' Ruling no. 829/1999, there were 17 indicators needed to be assessed to classify whether one house was healthy or not. Those 17 indicators were divided into 3 groups, which had different value of weight. First group was physical condition such as the presence and types of ceilings, walls, floors, windows, ventilation, and lighting. The second group was sanitation facilities such as clean water, means of defecation (BAB), sewage, and garbage disposal. The third group was behaviour of household members such as opening windows (the room and the family room), and the behavior of disposing of waste into the trash.

However, there were two indicators of this behavior's group that could not be included into, due to the lack of data. Those variables were behavior of cleaning/sweeping the home and toileting of infants and children under five. There was not any information about behavior of mother when she had to clean of children's faeces into toilet. Those would be the limitation of this analysis. Then, there were only 15 indicators of healthy home that might be put into the model.

Scoring for each variable was in accordance to the guidelines from Directorate General PPM & PL Ministry of Health. The scores ranged from 0 to a maximum of 4 for each variable. A score of "0" was given the most unfavorable conditions, e.g. house conditions in which there was no ceiling. The score of "4" was the maximum value that could be assigned to a variable, e.g. variable "means clean water", then the score 4 was given to a house with the good conditions (meaning that the house had clean water) and met health requirements.[13]

After scoring, those indicators had to be calculated for weight in order to consider the role of each indicator groups forming healthy home (by Blum theory). According to the guidelines, the weight for the home components was 31, 25 for sanitation group, and 44 for behaviour group. The results for house assessment obtained by multiplying score variable with weight. This calculation had already considered a colinearity issues.[14] Determination of the cut off points for healthy home might not follow a predetermined manner in the guidebook healthy home issued by P2M & PL, due to score result was very low. Therefore, the cut-off point was determined

statistically by using the distribution of graphics intersections generated.

Results

It can be said that a healthy home is a place of shelter that meets the needs of the physiological, prevent disease transmission, prevention of accidents and meet the concept of cleanliness, healthy and beauty and able to lead a perfect life as well as physically, spiritually and economically.

This analysis showed that the national prevalence of children under five suffering from respiratory infection in Indonesia was 26%. The highest prevalence of respiratory infection was in East Java Province (31.9%) and the smallest was in North Maluku (14.7%).

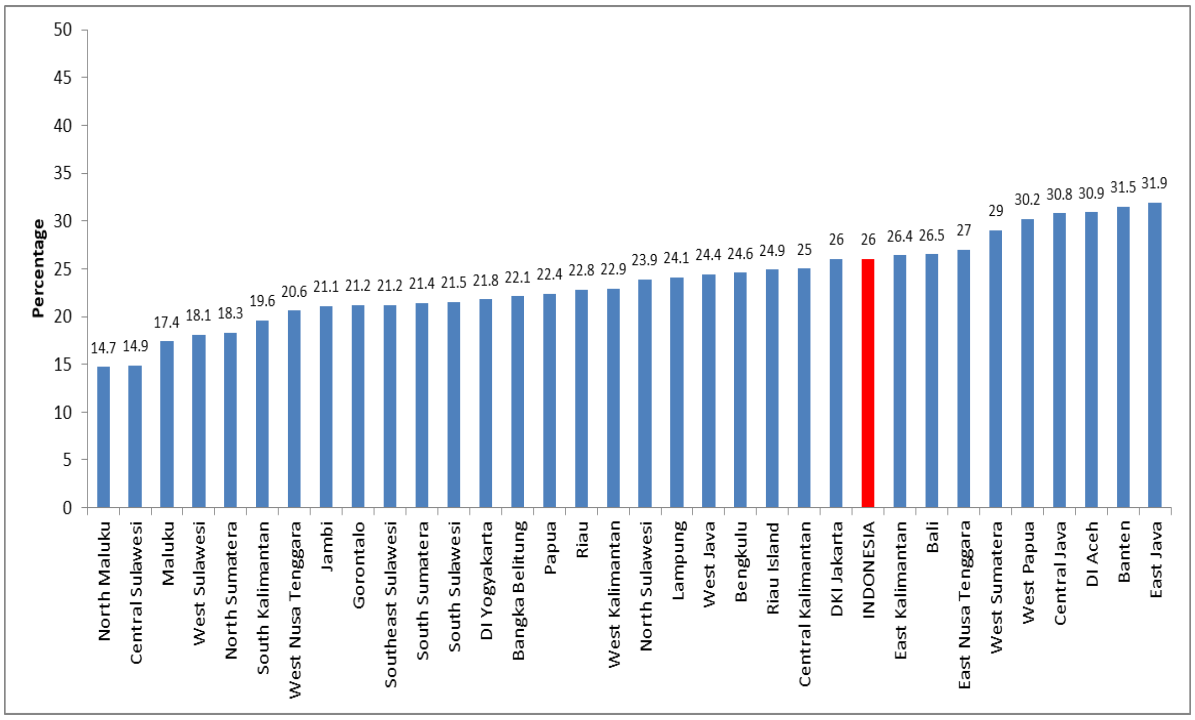

Figure 1. Distribution of ARI in Children under Five by Province, Riskesdas 2013

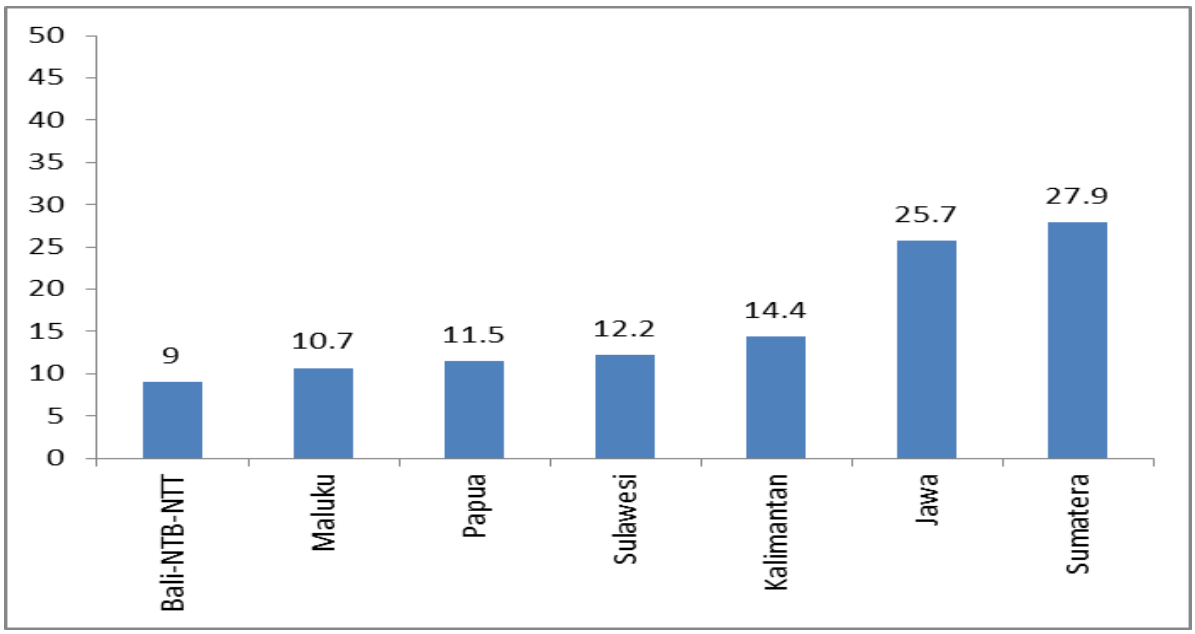

Figure 2. Distribution of Healthy Home in Households with Children under Five by Region, Riskesdas 2013

Table 1. Description of Healthy Home, Indoor and Outdoor Pollution, Economic Status and Respiratory Infection in Children under Five Years

Variables	Respiratory Infection				p *value*	OR	95% CI
	Yes		No				
	n	%	n	%			
Healthy home							
Not healthy home	11,845	26.1	33,491	73.9			
Healthy home	3,519	25.7	10,199	74.3			
Outdoor air pollution							
Yes	2,576	25.7	7,461	74.3	0.378	0.98	0.93-1.03
No	12,788	26.1	36,230	73.9			
Indoor air pollution							
Yes	5,559	24.8	16,844	75.2	0.000	0.90	0.87-0.93
No	9,805	26.8	26,847	73.2			
Household economic status							
Poor-moderate (Quintile 1-3)	9,699	26.0	27,650	74.0	0.728	0.99	0.96-1.03
Rich (Quintile 4-5)	5,665	26.1	16,041	73.9			

Table 2. Association of Healthy Home, Air Pollution, Economic Status and Respiratory Infection in Children under Five Years

Variables					95% C.I.	
	B	S.E.	p *value*	OR	Lower	Upper
Healthy home					0.86	1.04
Economic status	0.038	0.023	0.095	1.04	0.99	1.09
Indoor pollution	-0.146	0.023	0.000	0.86	0.83	0.91
Interaction between healthy home and indoor air pollution	0.122	0.056	0.028	1.13	1.01	1.26
Constant	**1.112**	**.016**	**.000**	**3.040**		

Regionally, the highest proportion of healthy home was in Sumatra Island (27.9%), while the area of Bali-NTB-NTT had the lowest proportion (9%).

Meanwhile, it could be seen that in some condition of the house, the proportion of children under five suffering from respiratory infection were not much different. However, some variables had a fairly close relationship with respiratory infection such as ventilation, lighting and smoke hole kitchen and open the window behavior, there were differences in the proportion.

Likewise the tables, there were significant different variables between indoor air pollution and respiratory disease in children under five. The variable of indoor air pollution was a composite variable which consisted of two variables, such as cooking fuel and lighting source in the home. While the variable of outdoor air pollution was a single variable which described the presence of environmental pollution on air in the last twelve months.

Based on logistic regression, there was a difference in the risk of children under five's respiratory disease in households which exposed with indoor air pollution, by 1.13 times greater than households without indoor air pollution, either within a healthy home or not.

At the beginning of analysis, the authors were tempted to analyze the formation of the index neighborhoods/settlement associated with respiratory infection in children under five in 33 provinces of Indonesia. However, due to limited variables, as well as after through the various stages of statistical tests, the index could not be formed. Based on these limitations, it was decided that a logistic regression analysis was the most appropriate methods used to describe the relationship between healthy home, pollution and economic status and respiratory disease in children under five in Indonesia.

Discussion

Several previous studies has examined the relationship between home quality and ARI disease. In addition, there are fewer articles that

discuss about healthy homes using Susenas data from 2001 to 2004 and Riskesdas 2007 and 2010.

For example, Hapsari *et al*[15] once made an article on healthy homes, where they saw the trend of healthy homes for 10 years. The variables used only 8 indicators of healthy homes. Meanwhile, the illnesses seen in association with healthy homes are ARI and diarrhea, which were only seen on the basis of symptoms.[15]

Meanwhile, this study does not create healthy home trends such as those made by Hapsari et al. This research is discussed about healthy residence of healthy home including environmental condition around it. The variables used here are 14 variables, and ARI indicator uses health provider's diagnosis.

So the main difference between those two papers is that the results of this study highlight the healthy settlement, not only the house but the environment around the dwelling to play a role in determining health status, as maintaining the health around is also an important thing.

Other research had been done by Suryani *et al.* in West Sumatra[16] and Rosdiana *et al.*[17] in Bogor District. Compared to the results of their research, this study found that indoor air pollution had an association with respiratory infection in children under five years. There was a difference in the risk of respiratory infection in children under five in the household who were exposed to indoor air pollution, either at healthy home and unhealthy home. This is consistent with studies in the city of Padang in 2015 by Suryani *et al* that suggested an association between respiratory disease (ISPA) and the use of cooking fuel.[16,17] The smoke from burning materials wood fuel with high concentrations can damage lungs. Burning smoke contains particle sand chemical substances such as lead, iron, manganese, arsenic, cadmium which can cause irritation in the respiratory tract mucosa easily, which is experienced particles in the air if entry through the respiratory tract will result epithelial cell damage, so that foreign objects or the incoming particles could not be removed.[18]

Similar results were obtained from studies of Kankaria *et al*[19] in India, which provided us evidence that indoor air pollution was a cause of increasing morbidities and mortalities on respiratory diseases, and there was a need for an urgent intervention. There are social, cultural, and financial factors that influence the decision of people about energy and cooking. For instance a traditional fuels for cooking, the problems with smoke, the aesthetic appeal of stoves, and users' perception about other alternatives.

Other result in Serbia by Stankovic *et al*[20] suggested a strong association between respiratory symptoms and indoor air pollution. The associations between home dampness and sinusitis and bronchitis were also found to be statistically significant. This result showed the evidence of the effects of indoor air pollution exposure in house on respiratory symptoms and illnesses in non-smoking women in Niš, Serbia.

Furthermore, Gall *et al*[21] reported there were combined technical and social complexities associated with effective cookstove implementation in developing countries, and there remained a significant need for intervention studies and interdisciplinary research to reduce the effects of cookstoves and other devices as sources of indoor air pollution (IAP) and agents of global climate change. To help guide the integration of public health and other disciplines in this field, we first provided a synthesis of previous research on IAP in developing countries and summarized successes and challenges from previous cookstove implementation programs.

This study showed there was no relationship between environmental conditions around the house (outdoor air pollution) with ARI in infants. This is not in line with the research conducted by Abelsohn *et al*[22] who found a relation that outdoor air pollution caused substantial morbidity and mortality in Canada. It could affect both the respiratory system (exacerbating asthma and chronic obstructive pulmonary disease) and the cardiovascular system (triggering arrhythmias, cardiac failure, and stroke).

The results of this study also reported that there was no relationship between socioeconomic status conditions with ARI in children under five. This result contradicts to the research's result conducted by Mustafaee *et al*[23] in Australia and Cakmak *et al*[24] in Canada that found a connection between respiratory health conditions with low economic and social status. This difference in outcomes is possible because of the difference in age of this study sample, in which this study was conducted on children under five, while both studies conducted in Australia and Canada were conducted against schoolchildren.

Conclusions

The highest percentage of respiratory infection in children under five years is in East Java Province and the lowest is in North Maluku Province. The highest proportion of healthy home by region is in Sumatera, and the lowest is in the region of Bali-NTB-NTT. There is a difference in the risk of respiratory infection in children under five in the household who are exposed to indoor air pollution, either at healthy home and unhealthy home. So, home with indoor air pollution may increase the risk of respiratory infection in children under five years in Indonesia, based on Riskesdas and PODES.

Suggestion

Since house with indoor air pollution may increase the risk of respiratory infection in children under five, then it is required to control indoor air pollution in the house. It means to reduce the use of wood as cooking fuel and the use of oil lamp in the house, that are still commonly used in society. Beside, considering socio-cultural and geography disparity in Indonesia, it is essential to simplify the component of indicators of healthy home in Indonesia. By reducing the number of indicators of the healthy home, then the percentage of healthy home is expected to be improved.

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