THE CORRELATION BETWEEN SOCIAL DETERMINANTS AND ENVIRONMENTAL CONDITION WITH MEASLES CASES AMONG INFANTS IN PADANG, WEST SUMATERA

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ABSTRACT

Background: Indonesia is targeting to eliminate measles by 2020. In 2018 there were still 191 cases of measles in the city of Padang. This study aimed to determine the risk factors most associated with the incidence of measles among children under five in Padang City in 2018.
Subjects and Method: A case-control study was conducted in Padang City, West Sumatera. The total of 74 children under five were enrolled in this study consisting of 37 with measles and 37 without measles. The study subjects were selected using sampling technique for cases and purposive sampling with matching age and sex for controls. The dependent variable was measles incidence. The independent variable was exclusive breastfeeding, measles immunization status, and vitamin A intake. The data were collected using medical records and questionnaire. The data were analyzed using d logistic regression.
Results: The logistic regression showed that the most influential variable with the incidence of measles among children under five was measles immunization status with (OR= 6.33; 95% CI= 1.87 to 21.39; p= 0.003).
Conclusion: Children under five who are not immunized against measles have the highest risk of measles incidence among children under five in Padang City.

Keywords: measles, immunization, children under five

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BACKGROUND

Measles is a virus-borne disease that is highly contagious. Droplets or direct contact with an infected person are the main modes of transmission. Measles can result in lifelong disabilities like brain damage, blindness, and deafness, as well as death. Measles has the potential to cause a high-fatality outbreak (WHO, 2012).

An outbreak of measles is declared when five or more clinical cases occur in groups over the course of four weeks and there is evidence of an epidemiological link. In 2017, the number of measles outbreaks in Indonesia was 345 with a total of 3,010 cases, higher than in 2016 (129 outbreaks with 1,511 cases) and 2015 (68 outbreaks with 831 cases). In 2016, the highest frequency of measles outbreaks occurred in West Sumatra, with 33 outbreaks with 495 cases and 1 person dying. The frequency of measles outbreaks in West Sumatra in 2017 decreased to 9 outbreaks with 84 cases (Depkes RI, 2017; 2018).

In 2016, out of 19 districts/ cities, Padang City was in position 1 with the highest number of measles cases, namely 361 cases. The number of measles cases per year is 2014 (84 cases), 2015 (167 cases) and 2016 (361 cases). The number of measles cases

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from 2014 - 2016 has increased, even there has been a two-fold increase in cases in 2016. In 2017, measles cases decreased to 191 cases. Measles outbreaks in Padang City occurred at Kuranji Health Center (9 cases) and Air Cold Health Center (17 cases) in May and September (DKK Padang, 2017).

According to Jhon Gordon, the factors that cause a disease are: Host (host), Agent (Virus/ disease germ) and Environment (Notoatmodjo, 2007).

Measles is a disease that arises from the interaction of these three factors. Measles is caused by the measles virus, namely from the family Paramyxovirus, genus Morbillivirus. Age is one of the factors that influence the occurrence of measles. According to age groups, the largest proportion of measles cases is in the 5–9-year age group and 1-4 years age group with the respective proportions of 31.6% and 25.4% (Depkes RI, 2017). Measles infection is more severe among children under five because the immune system is immature at a young age. The maternal immunity carried by children to measles gradually diminishes until it loses its protective power at the average age of 9 months. Therefore, the first measles immunization is carried out at the age of nine months (Arleni, 2014; Mujiati, 2015).

Measles is also influenced by social determinants including education, knowledge, health services and socioeconomic status. Exclusive breastfeeding and vitamin A are also part of the mandatory health service programs for children under five. Exclusive breastfeeding coverage in Padang City is 76.52% and the coverage of vitamin A provision in Padang City is 95.6% (Ardiyanto et al., 2016; Ma et al., 2016; Mujiati, 2015; Yanti and Sulistyaningsih, 2015). Apart from social determinants, measles transmission is also influenced by environmental conditions. Environmental conditions that can affect measles include room occupancy density and room ventilation area (Basra, 2015).

This study aims to determine the risk factors that most associated with the incidence of measles among children under five in the city of Padang in 2018.

SUBJECTS AND METHOD

1. Study Design

A case control study was conducted from February to September in 2018, in Padang City, West Sumatera, Indonesia.

2. Population and Sample

The study population was all children under five who suffered from measles based on secondary data from the Padang City Health Office in 2017. The sample size in this study was obtained with a ratio of 1: 1 between the case group and the control group totaling 74 people.

3. Study Variables

The dependent variable was measles incidence. The independent variable was exclusive breastfeeding, measles immunization status, and vitamin A intake.

4. Study Instruments.

Case sampling was carried out by total sampling and control sampling was carried out by purposive sampling method based on matching age and gender.

5. Data Analysis

The data were analyzed using univariate, bivariate, and multivariate analysis.

RESULTS

The study subject characteristic was presented in Table 1.

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Table 1. Distribution of Study subjects by Social Determinants and Environmental Conditions in Case and Control Groups

Social Determinants of and Environmental	Case		Control	
	n	%	n	%
Mother's Education				
Low	0	0.00	2	5.41
High	37	100	35	94.59
Family Income				
Low	36	97.30	37	100
High	1	2.70	0	0:00
Measles Status				
Never	19	51.35	3	8:11
Ever	18	48.65	34	91.89
Exclusive breastfeeding				
No	22	59.46	12	32.43
Yes	15	40.54	25	67.57
The provision of Vitamin A				
Incomplete	20	54.05	9	24.32
Full	17	45.95	28	75.68
Density Residential Room				
Compact	30	81.08	21	56.76
Not crowded	7	18.92	16	43.24
Room Ventilation Area				
Does not meet the requirement	28	75.68	18	48.65
Fulfill the requirement	9	24.32	19	51.35

Table 1 shows that study subjects in the case group had higher mother's education (100%), low family income (98.65%), had never been immunized against measles (51.35%), mothers were not exclusively breastfed (59.46%), given incomplete vitamin A provision (54.05%), had dense room occupancy density (81.08%), and had room ventilation area that did not meet the requirements (75.68%).

Table 2. Relationship between Social Determinant and Environmental Condition with the Incidence of Measles among children under five in Padang City in 2018

Social Determinant and Environmental Condition	OR	95% CI		p
		Lower	Upper	
Mother's Education	0.20	0.01	4.17	0.250
Family Income	0.33	0.01	8.18	0.500
Measles Immunization Status	6.33	1.87	21.40	<0.001
Exclusive Breastfeeding	3.00	1.09	8.25	0.025
Provision of Vitamin A	2.57	1.07	6.15	0.027
Room Occupancy Density	2.80	1.01	7.77	0.041

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Room Ventilation Area	3.00	1.09	8.25	0.025

Table 2 shows that there was a relationship between measles immunization status (OR= 6.33; p<0.001), exclusive breastfeeding (OR= 3.00; p= 0.025), giving vitamin A (OR= 2.57; p= 0.027), room occupancy density (OR= 2.80; p= 0.041), and room ventilation area (OR= 3.00; p= 0.025) with incidence of measles among children under five, and there was no relationship between maternal education (p= 0.250) and family income (p= 0.500) with the incidence of measles among children under five.

Table 3. The most dominant factors associated with the incidence of measles among children under five in Padang City, 2018

Factor	OR	95% CI		p
		Lower	Upper	
Status of Measles Immunization	6.33	1.87	21.39	0.003

Table 3 shows that the variable of measles immunization status was the most dominant variable affecting the incidence of measles among children under five in Padang City in 2018. The results of multivariate analysis obtained was OR= 6.33, which means that children under five who had never immunized against measles were at 6.33 times risk of experiencing measles compared to children under five who had immunized against measles in the same condition after being controlled with the exclusive breastfeeding variable, giving vitamin A, room occupancy density, and room ventilation area.

DISCUSSION

The results showed that there was no significant relationship between maternal education and the incidence of measles among children under five in Padang City in 2018. Not in line with the research of Ma et al. (2016) which shows that mothers with low education are 1.7 times more likely to have measles incidence compared to mothers with higher education. High or low level of education does not guarantee someone to behave well about health. Even though a person's education level is high, it does not mean that they have good health behavior. This study only measures the level of formal education taken by the study subjects. Apart from formal education, education about health is also influential in the prevention of measles. The health education provided can provide awareness to the public to understand about measles.

The results showed that there was no significant relationship between family income and the incidence of measles among children under five in Padang City in 2018. This is because the majority of study subjects in both the case and control groups with low income already have national health insurance or other health insurance, so that low-income study subjects also have easy access to health services.

The results showed that there was a significant relationship between measles immunization status and the incidence of measles among children under five in Padang City in 2018. Children under five who have never immunized against measles are at 6.33 times the risk of experiencing measles compared to children under five who have

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received measles immunization. This is in line with Basra's (2015) study which states that measles immunization status is a risk factor for measles in children. Measles immunization plays a role in replacing the maternal immunity carried by children against measles which gradually loses its protective power up to the age of 9 months. Therefore, the first measles immunization is carried out at 9 months of age. The low coverage of measles immunization is influenced by the low knowledge of mothers about the benefits of immunization. The results of interviews with mothers of children under five show that mothers are still afraid to bring their children to be immunized because they are afraid that the child will have a fever after being immunized. The low knowledge about immunization and the lack of awareness of mothers to bring their children to health services are the reasons for mothers who do not bring their children to be immunized.

The results showed that there was a significant relationship between exclusive breast-feeding and the incidence of measles among children under five in the city of Padang in 2018. Children under five who are not exclusively breastfed have a 3.00 times risk of experiencing measles compared to children under five who are exclusively breastfed. In line with the research of Ardiyanto et al. (2016) which shows that children who are not exclusively breastfed have a risk of measles 6.88 times than children who are exclusively breastfed. Breast milk functions as an active immunization because it can stimulate the formation of a baby's immune system, so that breastmilk guarantees the baby's nutriational status is good because of the protective factors that can reduce infant morbidity and mortality. Breast milk contains various anti-infective substances and is free from contamination. Breastmilk contains millions of antibodies that function as germ killers (Roesli, 2005). Diseases that can be prevented by exclusive breastfeeding include meningitis, acute respiratory infections, urogenital tract infections, measles, sepsis, botulism, diarrhea, diabetes at a young age, and coronary artery disease (Riksani, 2012). The low coverage of exclusive breastfeeding is influenced by the misunderstanding of mothers about exclusive breastfeeding. The results of interviews with mothers of children under five show that mothers only know that exclusive breastfeeding is given to children within a period of 6 months, but do not know that during this time exclusive breastfeeding should not be mixed with formula milk or other additional foods.

The results showed that there was a significant relationship between the provision of vitamin A and the incidence of measles among children under five in the city of Padang in 2018. Children under five who are not completely given vitamin A have a risk of 2.57 times to experience measles compared to children under-fives who are completely given vitamin A. Study by Yanti and Sulistyaningsih (2015) which states that children who do not get vitamin A complete are 4.6 times more likely to get measles than children who are complete with vitamin A. Vitamin A is a micronutrient that is important for the immune system. Vitamin A is able to protect the body from infection by foreign organisms, such as pathogenic bacteria.

Vitamin A will increase the work activity of white blood cells and antibodies in the body, so that the body becomes more resistant to toxin compounds and to attack by parasitic microorganisms, such as patho-

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genic bacteria and viruses. Vitamin A is one of the nutrients from the vitamin class that is needed by the body which is useful for eye health (in order to see properly) and for body health (increasing the body's resistance to fighting diseases such as measles, diarrhea, and other infectious diseases). Vitamin A can also increase the body's resistance to the measles virus in the eye to reduce the risk of blindness (Hamidin, 2014). The low coverage of vitamin A is influenced by the low knowledge of mothers about the benefits of vitamin A and the lack of awareness of mothers to bring their children to health services. This is also due to the fact that in some integrated healthcare center, cadres are less active in visiting children under-fives to each house to be given vitamin A on their schedule 2 times a year, namely February and August.

The results showed that there was a significant relationship between room occupancy density and the incidence of measles among children under five in the city of Padang in 2018. Children under five with dense room occupancy were at 2.80 times the risk of experiencing measles compared to children under-fives with less crowded room occupancy. This is in line with Basra's (2015) study which states that room occupancy density is a risk factor for measles in children. Children who live in densely occupied rooms are at 5.0 times the risk of getting measles compared to those that are not crowded. Occupancy density increases the risk and severity of environmentally based diseases. Density of occupancy is a fertile nursery for viruses, as well as a means of scientific genetic engineering experiments. Measles virus is very contagious, the environment is one of the factors causing measles transmission, one of these environmental factors is the density of the occupancy.

The results showed that there was a significant relationship between the area of room ventilation and the incidence of measles among children under five in the city of Padang in 2018. Children under five with a room ventilation area that did not meet the risk of experiencing measles were 3.00 times more likely to experience measles compared to children under five with an adequate room ventilation area. terms. This is in line with Basra's (2015) study which states that room ventilation is a risk factor for measles in children. Children who sleep in rooms with non-eligible ventilation have a 5.5 times risk of getting measles compared to children whose room ventilation meets the requirements.

The absence of adequate ventilation results in improper air exchange. The impact of air exchange that does not meet the requirements can lead to fertile growth of microorganisms. This results in health problems including the development of the measles virus (Ministry of Health, 2011). Another function of ventilation is to remove excess hot air caused by body radiation, conditions, evaporation or external conditions and can evenly disrupt the air temperature. Air temperature greatly affects the length of the sporogony cycle or the extrinsic incubation period. The higher the temperature (to some extent) the longer the extrinsic incubation period, and conversely the lower the temperature the shorter the extrinsic incubation period. Measles cases will increase in the dry season when the temperature is high, on the other hand, when the temperature is low, the incidence of measles will decrease. Hot temperatures are very favorable for the measles virus (paramyxovirus) in breeding. Ventilation can

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also affect room lighting. Lighting in the room is closely related to the humidity level in the room. Lack of lighting will cause high humidity in the room and has the potential to be a breeding ground for germs and viruses. The measles virus can survive in a cool, humid and dark place without sunlight (Abdullatif, 2012; Bonnie et al., 2006).

The results of multivariate analysis in the full model show final that measles immunization status is the most dominant risk factor affecting the incidence of measles among children under five in Padang City after being controlled with exclusive breastfeeding, vitamin A administration, room occupancy density and room ventilation area in 2018. Measles immunization is aimed to provide active immunity against measles. Children under five who have received measles immunization are expected not to get measles because the immune system against measles has been formed.

Measles immunization status, exclusive breastfeeding, vitamin A administration, room occupancy density and room ventilation area are related to the incidence of measles among children under five in Padang City in 2018.Mother's education and family income are not related to the incidence of measles among children under five in Padang City in 2018. Measles immunization status is the most dominant risk factor affecting the incidence of measles among children under five in the City of Padang in 2018. Health workers should increase the coverage of measles immunization and make efforts to increase public knowledge and awareness, especially mothers of children under five with health promotion and education about measles. causes, risk factors and efforts to prevent it (through measles immunization) and its handling. Health cadres should be more active in sweeping homes for children under five who do not come to the integrated healthcare center to be given vitamin A according to schedule. The community should actively participate in increasing the coverage of measles immunization and participate in health education activities held by health workers to increase knowledge and awareness of the community itself.

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