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The Effect Of Lead (Pb) Exposure In Pregnant Women's Blood Who Work At Agricultural And Plantation Sector In West Aceh

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ABSTRACT

Lead (pb) exposure has an effect on decreasing public health status, primarily on pregnant women. Lead (pb) is a poison metal who can accumulate in the blood and causing disturbances on pregnancy. Maternal death in west Aceh in 2020 – 2021 reached 4619 – 4620 cases. The aim of this study is to determine blood lead levels in pregnant women who work at agricultural and plantation sectors.Cross-sectional method was carried out with univariate and multivariate designs. Samples are49 pregnant women who live in Meurebo. Blood samples were taken using laboratory research and analyzed through Atomic Absorption Spectrophotometry (ASS). Interviews were conducted using questionnaires on independent variables. The average of bloodlead contentis 63.3%; age with prevalence ratio (Pr) = 0.165 (Cl. 0.040-0.686), education with prevalence ratio (Pr) = 12.222 (Cl. 2.832-52.744), knowledge level prevalence ratio (Pr) = 0.221 (Cl.0.064-0.767), length of work of pregnant women with prevalence ratio (Pr) = 4.518 (Cl. 1.303-15.660), and work history with prevalence ratio (Pr) = 8.333 (Cl. 2,216-31,335). The conclusion is there is an effect of lead exposure in pregnant women's blood. The dominant variable is occupational history which has an 18-fold greater chance of being exposed to lead (Pb) which has a statistically significant effect p=0.004. It is necessary to increase knowledge related to lead exposure in agriculture and plantationssector and use personal protective equipment when operating in those area.

Keywords: Pregnant woman, Lead (Pb) , Agricultural Sector, Exposure.

BACKGROUND

The number of maternal mortalitiesin the world is estimated around 289per 100,000 live births, and in Southeast Asian countries such as Indonesia, it can reach 190 cases.According to World Health Organization (WHO), Maternal Mortality Rate (MMR) is death that occurs during pregnancy with direct or indirect causes. It is indicated the degree of public health is low. Therefore, it is included in the target of achieving the Sustainable Development Goals (SDGs) as an integrated and sustainable development framework to reduce maternal mortality to at least 70 per 100,000 up to 2030 and as the fifth goal of the Millennium Development Goals (MDGs).In 2015, 191 UN member countries including Indonesia have made a joint pledge to improve maternal health through access to sustainable services (Riskesdas, 2018).

Maternal mortality cases in Indonesia increase regularly. According to the Chair of the International Scientific Committee Conference on Indonesia Family Planning and Reproductive Health (ICIFPRH), MeiwitaBudhiharsana, until 2019 the case of MMR is high at 305 per 100,000 live births with target in 2015 is 102 per 100,000.It is as stated by The Head of the National Population and Family Planning Agency (BKKBN), in 2019 MMR is one of the challenges that must be faced by Indonesia, and it becomes a national priority (Susiana. S, 2019).

Factors causing maternal mortality related to pregnancy and childbirthis the influence of maternal health status and readiness to become pregnant. In addition, as stated by several studies, the other factor of MMR is regarding the spread of lead in the environment. Lead is a poison material used

widely and cancause environmental damage and health problems. Lead is an active accumulation of toxins produced and will accumulate in human organs and will cause anemia, impaired kidney function, nervous system, brain and skin disorder. WHO (2013) stated lead exposure had accounted for 143,000 cases of death around the world or equivalent to 0.6%.

Lead has very bad impact on health. Pregnant women are a vulnerable group to have an adverse impact on disorders in their pregnancy.Generally, pregnant women can be exposed to lead due to the impact of various environmental elements such as inhaling dirty air from vehicle fumes, inhaling various kinds of dust and or consuming food and drinks that have been exposed to lead. In addition, humans can also be exposed to lead related to human activities such as agriculture, industrial emissions from lead smelting and refining, workshops, welding, factories and batteries (Nasir. M et al, 2018).

Pregnant women who have high lead exposure in the blood has some serious problem. It will affect the fetus even to a worse stage such as miscarriage, premature birth, fetal death, low birth weight babies, birth defects and others. Mubarak, M.S et al (2018) found in the Brebes Beach area the effect of lead in the blood of pregnant women due to the participation of in agricultural activities that use pesticides at high levels until they are absorbed by the soil and accumulate in vegetables, fruits and can be transferred in the body of pregnant women due to consuming agricultural products exposed to pesticides. Istiaroh (2014) related to the accumulation of lead in agricultural areas that use pesticides in agriculture in the leaves of shade plants in Central Java Regency found that some pesticides contained lead.

West Aceh is a coastal area located in the western part of Aceh Province which has potential in mining sector, especially coal mining of 1.7 billion tons with known coal resources of 600 million and reserves of 400 million. One of the sub-districts thathave coal reserves is Meureubo. It is not only a coastal area, but also an area that has great potential for agricultural. The majority of people in this area, especially in rural area work as farmer. Coal mining and rice farming activities can have a high risk of exposure to pregnant women through the use of pesticides and the influence of coal which can have an impact on air pollution from mining activities adjacent to village community housing.

Those backgrounds can be strengthened as a cause of maternal death which is shown in data obtained from the West Aceh Health Service.In 2020it shows the Maternal Mortality Rate is 4619 cases and in 2021 it is 4623 cases. The highest was found in Meureubo District as many as 714 cases.

Therefore, the researcher is interesting to conductresearch "The Effect of Lead Exposure (Pb) in Pregnant Women's Blood Who Work in the Agriculture and Plantation Sector in West Aceh Regency"

RESEARCH METHOD

This study applied quantitative research methods with observational analytic research in a cross-sectional study. Thepopulations were all mothers living in the Meureubo Health Center Working Area as many as 49 pregnant women. Blood samples were taken by medical personnel and analyzed by health analysts from the laboratory. Examination of lead levels in blood was carried out using the Atomic Absorption Spectrophotometry (ASS) method. Interview was conducted using a questionnaire that has been measured the severity of the variables in this study. It is conducted to determine the history of lead exposure in the blood of pregnant women. The data was analyzed using bivariate test to determine the variables associated with the effect of exposure to lead in the blood of pregnant women with the incidence of preeclampsia.

RESULT AND DISCUSSION

Result

Analysis Univariate

Table 1. Frequency distribution based on research respondent variables

Variable	Total	
	n	%

Lead level (Pb) in the blood of pregnant women	18	36,7
Low (≤19,40 µg/dL)	31	63,3
High (>19,40 µg/dL)		
Age of pregnant women		
≤30 year	20	40,8
>30 year	29	59,2
Education Level		
Elementary level	25	51,0
Middle level	24	49,0
Knowledge Level		
Good	30	61,2
Bad	19	38,8
Occupational History		
Gardener	18	36,7
Farmer	31	63,3
Length of Work		
<6 hour/day	19	38,8
≥6 hour/day	30	61,2

Primary Data (Process in 2021)

Table 1 explains the proportion of lead (Pb) levels in the blood of high category pregnant women (> 19.40 g/dL) is 63.3%, the proportion of pregnant women in the category of more than 30 years is 59.2%, the proportion of education level the basic education category is 51.0%, the proportion of knowledge level in the good category is 61.2%, the proportion of work history in the farmer category is 63.3% and the proportion of work duration in the category greater than 6 hours/day is 61.2%.

Analysis Bivariate

Table 2. Cross tabulation of independent variables with blood lead (Pb) levels

Primary Data (Process in 2021)

Variable	Lead Level (Pb) in blood of pregnant women				Total		P
	Low (≤19,40 µg/dL)		High (>19,40 µg/dL)				
Age of Pregnant Women							
≤30 year	3	16.7%	17	54.8%	20	40.8%	0,020
>30 year	15	83.3%	14	45.2%	29	59.2%	
Education Level							
Middle level	15	83.3%	9	29.0%	24	49.0%	0,001
Elementary level	3	16.7%	22	71.0%	25	51.0%	
Knowledge Level							
Good	7	38.9%	23	74.2%	30	61.2%	0,032
Bad	11	61.1%	8	25.8%	19	38.8%	
Length of work							
<6 hour/day	11	61.1%	8	25.8%	19	38.8%	0,032
≥6 hour/day	7	38.9%	23	74.2%	30	61.2%	
Work History							
Gardener	12	66.7%	6	19.4%	18	36.7%	0,003
Farmer	6	33.3%	25	80.6%	31	63.3%	

Table 2 shows all independent variables related to lead (Pb) levels in the blood of pregnant women including: Age of pregnant women with prevalence ratio (Pr) = 0.165 (Cl.

0.040-0.686), means respondents with age more than 30 years have a 0 chance ,16 times greater for exposure to levels of Lead (Pb) in the blood with a p value of 0.020. Education level with prevalence ratio (Pr) = 12.222 (Cl. 2.832-52.744), means respondents with elementary education level have a 12 times greater chance of being exposed to blood lead (Pb) levels with a p value of 0.001. The level of knowledge with Prevalence Ratio (Pr) = 0.221 (Cl.0.064-0.767), means respondents with a low level of knowledge have 0.22 times greater chance of being exposed to levels of Lead (Pb) in the blood with a p value of 0.032. The length of work of pregnant women with a prevalence ratio (Pr) = 4.518 (Cl. 1.303-15.660), means respondents with work more than 6 hours/day have a 4.51 times greater chance of being exposed to levels of Lead (Pb) in the blood with a p value of 0.032. Occupational history with prevalence ratio (Pr) = 8,333 (Cl.2,216-31.335), means respondents with a history of farmer work have an 8.33 times greater chance of being exposed to blood levels of Lead (Pb) with a p value of 0.003.

Analysis multivariate

Table 3. Variable results in the Equation (Parameter Estimation)

Variable	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Occupational history	2.916	1.026	8.072	1	0.004	18.462	2.470	137.992
Education level	2.620	.938	7.809	1	0.005	13.739	2.187	86.317
Length of work	2.012	.960	4.392	1	0.036	7.480	1.139	49.114
age	1.785	1.081	2.724	1	.099	.168	.020	1.397

Primary Data (Process in 2021)

Based on table 4, it can be seen 5 variables carried out by the multivariate logistic regression statistical test, there are 3 variables that are related ($p < 0.05$), namely the variable of work history, education level and length of work. These three variables have a significant effect on Lead content (Pb) on pregnant women's blood. The dominant variable is the work history variable with a Prevalence ratio value (Pr) = 18.462. It means the farmer's work history has an 18-fold greater chance of being exposed to lead (Pb) levels in the blood and has a statistically significant relationship with p value = 0.004.

Discussion

Relationship between age and levels of lead in the blood of pregnant women who work in the Agriculture and Plantation sector in West Aceh Regency

Based on the results, it was found the proportion of respondents with the age of 29 pregnant women who are more than 30 years old is 59.2%. The results of statistical analysis using the chi-square test obtained p = 0.020 <0.05. It means there is a relationship between age and lead (Pb) levels in the blood of pregnant women who work in the agricultural sector in West Aceh Regency. The Prevalence Ratio (PR) value is (Pr) = 0.165 (Cl. 0.040-0.686), means respondents aged more than 30 years have a 0.16 times greater chance of being exposed to levels of Lead (Pb) in the blood. Based on the results of the multivariate test, the value of the prevalence ratio (Pr) = .168. It means the length of work of farmers has a 0.168-fold greater chance of being exposed to levels of Lead (Pb) in the blood and has a statistically significant relationship with p value = 0.099. This study is in line with research conducted by Eka H and Mukono J 2017, they found the average response has an age of 39.38 years with 4 respondents (25%) having an age > 40 years. Age is directly proportional to lead levels accumulates in the body. According to Shatriadi H and Zairinayati 2017, one factor that can cause high levels of Lead (Pb) in the blood is the age of the worker. It also can be seen from the results of Putra's W.E et al 2020 entitled the content of heavy metal PB in clean water and in the blood of women of

childbearing age in the city of Semarang. There is a relationship between age and blood lead levels aged 15 to 49 years

Researchers assumes that the age of pregnant women who are more than 30 years old will have higher levels of Lead (Pb) in the blood because the older the age of pregnant women, the more susceptible they are to the accumulation of Lead (Pb) levels in the body or the higher the accumulation of lead in the body. If the level of Lead (Pb) in the blood of pregnant women is high, it will be very risky for the baby because high levels of lead (Pb) in the blood will cause new problems such as causing hypertension in pregnant women.

Relationship between Education Level and Lead (Pb) levels in the blood of pregnant women who work in the Agriculture and Plantation sector in West Aceh Regency

Based on the research, it shows as many as 25 respondents or 51.0% are women with elementary education level. The results of statistical analysis using the chi-square test obtained p = 0.001 <0.05. It means there is a relationship between the level of education and the level of lead (Pb) in the blood of pregnant women who work in the agricultural sector in West Aceh Regency. The value of the prevalence ratio (Pr) = 12.222 (Cl. 2.832-52.744), means respondents with elementary education levels have a 12 times greater chance of being exposed to levels of Lead (Pb) in the blood. Based on the results of the multivariate test, the value of the prevalence ratio (Pr) = 13,739. It is indicate the education level of farmers has a 14-fold greater chance of being exposed to lead (Pb) levels in the blood and has a statistically significant relationship with p value = 0.005

This is in line with the research conducted by Hari Juliana. C et al. 2017, in which they found that in terms of education, the average education of pregnant women is elementary school graduates 41 people (48.2%), followed by junior and senior high school, out of school and college graduates. Out of 85 respondents only 1 respondent had lead levels below the normal limit.

Researchers assume education level can affect blood lead (Pb) levels because if someone has a high education, they will have knowledge about lead and the dangers of lead in the body. By having knowledge about this, a person will protect the body from exposure to lead.

The Relationship between Length of Work with Lead (Pb) levels in the blood of pregnant women who work in the Agriculture and Plantation sector in West Aceh Regency

Based on the result, it shows the proportion of working hours of pregnant women in the category greater than 6 hours/day is 30 respondents or 61.2%. The results of statistical analysis using the chi-square test obtained p = 0.032 <0.05. It means there is a relationship between length of work and levels of lead (Pb) in the blood of pregnant women who work in the agricultural sector in West Aceh Regency. Prevalence ratio value (Pr) = 4.518 (Cl. 1.303-15.660), means respondents with work more than 6 hours/day have a 4.51 times greater chance of being exposed to levels of Lead (Pb) in the blood. Based on the results of the multivariate test, the Prevalence ratio value (Pr) = 7.480. This means the length of work of farmers has a 7-fold greater chance of being exposed to levels of Lead (Pb) in the blood and has a statistically significant relationship with p value = 0.005.

The results of this study are in line with the research that has been carried out by Hartini. E, 2011 that based on the results of the Chi-square test, p value = 0.015, it means there is a relationship between length of work in agricultural activities and Pb levels in the blood, with RP 1.8, which means women of childbearing age with years of service > 8, 5 years have a 1.8 times greater risk of having high levels of Pb in the blood category compared to women of childbearing with a working period of < 8.5 years. According to Sutomo (2003) in Eka, H and Mukono, J (2017), the longer a person works, the higher the exposure to pollutants obtained.

Researchers assumes the length of work can increase the risk of high levels of Lead (Pb) in the blood because the longer pregnant women work in the agricultural sector, the longer pregnant women are exposed to Lead (Pb) from agricultural chemicals. This is one of the factors causing high levels of Lead (Pb) in the blood of pregnant women.

Relationship between Occupational History with Lead (Pb) levels in the blood of pregnant women who work in the Agriculture and Plantation sector in West Aceh Regency

Based on the research conducted, it shows the proportion of work history in the farmer category is 31 or 63.3%. Statistical analysis using chi-square sound p = 0.003 <0.05. Itis indicatebetween occupational history and levels of lead (Pb) in the blood of pregnant women who work in the agricultural sector in West Aceh Regency has a relationship. The value of the prevalence ratio (Pr) = 8.333 (Cl.2,216-31.335), means respondents with a history of farmer work have an 8.33 times greater chance of being exposed to levels of Lead (Pb) in the blood. On the other hand, multivariate testshowed the value of the prevalence ratio (Pr) = 18.462. This means that the farmer's work history has an 18-fold greater chance of being exposed to lead (Pb) levels in the blood and has a statistically significant relationship with p value = 0.004.

Hari Ismanto et al. 2019 states the work of pregnant women and husbands is also affect the risk of lead exposure, especially for the category of work that is prone to lead exposure such as farmer.

Researchers assumes that the work history of pregnant women can increase the risk of higher blood lead levels in agriculture because mothers who work as farmers will more often use chemicals such as pesticides, fertilizers and others. This will increase the risk of high levels of Lead in the blood of pregnant women.

Conclusion

To sum up, it can be drawn as follow: The average of blood leadlevel in pregnant women who work in agricultural is >19.40 g/ and dL is 63.3%.The effect of high blood lead levels on the variable age of pregnant women with prevalence ratio (Pr) = 0.165 (Cl. 0.040-0.686), education with prevalence ratio (Pr) = 12,222 (Cl. 2.832-52.744), level of knowledge with prevalence ratio (Pr)) = 0.221 (Cl.0.064-0.767), length of work of pregnant women with prevalence ratio (Pr) = 4.518 (Cl. 1.303-15.660), and occupational history with prevalence ratio (Pr) = 8.333 (Cl.2,216-31,335).There is an effect of lead exposure in pregnant women's blood who work in agricultural area. The dominant variable is work history variable which has an 18-fold greater chance of being exposed to lead (Pb) levels in the blood which has a statistically significant effect p=0.004

Suggestion

It is necessary to monitor blood lead levels regularly every 6 monthsto preventpregnant women from complications during pregnancy. They are advised to consume organic vegetables and fruits, and to use personal protective equipment when carrying out activities in agricultural areas.

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