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Reminding Factors Anemia Events On Pregnant Woman in Endemis Malaria at Kapuas Regency Central Kalimantan Indonesia

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***Abstract* - Anemia is still a public health problem in several countries around the world, including in Indonesia. In Indonesia there are 15 million cases of anemia that cause 38,000 deaths every year. The percentage of Anemia in 2007 in the province of Central Kalimantan was 13.5%, still above the national percentage (11.5%) [10.] Kapuas district is one of the contributors to the incident. The purpose of this study was to determine the factors that influence the incidence of anemia of pregnant women in malaria endemic areas in Kapuas District. This study was a cross sectional study, with the population being all pregnant women in four health centers with malaria endemic identification of high incidence area of malaria in 2015. The total subjects were 268 pregnant women. Data analysis used univariate, bivariate (chi-square) and multivariate (logistic regression) analysis. The most statistically significant factor in the occurrence of anemia in area of endemic malaria are Pregnant women whose pregnancy spacing is less than 2 years (24 months) tend to be 0.2 times affected for anemia of > 2 years (OR: 0.2; 95% CI: 0.08-0.42). Pregnant women with gravida ≥ 2 times have anemia risk 0.1 times than < 2 times (OR: 0.1; 95% CI: 0.05-0.29). Pregnant women infected with plasmodium (vivax or falciparum) will be at risk 0.8 times than non-infected with plasmodium (OR: 0.8; 5% CI: 0.51-1.28). The results of this study can be used as a reference for some research more specific by considering outside variables. Needed another research with case control or cohort design. Besides it is also advisable to make policy in budgeted funds to support development programs more effective and efficient in order to reduce maternal anemia, especially associated with malaria. Prim gravida and nutritional status, Ante Natal Care(ANC) on a regular basis during pregnancy. And encouraged to cultivate healthy lifestyle using mosquito nets to avoid mosquito bites.**

Keywords: malaria; pregnant women; anemia

I. INTRODUCTION

The main health problem being faced by the Indonesian nation is the maternal mortality rate. The last survey of Maternal Mortality Rate Indonesia 2010 was 228 per 100,000 live births. In Indonesia there are 15 million cases of anemia that cause 38,000 deaths every year, an estimated 35% of the population still live in areas at risk of contracting malaria. A total of 484 districts or cities in Indonesia, there are 338 districts or cities that are endemic areas malaria [36]. Anemia prevention efforts in Indonesia is one of the efforts to reduce maternal and child mortality cases related to international commitment in MDGs that is to improve maternal health and reduce child mortality.

In Central Kalimantan, malaria and anemia are still a significant problem. AMI (Annual Malaria Incidence) average from 1994-1998 is 19.8 per 1000 population, there is an increase of 1999 that is 29.25 per 1000 population. In 2004, AMI experienced a decline of 24.52 in 1000 population and in 2010 increased to 40 in 1000 population [10].

II. METHODS

The type of this research is descriptive research with cross-sectional design. This design is expected to illustrate and analyze the relationship between several risk factors with the incidence of disease in a certain period. This design is one type of observational study to explore various risk factors that affect certain events. Subjects in this study were all pregnant women from selected villages who met the criteria taken as the study sample. Sampling in this study was conducted simultaneously in four health center high incidence area in Kapuas district

Measuring tool in this research is questionnaire, which is used to collect data, both secondary data coming from various sources in health center, and primary data obtained by direct researcher from respondent by measuring malaria with RDT and measurement of HB level by Sahli method.

III. RESULT

Univariate analysis

Analysis of univariate data aims to describe the frequency distribution of the characteristics of mothers Anemia (cases) based on research variables. Bivariate analysis, his analysis uses chi-square test, with 2x2 cross-tabulation to determine the relationship between the variables, and to determine the strength of the relationship how big the risk of anemia by

calculating the Prevalence Odds Ratio (POR) with 95% confidence interval (CI), at the level of significance A 5%.

TABLE 1
ANALYSIS OF VARIABLE RELATIONSHIP BETWEEN ABORTION VARIABLE WITH ANEMIA

	Anemia						
	Positif		**Negatif**				
	n	**%**	**n**	**%**	**Pvalue**	**POR**	**95%**
Abortus Ever Never	46 116	73.02 56.86	17 88	26.98 43.14	0.023*	2.05	1.10-3.82

(POR = 2.05; 95% CI = 1.10-3.82)

TABLE 2
ANALYSIS OF VARIABLE RELATIONSHIP BETWEEN NUTRITIONAL STATUS VARIABLES (LILA) WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%	n	%	P	POR	95%CI
Nutrional status less good	122 40	59.51 63.49	83 23	40.49 36.51	0.572	1.18	0.66-2.12

(POR = 1.18; 95% CI = 0.66-2.12).

TABLE 3
ANALYSIS OF VARIABLE RELATIONSHIP BETWEEN MATERNAL AGE VARIABLE WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%	n	%	P	POR	95%CI
Mother's age < 20th dan≥35th 20-34 th	62 100	72.09 54.95	24 82	27.91 45.05	* 0.008*	2.118	1.21-3.69

(POR = 2.12; 95 % CI = 1.21-3.69)

TABLE 4
ANALYSIS OF VARIABLE RELATIONSHIP BETWEEN PARITY VARIABLES WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%			P	POR	95%CI
Parity paritas≥2 paritas<2	138 24	59.48 66.67	94 12	40.52 33.33	0.418	2.05	0.34-1.54

(POR = 2.05; 95% CI = 0.34-5.00)

TABLE 5
ANALYSIS OF VARIABLE RELATIONSHIP BETWEEN PREGNANCY DISTANCE VARIABLES WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%	n	%	P	POR	95%CI
Pregnancy distance <2th ≥2th	107 55	66.88 50.93	53 53	33.13 49.07	0.009*	1.94	1.18-3.21

(OR = 1.94; 95% CI = 1.18-3.21)

TABLE 6
ANALYSIS OF VARIABLE RELATIONSHIP BETWEEN ANC VARIABLE WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%	n	%	P	POR	95%CI
ANC <4 kali ≥4 kali	131 31	60.09 62.00	87 19	39.91 38.00	0.803	0.92	0.66-2.12

(OR = 1.18; 95% CI = 0.66-2.120)

TABLE 7
ANALYSIS OF VARIABLE RELATIONSHIP BETWEEN EDUCATION VARIABLES WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%	n	%	P	POR	95%CI
Education < junior High School ≥Senior high School	92 70	56.79 66.04	70 36	43.21 33.96	0.13	1.48	0.68-2.45

(OR = 1.48; 95% CI = 0.689-2.45)

TABLE 8
BIVARIATE ANALYSIS BETWEEN KNOWLEDGE VARIABLES WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%	n	%	P	POR	95%CI
Knowledge Less <20 Good ≥20	155 7	59.62 87.50	105 1	40.38 12.50	0.15	4.74	0.57 - 39.10

(POR = 4.74; 95% CI = 0.575-39.108)

TABLE 9
ANALYZE THE RELATIONSHIP OF VARIABLES BETWEEN WORK VARIABLES WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%	n	%	P	POR	95%CI
Work							
None	106	60.92	68	39.08	0.83	0.95	0.35-1.54
Work	56	59.57	38	40.43			

(POR = 0.73; 95% CI = 0.35-1.54)

TABLE 10
BIVARIATE ANALYSIS BETWEEN VARIABLES OF GRAVIDITY WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%	n	%	P	POR	95%CI
Gravida							
pregnant ≥ 2 X	108	66.67	54	33.33	0.01*	1.93	1.16-3.18
pregnant <2X	54	50.94	52	49.06			

(POR = 1.93; 95% CI = 1.166-3.181)

TABLE 11
ANALYSIS OF VARIABLE RELATIONSHIP BETWEEN PREGNANCY AGE VARIABLE WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%			P	POR	95%CI
Remnant's age							
<5 month	29	67.44	14	32.56	0.308	1.18	0.34-1.39
≥5 month	133	59.11	92	40.89			

(POR = 1.18; 95% CI = 0.34-1.39)

TABLE 12
BIVARIABLE ANALYSIS BETWEEN PLASMODIUM VARIABLES WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%			P	POR	95%CI
Plasmodium's type							
negatif	73	55.30	59	44.70	0.11	1.23	0.94-1.59
vivak	51	64.56	28	35.44			
Falcifarum	21	65.63	11	34.38			
Mix	17	68.00	8	32.00			

POR = 1.23, 95% CI = 0.948-1.597)

TABLE 13
BIVARIATE ANALYSIS BETWEEN THE VARIABLES OF MALARIA INFECTION WITH ANEMIA

	Anemia						
	Positif		Negatif				
	n	%	n	%	P	POR	95%CI
malaria infection							
Positif	89	65.44	47	34.56	0.09	1.52	0.935-2.120
Negatif	73	55.30	59	44.70			

(POR) = 1.52; 95% 0.935-2.12)

Multivariate analysis

This analysis is used to follow up the results of bivariate analysis, which aims to determine the significance of the relationship between independent variables and dependent variables by including or controlling other variables simultaneously.

TABLE 14
SUMMARY OF LOGISTIC REGRESSION OF EACH COVARIATE INCIDENCE OF ANEMIA OF PREGNANT WOMEN

Variabel	POR	SE	PValue	95% CI
knowledge	1.22	0.41	0.54	0.63 - 2.37
nutritional status	1.73	0.64	0.14	0.84 - 3.57
malaria infection	5.29	3.59	0.01	1.40 - 19.98
pregnancy distance	0.19	0.08	0.00	0.09 - 0.46
plasmodium type	0.68	0.22	0.25	0.36 - 1.30
pregnancy age	2.38	0.97	0.03	1.07 - 5.29
Gravida	0.30	0.11	0.002	0.14 - 0.63

This multivariable analysis is also used for the effects of modification, as well as to select the best model for intervention. The modeling analysis that was built was aimed at finding out how much the anemia incidence was influenced by other variables. To show how much other controlled variables can predict the incidence of anemia. At significance level α 0,05 (p <0,05), this test result will show prevalence odds ratio (POR), confidence interval (CI) equal to 95%.

TABLE 15
SUMMARY OF LOGISTIC REGRESSION OF EACH COVARIATE INCIDENCE OF ANEMIA OF PREGNANT WOMEN

No	Variabel	-Log LR	P Value
1	infection * Gravida	133.1937	0.001
2	infection *pregnancy age	134.3889	0.001
3	infection *pregnancy distance	138.3028	0.077
4	infection *plasmodium type	135.7308	0.007
5	infection * upper arm circumference	132.4224	0.000
6	infection *knowledge	138.0229	0.058
7	Gravida* pregnancy age	139.7699	0.511
8	Gravida* pregnancy distance	128.3607	0.000
9	Gravida* plasmodium type	132.7782	0.003

10	Gravida* upper arm circumference	159.9847	0.956
11	Gravida* knowledge	139.6993	0.454
12	pregnancy age * pregnancy distance	139.3791	0.273
13	pregnancy age * plasmodium type	137.3096	0.031
14	pregnancy age * upper arm circumference	134.6282	0.001
15	pregnancy age * knowledge	139.4414	0.300
16	pregnancy distance * plasmodium type	139.4415	0.248
17	pregnancy distance * upper arm circumference	138.2763	0.067
18	pregnancy distance * knowledge	139.9055	0.687
19	plasmodium type * upper arm circumference	136.0345	0.011
20	plasmodium type * knowledge	139.2004	0.230
21	upper arm circumference * knowledge	138.5507	0.098

Of all these interaction results are then included in the LR test in order to determine the most dominant factors for the occurrence of anemia. The technicality is that all variables present at the multivariate level are included in the model, then interacted.

TABLE 16
INTERACTION RESULT OF ALL ELIGIBLE VARIABLES WITH ANEMIA INCIDENCE IN PREGNANT WOMEN IN MALARIA ENDEMIC AREA IN MULTIVARIATE MODEL

NO	Variabel	-Log LR	P Value
	Full Model	117.9225	
1	infection * Gravida	117.4814	0.35
2	infection *pregnancy age	116.8615	0.15
3	infection *pregnancy distance	117.9225	0.99
4	infection *plasmodium type	117.9225	-
5	infection * upper arm circumference	117.6333	0.45
6	infection *knowledge	117.1106	0.20
7	Gravida* pregnancy age	117.1128	0.20
8	Gravida* pregnancy distance	117.8799	-
9	Gravida* plasmodium type	113.1584	0.002
10	Gravida* upper arm circumference	117.7373	0.54
11	Gravida* knowledge	117.4896	0.35
12	pregnancy age * pregnancy distance	117.4235	0.32
13	pregnancy age * plasmodium type	116.8429	0.14
14	pregnancy age * upper arm circumference	117.0955	0.20
15	pregnancy age * knowledge	116.1561	0.06
16	pregnancy distance * plasmodium type	117.8689	0.74
17	pregnancy distance * upper arm circumference	116.8454	0.14
18	pregnancy distance * knowledge	117.9103	0.88
19	plasmodium type * upper arm circumference	117.8991	0.83
20	plasmodium type * knowledge	117.0151	0.18
21	upper arm circumference * knowledge	117.7227	0.53

From table after done Lrtest with interaction seen that interaction 9 (Gravida and Plasmodium Type) feasible entering model. Therefore need expenditure variable whose value p value biggest until found p value <0,05.

TABLE 17
THE RESULTS OF INTERACTION ANALYSIS 9 WITH ALL APPROPRIATE VARIABLES WITH THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN MALARIA ENDEMIC AREAS

Variabel	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
	POR 95%CI P Value	**POR 95%CI P Value**	**POR 95%CI P Value**	**POR 95% P Value**	**POR 95% P Value**
Interacsion 9 (Gravida,plasmodium type)	3.18 (1.38-7.32) 0.007	3.13 (1.35-7.22) 0.008	3.15 (1.34-7.39) 0.008	4.56 (1.87-11.09) 0.01	***4.69 (1.95-11.30) 0.001***
pregnancy distance	0.20 (0.08-0.48) 0.000	0.20 (0.09-0.48) 0.000	0.20 (0.09-0.49) 0.000	0.20 (0.86-0.47) 0.000	***0.18 0.08-0.42 0.000***
Nutrisional status (upper arm circumference	1.79 (0.84-3.78) 0.376	1.78 (0.84-3.78) 0.13	–	–	–
knowledge	1.32 (0.67-2.61) 0.42	–	–	–	–
plasmodium type	0.50 (0.25-0.99) 0.05	0.50 (0.25-0.99) 0.06	0.53 (0.27-1.05) 0.07	0.81 (0.52-1.29) 0.39	***0.811 (0.51-1.28) 0.37***
malaria infection	3.28 (0.79-13.71) 0.103	3.28 (0.80-14.12) 0.09	3.37 (0.78-14.49) 0.10	–	–
Gravida	0.14 (0.06-0.37) 0.00	0.15 (0.06-0.38) 0.00	0.15 (0.06-0.37) 0.000	0.13 (0.05-0.32) 0.000	***0.12 (0.05-0.29) 0.000***
pregnancy age	2.26 (0.99-5.18) 0.05	2.31 (1.01-5.24) 0.05	2.15 (0.94-4.86) 0.07	2.07 (0.93-4.63) 0.074	–
-Log likehood R^2 n	133.16 0.1916 268	133.489 0.1893 268	114.616 0.1812 268	115.963 0.1716 268	117.51 0.1606 268

From the table shows that not all covariates deserve to enter the model. Hence the need for the expenditure of variables whose value p value is greatest until found p value <0.05.

TABLE 18
THE FINAL RESULTS OF MULTIVARIATE ANALYSIS WITH ALL APPROPRIATE VARIABLES WITH THE INCIDENCE OF ANEMIA IN PREGNANT WOMEN IN MALARIA ENDEMIC AREAS

Variabel	**POR**	**PValue**	**95%CI**
pregnancy distance	0.18	0.000	(0.08-0.42)
Gravida	0.12	0.000	(0.05-0.29)

plasmodium type	0.811	0.37	(0.51-1.28)
Interaksion 9 (Gravida, plasmodium type)	4.69	0.001	(1.95-11.30)

IV. DISCUSSION

Relationship of malaria infection pregnant women with the incidence of anemia.In univariate analysis in this study, of all pregnant women infected with malaria there were as many as 50.75% and uninfected as much as 49.2%. The result of POR on bivariate analysis was different with POR after adjusted for all variables in multivariable analysis, statistically there was no significant correlation between malaria infection in pregnant mother and the occurrence of anemia. The association of the type of plasmodium with the occurrence of anemia Prevalence of malaria incidence in Kapuas District, in general type P. vivax 2 times more than P. falciparum. According to District Health Office , this proportion in 2012 based on Kapuas health service report was 772 cases (33,7%) with P. falciparum, 1484 cases (64,71%) with P. vivax and 37 cases (0.02%) with mixed plasmodium species.

The relationship between maternal age and the incidence of anemia Age does not necessarily mean risk factors, but women in certain age groups who will become risk groups. Adolescents (<20 years) and reproductive adult women (≥35 years old) have increased certain risk factors compared to other age groups, which collectively risk this can act to increase anemia, premature birth, or poor pregnancy outcomes among age groups This [9.] Relationship parity with the incidence of anemia. Malaria infection is more likely to cause severe anemia and give birth to LBW [8]. According to Shah & Ohlsson (2002), parities 1 and 4 or more (Grande multipara) increase the risk of pregnancy complications, fetal growth disorders, asphyxia and mature infants [35.] Relationship of mother's nutritional status with the incidence of anemia. Anthropometric examination can be used to determine the nutritional status of pregnant women is by measuring body weight before pregnancy, height, body mass index, and upper arm circumference (LILA).

The relationship between maternal gravida and anemia.The proportion of pregnant women ≥ 2 times has a high enough value of 60.45% compared with women who had a first pregnancy (39.55%). This shows that the high risk of anemia in pregnant women who ≥2 times pregnancy. The relationship of gravidity and anemia has significant links. It can be seen from bivariate analysis results obtained by OR = 1.93 (95% CI = 1,166 - 3,181) and p = 0,01.

The relationship between pregnant women's work with anemia. In accordance with the results of research above the proportion of anemia incidence in pregnant women who do not work (only housewives) as much as 64.93%, while those who have other than housewives as much as 35.07%. The result of bivariate analysis obtained by POR = 0.73 (95% CI = 0,35- 1,54) and p value = 0,41. The relationship between knowledge of pregnant women and anemia. From the results of the above study described the proportion of anemia in pregnant women who have less knowledge as much as 81.345%, while those who have enough education as much as 2.99%. Bivariate analysis results obtained values OR = 4.748 (95% CI = 0,575- 39.108) and p = 0.15. This means pregnant women who have less knowledge, anemic tendencies 5 times greater than those with sufficient knowledge. According to (Mortoatmodjo, 1973)

The relationship between maternity educations with anemia. it was reported that of 776 anemic pregnant women, 51.6% of pregnant women with anemia status could not complete primary school, 19.0% of pregnant women with anemia status could finish school Basic and the remaining 29.0% of pregnant women with anemia status can finish primary school and the remaining 29.4% of pregnant women suffering from anemia can finish junior high school or more. The relationship between ANC of pregnant women with anemia,Based on research data, it was explained that the proportion of anemia incidence in mother who performed ANC <4 times as much as 82.34%, while those who have done ANC as much as 18.66%. Bivariate analysis results obtained OR = 1.1805 (95% CI = 0.66- 2.12) and Value p = 0.83. The values of OR> 1 and CI range do not exceed 1, and p> 0,05, then ANC is not a risk factor for the occurrence of anemia. Statistically concluded that there is no significant relationship between ANC with the incidence of anemia.

The relationship between maternal distance with anemia,The above data describes the prevalence of pregnancy spacing at risk for pregnant women who are <2 years of age as much as 59.70%. After performing the labor process, to recover her body, a woman needs at least 2 years to prepare her reproductive organs in her next delivery [34]. The relationship between pregnancy age and anemia of pregnant women,From risk group data were pregnant women who had more than 5 months' gestation (83.96% and no risk less than 5 months (16.06%) .The results of Muhilal et al (1991) in eastern Indonesia found that at First trimester pregnancy anemia prevalence 46.8%, rose in the second trimester to 48.7% and rose again in the third trimester to 51.6% .

After interaction and continued with Lr test at the multivariate level (nutritional status (upper arm circumference), Knowledge, malaria infection, gestational age, gravida, plasmodium type, and plasmodium type) the relationship between variables begins to change. The statistically significant final results are the gravida variable, the gestational distance variables, the plasmodium type and the interaction between (gravida and plasmodium species).

V. CONCLUSION

Based on the results of analysis and discussion of this study it can be concluded as follows: The proportion of anemia incidence in pregnant women caused by malaria, At the bivariate level there is a significant relationship between malaria infection, gestational age, gestational distance and plasmodium type with anemia occurrence in Kapuas District.

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VI. RECOMMENDATIONS

The results of this study can be used as the basis for reference to further research, more specific by considering the outside variables. Needed further research by design of case control or cohort.For Kapuas District Health Office to be the material of evaluation and consideration in developing the program in order to decrease the prevalence of anemia.

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