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# Factors Related to Anemia in Pregnant Women of Dayak Kenyah Tribe at Kutai Kartanegara Regency, East Kalimantan Province

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**Abstract:** Anemia is one of the nutritional problems in pregnant women. This study aimed to assess factors associated with hemoglobin levels in pregnant women. Study design was cross-sectional with 72 pregnant women Dayak Kenyah as total samples. Data were collected by trained field workers including sample characteristics, nutrient intake, consumption of iron tablets and hemoglobin levels of pregnant women. Bivariate analysis was used to assess factors associated with hemoglobin levels of pregnant women. The results showed that 75% of pregnant women were anemic in which 48.6% with mild anemia and 26.4% with moderate anemia. The average nutrient intake of pregnant women was lower than RDA except of Zinc and Vitamin $B_{12}$). Chi-square analysis showed maternal gestational age ($p = 0.04$), the intake of iron ($p = 0.04$); vitamin A ($p = 0.04$) and iron tablet consumption ($p = 0.008$), significantly associated with the incidence of anemia in pregnant women. It was concluded that statistically the incidence of anemia among pregnant women of Dayak Kenyah significantly associated with maternal gestational age, intake of iron and vitamin A and iron tablet consumption. It is expected that the improvement of nutrient intake for pregnant women and compliance consumption of iron tablets can be used in a program to prevent anemia in pregnant women.

**Key words:** Characteristics of pregnant women, nutrient intake, hemoglobin level, pregnant women, iron tablet

## INTRODUCTION

Anemia is a factor that aggravates the health and nutritional status of pregnant women and give effect to complications during childbirth which is the direct cause of maternal death (Hernawati, 2011). Anemia is a the largest problem of micronutrients and most difficult to overcome in the whole world (Soekirman, 2000). The WHO declares that there are 52% of pregnant women are suffered with anemia in developing countries (WHO, 2005). In Indonesia there are 37.1% of pregnant women are suffered with anemia (Ministry of Health, 2013).

Iron deficiency is a major cause of nutritional anemia than other nutrients such as folic acid, vitamin B12, protein, vitamins and other trace elements. That is why anemia is often associated with iron deficiency anemia (Wirakusumah, 1999). Anemia often occurs due to iron deficiency in pregnant women because of increased iron requirements doubled due to increased blood volume without plasma volume expansion, to meet the needs of mothers (to prevent blood loss during delivery) and fetal growth (Cunningham and Garry, 2001). This is in line with the increase of gestational age. It is estimated that below 50% of mothers do not have enough iron reserves during pregnancy which will increase the anemia in pregnancy. It has been proved in Thailand that the main cause of anemia in pregnant women is iron deficiency (43.1%) (Cunningham and Garry, 2001). A study in Malawi found that 32% of 150 pregnant women are deficient in iron with one or more other micronutrient (Broek Van Den and Letsky, 2000). Similarly, a study in Tanzania shows that anemia in pregnant women associated with iron deficiency ($p = 0.03$), vitamin A ($p = 0.004$) and nutritional status (Upper Arm Circumference) ($p = 0.003$) (Hinderaker *et al*., 2002). There is a close correlation between anemia during pregnancy with fetal death, miscarriage, birth defects, low birth weight, reduced iron stores in the child or the child is born in a state of nutritional anemia. These conditions cause the perinatal mortality rate is still high, as well as maternal mortality and morbidity. Furthermore, it will provoke bleeding during delivery which is the main cause (28%) of maternal deaths in Indonesia (Ahmed *et al*., 2001; Ministry of Health, 2001) Iron deficiency anemia in pregnant women in Indonesia is still high, about 40% (Hernawati, 2011), as well as 54.7% in East Kalimantan and 36.4% in Kutai Kartanegara regency (East Kalimantan Province Health Department, 2004). The problem of anemia in Kutai Kartanegara regency varies in each sub-district.

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## MATERIALS AND METHODS

This research was conducted in the sub-district of Tabang, Kutai Kartanegara Regency, East Kalimantan Province on the Dayak Kenyah community. The sub-district of Tabang is the farthest sub-district in Kutai Kartanegara regency (±480 km from Tenggarong, the capitol of the regency). This type of research is observational using cross sectional design. The population is all pregnant women of Dayak Kenyah in sub-district Tabang. Samples are 72 pregnant women who have met the inclusion criteria are willing to follow this study. Data collection is done by trained field health workers by using thee questionnaires. Data of biomedical factors (the gestational age, spacing pregnancies, parity), socio-economic (education, employment), iron tablet consumption, measured by interview using a questionnaire. Data consumption is measured using 24 h Recall Form (performed 2 days at a time that is not consecutive) and a food frequency questionnaire (Gibson, 2005). Hemoglobin levels of pregnant women assessed in the field through cyanmethemoglobin method using the blood HemoCue photometer (World Health Organization, 2001). Data of food intake is processed using software Nutrisurvey, while iron tablet consumption data as well as the characteristics of the samples are processed using SPSS for windows 16. Chi-square analysis is to assess the factors associated with anemia among pregnant women.

## RESULTS AND DISCUSSION

**Characteristics of pregnant women:** From the statistical analysis of the relationship between the characteristics of the sample with anemia nutritional status of pregnant women, it is generally known that there is no significant relationship (p>0.05), except the gestational age that significantly associated (p = 0.004). (Table 1).

Table 1: Anemia nutritional status of pregnant women based on maternal characteristics

| | Status of nutritional anemia ----- of pregnant women ---- | | | | | |
|---|---|---|---|---|---|---|
| | Non anemia | | -- Anemia -- | | Total 100% | value of p |
| Characteristics | N | % | N | % | N | |
| **Age** | | | | | | |
| <20 years | 2 | 33.3 | 4 | 66.7 | | |
| 20-35 years | 13 | 26.0 | 37 | 74.0 | 72 | 0.75 |
| >35 years | 3 | 18.8 | 13 | 81.2 | | |
| **Education** | | | | | | |
| ≤9 years | 7 | 17.5 | 33 | 82.5 | 72 | 0.10 |
| >9 years | 11 | 34.4 | 21 | 65.6 | | |
| **Mothers work** | | | | | | |
| Working | 6 | 25 | 18 | 75 | 72 | 1.0 |
| Not working | 12 | 25 | 36 | 75 | | |
| **Family revenue** | | | | | | |
| ≤2 million IDR | 4 | 18.2 | 18 | 81.8 | 72 | 0.36 |
| >2 million IDR | 14 | 28.0 | 36 | 72.0 | | |
| **Gestational age** | | | | | | |
| 1st Trimester | 8 | 38.1 | 13 | 61.9 | | |
| 2nd Trimester | 1 | 3.6 | 27 | 96.4 | 72 | 0.004 |
| 3rd Trimester | 9 | 39.1 | 14 | 60.9 | | |
| **Parity** | | | | | | |
| 1 child | 6 | 23.1 | 20 | 76.9 | 72 | 0.43 |
| 2-3 children | 8 | 28.6 | 20 | 71.4 | | |
| >3 children | 0 | 0 | 6 | 100 | | |
| No child | 4 | 33.3 | 8 | 66.7 | | |
| **Distance of birth** | | | | | | |
| <2 years | 1 | 16.7 | 5 | 83.8 | 72 | 0.88 |
| ≥2 years | 14 | 25.5 | 41 | 74.5 | | |
| No child | 3 | 27.3 | 8 | 72.7 | | |

Source: Primary data 2014

In this study, pregnant women are generally in a healthy and safe reproductive age. Most of them was between 20-35 years (66.4%); 22.3% in the age >35 years as the high-risk age and 8.3% in age <20 years. Women at age <20 years-physiologically and psychologically are not mature yet for being pregnant. Incidence of anemia is higher in pregnant women aged <20 years, (Lestari *et al*., 1989) whereas at age >35 years with regard to deterioration and the decreased of endurance and a variety of diseases that often afflict at this age (Amiruddin and Hasmi, 2014). Women aged >35 years have higher risk of obstetric complications and perinatal morbidity and mortality. Pregnant women in this age also shows an increase in the problem of hypertension, diabetes, solution placenta, placenta previa, premature and stillbirth (Cunningham and Garry, 2001). Research in Tanzania showed that age <20 years and >35 years are the risk factors that affect the health of born babies (Mosha and Philemon, 2010). The study of HM Hanif in Pakistan in 2011 explained that statistically, women who pregnants first time at older ages (i.e., 40-49 years) had a significantly greater risk for the occurrence of perinatal deaths, which is 50% greater than in the age group 20-29 years. Similarly, mothers in the age group 30-39 years have a greater risk than in the age group 20-29 years. The very young mother (<20 years) ranks second after the age group 40-49 years. Maternal age in this study was not significantly associated with the incidence of anemia, p = 0.75.

The distribution of gestational age in this study are 29.2% in the first trimester; 38.9% in the second trimester and 31.9% in the third trimester. The incidence of anemia in pregnant women varies according to the gestational age because it is associated with the increased nutritional needs as well as increased growth of the pregnancy. Iron needs in each trimester of pregnancy are different. The iron need in the first trimester is even lower than the period before pregnancy, this is caused a pregnant woman does not menstruate and fetus do not need a lot of iron. Ahead of the second trimester, the need for iron begins to increase. At this time the number of red blood cells increase to 35%, in line with the increasing need as much as 450 mg of iron. The increase of red blood cells is caused by the increase oxygen need of the fetus. The

hemoglobin concentration will decrease during the second trimester for the average of 1 g/dl. Physiological anemia is due to blood plasma volume increases far above the increase in the number of red blood cells which called hemodilution (Wirakusumah, 1999). When the Hb before pregnancy is 11 g% then at the pregnancy through the hemodilution the Hb would be 9.5 to 10 g% and would develop the physiological anemia (Amiruddin and Hasmi, 2014). The results are consistent with the theory where based on the analysis of the incidence of anemia for each trimester, it is known that pregnant women who are anemic in the second trimester are 96.4%; in the third trimester are 60.9% and in the first trimester are 61.9% and statistically obtained p = 0.004. This means there is a significant relationship between gestational age and nutritional anemia in pregnant women.

The parity of pregnant women in this study generally are 45.8% with one child and 5% with at least 4 (four) children. The woman with high parity will affect the state of uterus and will cause the decline of reproductive function. The uterine muscles are too weak and are less able to contract normally that can develop the possibility of a larger primary postpartum hemorrhage. Odds Ratio calculation results shows that mothers of parity <1 or >3 have a 6.1 times greater risk for postpartum hemorrhage than women who have parity 2-3 children (Dina, 2013). Result of this study is also consistent with the research of Pardosi (2009) which concludes that the incidence of postpartum hemorrhage is significantly associated with the parity. Pregnant women with parity of 1 or more than 5 are at risk for postpartum hemorrhage in which occurs 3.86 times more than of the pregnant women with parity two up to 5. Postpartum hemorrhage is often accompanied by anemia as an associated cause and sepsis is the leading cause of maternal mortality which are directly related to inadequate antenatal care and delivery service. Parity in this study did not correlate significantly with the incidence of anemia in pregnant women, p = 0.43.

Pregnant women generally have a birth distance between 2 (two) years (66.7%), while <2 (two) years (18.1%) and not having children (15.3%). The closer spacing of pregnancy could not provide sufficient opportunities for optimalization of uterus cells. 52.6% of low birth weight is found at the spacing of pregnancy <2 years while 80.7% of normal birth weight is found at the spacing of pregnancy >2 years (Amiruddin and Hasmi, 2014). The women who gave birth rapidly lead to not having enough time to recover due to previous delivery and breastfeeding (Galway *et al*., 1987). According to Sibuea (1985), at the end of pregnancy it would take two years to recover the amount of iron reserves to normal levels, with the requirements that during that time the health condition is good and adequate nutrition intake. The birth distance in this study does not correlate significantly, p = 0.88.

Table 2: Average Intake of Nutrients Substance of Dayak Kenyah's Pregnant Women at Subdistrict Tabang, Kutai Kartanegara Regency, 2014

| Nutrients Substance | RDA 2004 | Mini-mum | Maxi-mum | Mean | % |
|---|---|---|---|---|---|
| Energy (kcal) | 2200 | 342 | 3386 | 1664.2 | 75.6 |
| Protein (g) | 67 | 8.5 | 179.2 | 55.2 | 82.4 |
| Calcium (mg) | 950 | 36 | 1426 | 303.4 | 31.9 |
| Iron (mg) | 39 | 8.5 | 310 | 16.2 | 41.7 |
| Zink (mg) | 1.3 | 1.7 | 17.55 | 5.85 | 449.8 |
| Riboflavin (µg) | 1.4 | 0 | 2.5 | 0.73 | 52.4 |
| Vitamin B6 (mg) | 1.7 | 0.3 | 3 | 1.1 | 62.5 |
| Folic acid (µg) | 600 | 5.15 | 367.3 | 112.4 | 18.7 |
| Vitamin B12 (µg) | 2.6 | 0 | 10.7 | 2.94 | 113.0 |
| Vitamin A (Re) | 800 | 1.68 | 4288.6 | 693.6 | 86.7 |
| Vitamin C (mg) | 85 | 0 | 295 | 48.9 | 57.6 |

Source: Primary data 2014

Table 3: Relationship between nutritional anemia status of pregnancy of dayak kenyah at sub-district tabang, kutai kartanegara regency, 2014

| | --- Nutritional anemia status --- of pregnancy --- | | | | | |
|---|---|---|---|---|---|---|
| | Not anemia | | -- Anemia -- | | Total 100% | value of p |
| Nutrients intake | N | % | N | % | N | |
| **Energy** | | | | | | |
| Good | 5 | 19.2 | 21 | 80.8 | 72 | 0,39 |
| Less | 13 | 28.3 | 33 | 71.7 | | |
| **Protein** | | | | | | |
| Good | 8 | 25.8 | 23 | 74.2 | 72 | 0,89 |
| Less | 10 | 24.4 | 31 | 75.6 | | |
| **Calcium** | | | | | | |
| Good | 0 | 0 | 4 | 100 | 72 | 0,23 |
| Less | 18 | 26.5 | 50 | 73.5 | | |
| **Iron** | | | | | | |
| Good | 4 | 57.1 | 3 | 42.9 | 72 | 0,04 |
| Less | 14 | 21.5 | 51 | 78.5 | | |
| **Zinc** | | | | | | |
| Good | 1 | 11.1 | 8 | 88.9 | 72 | 0,30 |
| Less | 17 | 26.9 | 46 | 73.1 | | |
| **Riboflavin** | | | | | | |
| Good | 1 | 14.3 | 6 | 85.7 | 72 | 0,49 |
| Less | 17 | 26.2 | 48 | 73.8 | | |
| **Vitamin B6** | | | | | | |
| Good | 2 | 14.3 | 12 | 85.7 | 72 | 0,30 |
| Less | 16 | 27.6 | 42 | 72.4 | | |
| **Folic acid** | | | | | | |
| Good | 0 | 0 | 0 | 0 | 72 | 0 |
| Less | 18 | 25 | 54 | 75 | | |
| **Vitamin B12** | | | | | | |
| Good | 11 | 29.7 | 26 | 70.3 | 72 | 0,34 |
| Less | 7 | 20 | 28 | 80 | | |
| **Vitamin C** | | | | | | |
| Good | 3 | 27.3 | 8 | 72.7 | 72 | 0,85 |
| Less | 15 | 24.6 | 46 | 75.4 | | |
| **Vitamin A** | | | | | | |
| Good | 8 | 42.1 | 11 | 57.9 | 72 | 0.04 |
| Less | 10 | 18.9 | 43 | 81.1 | | |

Source: Primary data 2014

**Nutrition intake:** The average nutrient intake of pregnant women was lower than RDA except for Zinc and Vitamin $B_{12}$) (Table 2).

Furthermore, the correlation between nutrient intake and nutritional anemia status of pregnant women are presented in Table 3.

Table 4: Relationship between nutritional status of pregnant women dayak kenyah with Iron consumption in the District of Kutai regency tabang 2014

| Iron tablet consumption | Nutritional anemia status ------- of pregnancy ------- Not anemia | | --- Anemia --- | | --- Total --- | | value of p |
|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | |
| None | 10 | 43.5 | 13 | 56.5 | 23 | 100 | 0.008 |
| ≤30 tablets | 4 | 11.8 | 30 | 88.2 | 34 | 100 | |
| 31-60 tablets | 1 | 10.0 | 9 | 90.0 | 10 | 100 | |
| 61-90 tablets | 3 | 60.0 | 2 | 40.0 | 5 | 100 | |
| Total | 18 | 25 | 54 | 75 | 72 | 100 | |

Source: Primary data 2014

Table 3 shows that there are two types of intake of nutrients that have a statistically significant relationship with the occurrence of anemia in pregnant women, $p<0.05$, namely iron intake with $p = 0.04$ and intake of vitamin A with $p = 0.04$ too. Although the intake of Vitamin $B_{12}$ and Vitamin C is not statistically significant but the percentage of mothers with good intake of vitamin $B_{12}$ that do not have anemia is higher than the mothers with less intake of vitamin $B_{12}$. Likewise, the intake of Vitamin C.

The study shows there is a significant association between the intake of iron with anemia in pregnant women, in which 57.1% of pregnant women whose intake of iron is good are not anemia, while 78.5% who with the less intake are anemia.

The result showes the relation between vitamin A intake with anemia is statistically significant with $p = 0.04$. Anemia does not occur at 42.1% of pregnant women with the good intake while at 57.9% suffered of anemia, whereas among the less intake of vitamin A there are 81.1% with anemia and 18.9% not anemia. Vitamin A is a fat soluble vitamin and plays a role in the absorption and mobilization of iron for red cell formation in the body. The good sources of vitamin A are vegetables and fruits. The low status of vitamin A will make iron stores can not be utilized for the process of erythropoiesis. In addition, Vitamin A and $\beta$-carotene will form a complexes with iron to create iron remains dissolved in the intestinal lumen so that iron absorption can be helped (Kirana, 2011).

Vitamin A deficiency can cause disturbances in iron metabolism (Meiji and Chew, 1988; Suharno *et al*., 1993; Ahmed *et al*., 1996) and will develop the anemia through effects on iron metabolism, hematopoiesis and increased susceptibility to infection (Semba and Bloem, 2002). Few nutrition studies around the world show a close relationship between vitamin A deficiency and anemia (Ahmed *et al*., 1996). There is clear evidence of the relationship between serum retinol and indicators of iron and vitamin A deficiency, as one of the causes of anemia (Semba and Bloem, 2002).

Furthermore, the relationship between the nutritional status of pregnant women with anemia who consumed iron are presented in Table 4.

Table 4 shows that anemia does not occur in 11.8% of pregnant women who take iron less than or equal to 30 tablets while 88.2% are anemia. Similarly, for the consumption of iron tablet 31-60, there are 10% of pregnant women who are not anemia and 90% are anemia. Furthermore, for the pregnant women who did not consume iron tablet, there are 43.5% of pregnant women who are not anemia and 56.5% are anemia. The relationship between the consumption of iron tablets with anemia is statistically significant with $p = 0.008$ ($p<0.05$).

The government runs the program of iron tablets and folic acid supplementation for pregnant women across the country. This program is an effort to overcome anemia for pregnant women over the years, but until now it does not give a positive result yet. The coverage is still low (32.2%) and the prevalence of anemia among pregnant women remains high (37.1%) (Ministry of Health, 2013). Likewise the results of studies in Maros regency in 2011 showed that out of the 188 pregnant women who consumed in average of 29.89 iron tablets, there were still 40.4% experienced anemia. This means that the amount of iron tablets consumed is not able to meet the iron needs. Moreover, the intakes of foods that rich in iron are also very low (Fatimah *et al*., 2011). This is consistent with study in India where among pregnant women who consume less iron tablets, 12.5% of women suffered from anemia and 3.1% of women are not anemic (Dasgupta *et al*., 2012).

The reason why the iron tablets supplementation program is less effective is because the less compliance of consuming iron tablets and also that some pregnant women have normal Haemoglobin level or have a good intake of iron. Other study found those condition.

**Conclusion:** The gestational age, iron intake, vitamin A intake and consumption of iron tablets of pregnant women were significantly associated with the incidence of anemia in pregnant women of Dayak Kenyah. The improvement of the pattern of iron intake and other nutrients and the compliance of consumption of iron tablets for pregnant women could prevent and reduce the occurrence of anemia and further impacts.

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