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Article

Correlation OfMaternal Serum Ferritin With Cord Blood Dopamine Concentration

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ABSTRACT

Anemia in pregnancy is a common health problems today, where iron deficiency is the main cause. Iron deficiency will affect the various organs and metabolic pathways, especially the central dopamine pathway. Dopamine is a neurotransmitter that is found in brain and affects human interpersonal actions and correlations. The purpose of this study was to determine the correlation of maternal serum feritin with cord blood dopamine concentration. The design of this study was cross sectional, observe 30 pregnant women with their babies born in Rika Hardi, SSiTmaternity clinic. Samples were selected by consecutive sampling. Ferritin and dopamine concentration was checked at BalaiLaboratoriumKesehatan West Sumatera, where ferritin concentration by ECLIA and dopamine concentration by ELISA. Data were analyzed with Spearman correlation test to find the correlation of maternal serum feritin with cord blood dopamine concentration. The study results obtained, mean concentration of maternal serum ferritin 33,21±26,08 ng/mL and cord blood dopamine concentration 172,27±27,21 ng/L. Correlation test of maternal serum feritin with cord blood dopamine concentration had p value = 0,301 (p>0,05). In this study, we can conclude that there is no correlation between maternal serum feritin with cord blood dopamine concentration. Further research is needed by considering various factors that affect maternal ferritin such as food intake and iron concentration supplementation, and which affect dopamine concentration, such as stress and adequate sleep.

I. INTRODUCTION

Pregnant women are one of the groups that are susceptible to malnutrition. During pregnancy mother and the fetus must increase nutrition needs because it must meet the nutritional needs of the mother and the fetus. Therefore, pregnant women need to pay attention to nutrition intake. Mistakes in this case will adversely affect the mother and the embryo. Anemia in pregnancy is one of the most common health problems today. WHO (2011) showed that in the age of 15-49 years there were approximately 32.4 million cases of anemia in pregnancy or by 38%. The countries of Southeast Asia, Western Mediterranean, and Africa are the areas with the most cases. For Southeast Asia. Indonesia and Thailand are ranked fourth highest, higher than Malaysia (27%) and Singapore (28%)(WHO, 2015).Riskesdas(2013) recorded the prevalence of anemia in pregnant women in Indonesia by 37.1%; higher than (2007) which amounted to 24.5% (Ministry of Health RI, 2013).

The USAID's A2Z Micronutrient and Child Blindness Project, ACCESS Program, and Food and Nutrition Technical Assistance (FANTA) Project (2006) report that about 50% of all types of anemia are estimated to result from iron deficiency (USAID et al., 2006). WHO scores are not much different, estimated at about 30-40% (WHO, 2015).

Many other studies also explain that iron deficiency is a major cause of anemia in pregnancy. An example is a study conducted by Sukrat and Sirichotiyakul in Thailand (2006), there is 43.1% of anemia in pregnancy was due to iron deficiency. Research in Malawi also found out of 150 pregnant women, 32% of whom had iron deficiency and one or more micronutrients (Van den Broek and Letsky, 2000). In Tanzania also showed correlation anemia of pregnant women with iron deficiency (Hinderaker et al., 2002).

Anemia during pregnancy has a correlation with low birth weight, preterm birth, fetal death, and inadequate iron reserves in newborns. This condition will cause high perinatal and maternal, and also morbidity is still high (Ahmad et al., 2010). According to Putri et al. (2015) in Semarang district it was found that out of 126 pregnant women with anemia who experienced abortus as many as 91 people (40.6%).

The amount of iron in the body can be assessed by measuring ferritin concentration, because iron is stored in this form. Availability of sufficient ferritin during pregnancy will be very beneficial for the development of the baby's brain. Ferritin plays a role in determining the intelligence of a child from the womb. Perinatal ferritin deficiency will have an impact on subsequent life, because of its role in neurocognitive and neurobehavioral development in the final two thirds of pregnancy (Estrada, 2014).

Ferritin is involved in various neurological functions. The existing ferritin will be able to support neuronal and glial energy metabolism, dendritic arborization, synaptogenesis, neurotransmitter synthesis, myelination. Ferritin deficiency affects behavior, where one becomes apathetic, emotional, fatigue, lack of concentration, often anxiety, hypoactivity, and decreased cognition and attention (Oski, 1993).

Ferritin deficiency will affect various organs and metabolic pathways, and the most sensitive of these are central dopamine pathways. Dopamine is a neurotransmitter found in the brain. These chemicals are called center of brain power. Most human interpersonal actions and correlations are influenced by this substance. Dopamine plays a role in regulating behavior and cognition, motivation, inhibiting prolactin production, plays in sleep, dreams, emotions, attention, working memory, and learning (Beard et al., 2006; Calabresi et al., 2007).

The correlation between ferritin and dopamine function has been studied for a long time in various experimental animals. The effect of ferritin and dopamine developed rapidly during early life in line with the increase in the number and density of dopamine transporters and their receptors. Ferritin is associated with monoamine oxidase activity, which is an enzyme that is for degradation important the of neurotransmitters. Ferritin is localized to dopaminergic nerves throughout the brain, extracellular dopamine and norepinephrine are elevated in the brains of iron-deficient mice, but other neurotransmitters do not. In addition, the loss of ferritin concentration in the brain is specific to certain areas of the brain and is a heterogeneous effect of dopamine neurology, whereas in areas where concentration do not fall, there is no change in dopamine (Erikson et al., 2001).

The number of problems regarding ferritin in pregnant women that will affect the development of the fetus, and no studies that see the correlationferitinconcentration of pregnant women aterm with dopamine concentration, the authors feel the need to conduct further research. Based on the description above, the authors are interested in conducting a study entitled "Correlation of maternal serum feritin with cord blood dopamine concentration ".

II. METHODS

The design of this study was cross sectional, observe 30 pregnant women with their babies born in Rika Hardimaternity clinic. Samples were selected by consecutive sampling. Ferritin and dopamine Balai concentration was checked at Laboratorium Kesehatan West Sumatera, where ferritin concentration by ECLIA and dopamine concentration by ELISA. This research was conducted in Aprilto May 2018.

III. RESULT

Characteristics of Respondents In this study, the characteristics of 30 pregnant women aterm are shown in the following table.

Mean age, parity and gestational age of the respondent

| Karakteristik | Mean | SD | Med | Min | Max |
|---------------|-------|------|-----|-----|-----|
| Age of | 29,43 | 6,04 | 28 | 18 | 41 |
| pregnant | | | | | |
| women | | | | | |
| Paritas (ke-) | 2,27 | 1,53 | 2 | 1 | 8 |
| | | | | | |
| Usiakehamilan | 39,50 | 0,78 | 40 | 38 | 41 |
| (minggu) | | | | | |

shows that the mean age of pregnant women is at the fertile age, is 29.43 ± 6.04 years. The mean parity was 2.27 ± 1.53 , and the mean of pregnancy of the respondent was aterm, is 39.53 ± 0.78 weeks.

Univariate Analysis

Univariate analysis is an analysis performed on each research variable. Univariate analysis was used to find out the description of the distribution of research variables including serum ferritin and serum dopamine concentration. The analysis results are as follows:

Average Concentration of Ferritin and Dopamine for Pregnant Women

Mean of ferritin and dopamine concentration of pregnant women in this study can be seen in the following table.

Respondents' ferritin and dopamine concentration

| Variabel | Mean | SD | Med | Min | Max | |
|----------|--------|-------|--------|--------|-------|--|
| Feritin | 33,21 | 26,08 | 23,81 | 10,05 | 93,97 | |
| (ng/mL) | | | | | | |
| Dopamin | 172,27 | 27,21 | 173,25 | 120,00 | 217,5 | |
| (ng/L) | | | | | | |

In table 3.2 it appears that the mean ferritin level of respondents is normal, which is 33.21 ± 26.08 ng / mL where the normal mean ferritin of third trimester pregnant women> 39 ng / Ml. The mean dopamine value was 172.27 ± 27.21 ng / L. In this study, the data distribution test showed that the dopamine content data was normally distributed, while the ferritin content was not

normally distributed. After transformation, ferritin content data remained not normally distributed. Therefore, an analysis of the correlation between ferritin concentration and dopamine concentration of the umbilical cord was used to test the Spearman

IV. DISCUSSION

This research was conducted on 30 people at term pregnant women and gave birth in Rika Hardimaternity clinic.

UnivariateAnalysis

Average of Ferritin Concentration and cord blood Dopamine

Serum ferritin is a measure of iron storage in body tissues. Low concentration of ferritin become an early sign of iron deficiency and anemia (Millichap et al., 2006).

Ferritin is currently considered the most important indicator in determining iron status in the iron deficiency stage wherein the concentration will decrease. However, ferritin will increase due to several factors such as infection and inflammation in pregnant women, so high values not always indicate good iron status. feritinneeds of pregnant women aterm is about 39 ng / mL. In this study, 70% of the samples had ferritin concentration below their needs. That is, there are still many pregnant women who have iron deficiency, which in turn will affect the occurrence of anemia during pregnancy. This is accordance with Riskesdas(2013) which recorded the prevalence of anemia in pregnant women in Indonesia is still quite high, at 37.1%; higher than 2007 which amounted to 24.5% (Ministry of Health RI, 2005; Ministry of Health RI, 2013).

The mean dopamine concentration in this study was $172,27 \pm 27,21$ ng / L. Dopamine is associated with modulation of

correlation. The results of the analysis show that there is no significant correlation between the two variables (p > 0.05). Thus, the value of r does not need to be calculated again.

psychomotor activity and executive function. Dopamine works by reprogramming brain function through the process of increasing the stimulation of the synapse in the course of a person's behavior (Tumbelaka et al., 2012).

Bivariate Analysis

Correlation OfMaternal Serum Feritin With Cord Blood Dopamine Concentration

Ferritin is a signal of iron storage in the body. Low ferritin concentration are an early sign of iron deficiency and anemia. Ferritin is an essential nutrient for mental, motor, and cognitive development. Ferritin is required in the production of tyrosine hydroxylase, an enzyme that plays a role in the production of levodopa, which then decarboxylates into dopamine (Connor &Benkovic, 1992; Tumbelaka et al., 2012).

Dopamine plays an important role in various nervous system, ranging from regulating motor functions to regulating the emotional status and regulation of the hypothalamic-pituitary axis. Dopamine system disorders associated with aggressive behavior, obsessive compulsive, and excessive self-stimulation (Mardion, 1995; Pinzon, 2007).

Nutrition and growth factor play a role in brain development both at prenatal and postnatal. Many micronutrients are important for brain development, one of them is Fe.the impact of deficiency or micronutrient excess depends on when iron deficiency, how much and how long iron deficiency.

If Iron deficiency anemia occurs at less than 2 years of age the impact will be irreversible, and the study showed 6 of 8 children with iron deficiency anemia over 2 years of age supplemented with good results. (Riskesdas, 2103).

Deficiency of ferritin will decrease the activity of tyrosine hydroxylase. As a result, the synthesis of dopamine will decrease, which will lead to neurodegeneration and neurological abnormalities (Pinzon, 2007). In this study, an analysis of the correlation between ferritin and cord blood dopamine concentration of umbilical cord in maternal was used Spearman test, significant when p <0.05. The results of the study, in which the analysis showed no significant correlation between maternal serum feritin with cord blood dopamine concentration(p=0.301).

Research about maternal ferritin concentration with cord blood dopamine concentration has never been done before. Existing research is to look at the correlation of maternal ferritin concentration with cognitive and motory function in infants who are born. However, the studies cancaused as a reference for this study.

In this study, different results from previous studies have shown an association between maternal ferritin and cognitive and motor function of the infant born, which certainly indicates a link between ferritin and dopamine. As Grantham-McGregor &Ani's 2001 study suggested that ferritin deficiency during pregnancy can lead to long-term cognitive and motor impairment in the baby being delivered. In addition, Siddappa et al. (2004) also found diabetic mothers with ferritin deficiency will give birth to infants with low concentrations of ferritin, which subsequently result in memory impairment in speech recognition (Grantham-McGregor &Ani, 2001; Siddappa al., 2004). et Research in the United States in 1992 obtained results that support the results of this study. Based on the **MMPI** questionnaire, it was reported that ferritin and hemoglobin concentration were not associated with depression. Kiddie et al. (2010) and Oner&Oner (2008) found no association between ferritin concentration with clinical symptoms and the severity of hyperactivity disorders attention and (GPPH) in children (Hunt &Pelland, 1999; Kiddie et al., 2010; Oner&Oner, 2008).

In this study, the researchers did not classify between iron deficiency anemia mothers and no iron deficiency anemia, thus affecting the results obtained. Grouping of pregnant women with anemia and no amemia is also needed, as the impact of ferritin on dopamine is more visible in women with low ferritin concentration. In addition, the use of iron or multivitamin supplements and other drugs that can affect serum ferritin concentration. Blood vapor level examination is also needed to rule out the possibility of inflammation or chronic infection that mav affect ferritin concentration. However, C-reactive protein testing is believed to be more meaningful to rule out the possibility of infection.

Limitations of ResearchThis study has the following limitations:

- 1) There is no control over the stress management and lifestyle of respondents that may affect dopamine concentration.
- 2) Limitations do not predict the mother's pregnancy age 37-41 weeks with the results of ferritin and dopamine examination.

V. CONCLUSION

The mean ferritin level of term pregnant women is 33.21 ± 26.08 ng/mL.The mean dopamine level of umbilical cord was 172.27 ± 27.21 ng/L.There is no correlation between ferritin concentration of term pregnant women with umbilical cord dopamine concentration. There are other factors that support ferritin concentration such as maternal food intake and iron supplementation and dopamine concentration in maternal stress, sleep disturbances and memory.

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