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Correlation of Maternal Zinc Levels with Neonatal Zinc and Neonatal Outcomes

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***Abstract*—Background: The aim of the study determine the correlation of maternal zinc levels with neonatal zinc and neonatal outcomes. Methods: The study was conducted using a cross sectional study. The study was conducted at Independent Midwifery Practice in Mandiangin Sub-district Koto Selayan Bukittinggi City, West Sumatera Province, Indonesia from July-December 2018. The population in this study were a term pregnant women, sample size 54 people. Sampling technique with consecutive sampling. Zinc level examination used atomic absorption spectrophotometry method test. Hypothesis test used pearson correlation. A two-tailed *P*-value of <0.05 was considered statistically significant. Results: The results of the study were a negative relationship with a weak strength between maternal zinc levels and neonatal zinc levels. There is no positive relationship between maternal zinc levels and neonatal height. There is a positive relationship with a weak strength between maternal zinc levels and neonatal body weight. There is a negative relationship with a weak strength between maternal zinc levels and neonatal head circumference. Conclusion: There were positive relationship with the weak strength between maternal zinc levels and neoantal zinc levels and nenoatal outcomes: height, weight and neonatal head circumference.**

***Index Terms*—maternal zinc levels, neonatal zinc level, neonatal outcomes, height, weight, head circumference**

I. INTRODUCTION

According to the Basic Health Research Data in Indonesia in 2013 the prevalence of Low Birth Weight (LBW) reached 10.2%, while in West Sumatra Province the prevalence of LBW reached 7.5%, which increased by 1.5% compared to 2010 which was only at 6%. In 2015 the number of LBW births in West Sumatra Province was 1,376 cases out of 58,529 live births (2.35%) which had increased from the previous two years [1].

Previous study states that in developing countries, the incidence of LBW is mainly caused by Intrauterine Growth Restriction (IUGR) due to micronutrient malnutrition during pregnancy [2]. Maternal nutritional status during pregnancy is an important determinant of fetal growth and development. Pregnant women in developing countries are proven to consume low micronutrients during pregnancy [3].

It is estimated that around 82% of all pregnant women in the world occurence zinc deficiency. Generally zinc deficiency occurs in developing countries [4]. This is also supported by data by the World Health Organization (WHO) which states that more than 80% of pregnant women worldwide have low zinc intake [5].

Another study showed that fetuses that grow with zinc deficiency end up with abnormalities in the central nervous system and zinc deficiency in pregnant women showing congenital abnormalities [6]. Zink functions for fetal growth and development. Zinc deficiency during pregnancy can cause LBW, IUGR, preterm birth and other complications during pregnancy [7].

The aim of the study determine the correlation of maternal zinc levels with neonatal zinc and neonatal outcomes.

II. MATERIALS AND METHODS

A. Study Design and Research Sample

The study was conducted using a cross sectional study. The study was conducted at Independent Midwifery Practice in Mandiangin Sub-district Koto Selayan Bukittinggi City, West Sumatera Province, Indonesia from July-December 2018. The population in this study were a term pregnant women, sample size 54 people. Sampling technique with consecutive sampling..

B. Operational Definitions

The variables of this study included independent variable is maternal zinc levels and dependent variable are neonatal zinc levels and neonatal outcomes.

C. Data Collection Technique

This study was approved by the Ethical Committee of Medical Faculty, Universitas Andalas with registration number 470/KEP/FK/2018. The measurement of maternal zinc levels and neonatal zinc levels used atomic absorption spectrophotometry method test. Neonatal outcomes measured: height, weight and neonatal head circumference.

D. Data Analysis

The quantitative variables were recorded as Mean±SD, median and percentage. Test the normality of data by Kolmogorov-smirnov test and hypothesis test used pearson correlation test. A two-tailed *P*-value of <0.05 was considered statistically Data were analyzed using the SPSS version 21.0.

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III. Results

Characteristics of respondents (Table 1).

Table 1: Characteristics of respondents

Characteristics	f(%) (n=54)
Education	
Bachelor	25 (46.3)
Senior high school	27 (50.0)
Junior high school	1 (1.9)
Elementary school	1 (1.9)
Parity	
Primiparous	19 (35.2)
Multiparous	35 (64.8)
Occupation	
Housewife	26 (48.1)
Teacher	6 (11.1)
Private employee	21 (38.9)
Merchant	1 (1.9)

Table 1 showed half of respondents have senior high school education (50.0%), more than half of respondents were multiparous (64.8%) and less than half of respondents were housewife (48.1%).

Table 2: Mean of maternal zinc levels, neonatal zinc levels, height, weight's neonatal dan head circumference

Variables	Mean (SD)
Maternal zinc	213.94 ± 54.12
Neonatal zinc	202.93 ± 72.47
Neonatal's height	49.57 ± 1.05
Neonatal's weight	3.35 ± 0.39
Head circumference	32.94 ± 1.18

Table 2 showed the mean of maternal zinc levels (213.94 ±54.12 µg/gram), neonatal zinc levels (202.93 ± 72.47 µg/gram), neonatal's height (49.57 ± 1.05 cm), neonatal's weight (3.35 ± 0.39 kg) and head circumference (32.94 ± 1.18 cm).

Table 3: Correlation of maternal zinc levels with neonatal zinc and neonatal outcomes

Variables	Pearson correlation (r)	p
Maternal zinc with neonatal zinc levels	-0.08	0.55
Maternal zinc levels with neonatal's height	0.07	0.61
Maternal zinc levels with neonatal's weight	0.24	0.08
Maternal zinc levels with head circumference	0.01	0.99

Table 3 known there were a negative relationship with a weak strength between maternal zinc levels and neonatal zinc levels. There is no positive relationship between maternal zinc levels and neonatal height. There is a positive relationship with a weak strength between maternal zinc levels and neonatal body weight. There is a negative relationship with a weak strength between maternal zinc levels and neonatal head circumference.

IV. DISCUSSION

The results of this study known there were positive relationship with the weak strength between maternal zinc levels and neoantal zinc levels and nenoatal outcomes: height, weight and neonatal head circumference.

Previous study in developing countries have a positive relationship between prenatal zinc supplements and birth weight [8]. Zinc serum levels in LBW infants were lower than normal birth weight infants. This study also shows that zinc levels are positively correlated with birth weight [9].

A study conducted on 131 children in Brazil showed a significant association of zinc serum with protein intake, in this study it was explained that zinc was transported into the blood binding to albumin (70%), α-2-makroalbumin (18%), and in small amounts bind to transferrin, ceruloplasin, and amino acids, specifically histidine and cysteine. The fact that there were positive correlation between protein intake and serum zinc means that zinc absorption is affected by zinc intake, therefore a lack of protein intake can affect zinc serum levels [10].

Another previous studies conducted in developing countries have a positive relationship between prenatal zinc supplementation and birth weight [8]. Serum zinc levels in LBW infants are lower than normal BBL babies. This study also shows that zinc levels are positively correlated with birth weight [9].

Zinc deficiency in animal experiments during early brain development causes defects, while subsequent deficiencies in brain development cause microscopic abnormalities and can eventually damage brain function. A number of limited studies have shown that the same phenomenon can occur in humans [10].

There are several factors that can affect absorption and excretion of zinc, among others, inadequate intake, infectious diseases, physiological conditions, increased needs, excessive excretion and interactions between zinc and nutrients and non-nutrients. Zinc contained in plant food sources has a lower bioavailability compared to animal foods because plants contain various compounds that can inhibit zinc metabolism in the body such as phytate, polyphenols, tannins and fiber. In addition to zinc intake, protein intake is an important aspect that has an influence on zinc absorption [9,11,12].

Intake of confounding nutrients copper intake that has a relationship to zinc serum. Copper is a competitive zinc substance in fighting over transporters and ligands. Excessive copper intake can interfere with the taking of zinc bonds by metalothionin in enterocytes. Metalotionin has a great affinity for copper compared to zinc [8,9,13].

V. CONCLUSION

The conclusion of this study confirmed there were positive relationship with the weak strength between maternal zinc levels and neoantal zinc levels and nenoatal outcomes: height, weight and neonatal head circumference.

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