Relationship between topography of the residential area

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Original Research Article

Relationship between topography of the residential area of breastfeeding mothers with zinc and calcium level in breast-milk in West Sumatera

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ABSTRACT

Background: Natural environment, the topography of the residential area affects the nutritional intake of the community greatly. Geographically (including the topography of the residential area), the nutritional intake will affect breastfeeding mothers, because the quantity and quality of breast milk is influenced by the food consumed by mothers every day.
Methods: This was observational research with a comparative cross-sectional design. The research was conducted at the Integrated Laboratory of LLDIKTI region X in December 2018 to January 2019 using the Atomic Absorption Spectrophotometer (AAS). Samples were 80 breastfeeding mothers consisting of 40 mothers living in lowland and 40 mothers in Highland. Data analyzed using the Kolmogorov Smirnov normalization test and Mann-Whitney test, if $p = 0.05$, was considered significant.
Results: Research showed that there was a significant relationship between the topography of residential area with zinc ($p = 0.00$) and calcium levels ($p = 0.00$). Zinc and calcium levels in breastfeeding mothers were higher in mothers who live in the lowlands than in the highlands.
Conclusions: The conclusion of this study, there is a significant relationship between the topography of the residential area of breastfeeding mothers with zinc and calcium levels in breast milk.

Keywords: Breast milk, Calcium, Topography, Zinc

INTRODUCTION

The natural environment, the topography of the residence area affects the nutritional intake of the community greatly. Based on geography (including the topography of residential area), each region has a different environment, such as resources, waters, temperature, weather, climate, soil fertility, and environmental health. This causes differences in the types of food commodities produced and food availability in these areas. The hilly area is dominant in vegetables, secondary crops and farm products and people tends to consume food sources of vegetable protein. The difference in these types of commodities causes differences in the types and amounts of food consumed daily. Most people in the lowland and coastal areas tend to consume food sources of animal protein derived from the sea and its processed products.[1,2]

Geographical differences such as differences in altitude above sea level will cause differences in weather and overall climate in that place, especially temperature, humidity, and rainfall. High rainfall can cause leaching of nutrients, especially minerals in soils from the highlands to lowlands. The low level of soil minerals due to this

leaching will greatly affect the mineral content of plants that grow on it. In addition to influencing plants, minerals in the soil also cause a decrease in mineral content in water. Plants and water with low mineral content consumed mainly by breastfeeding mothers are then expected to affect the milk produced.[3]

Some of the minerals needed for baby's growth are zinc and calcium. Zink is the second largest metal element among the elements that become human nutritional needs. Unlike iron, zinc is relatively evenly distributed throughout the body especially as a component of thousands of zinc metalloproteins. Zinc elements are essential trace elements for the body.[4,5]

Calcium is one of the substances needed from infancy to old age. The amount of calcium can be distinguished by sex and age. According to a nutritionist, the calcium requirements needed by Indonesians are on average 500-800mg/day and will increase during pregnancy and lactation.[6,7]

According to research conducted in Ethiopia in 2 population groups in the mountainous area and lowlands where the basic food sources in the two groups were different. The results showed a difference in calcium levels in breast milk of women living in mountainous areas with lowland areas ($p<0.01$). This difference is influenced by the mother's food intake and the geographical location of the mother's residence. However, no significant differences were found in zinc levels in breast milk of women living in mountainous areas with lowland areas ($p>0.05$).[8]

Research conducted by Joko (2000) on zinc levels in breast milk in urban, rural and coastal areas found the difference of food consumption of breastfeeding mothers containing zinc in these three regions. In mothers living in the coastal area, there is a significant relationship between the consumption of food containing zinc to zinc levels in breast milk. The results of this study are in line with that of Andi (2016). It was found that the average zinc content in low breast milk was found in women with a low zinc intake.[9,10]

This study aims to determine the relationship of the topography of residential areas with zinc and calcium levels in breast milk.

METHODS

This study was an observational study with a comparative cross-sectional design. The population was breast milk from breastfeeding mothers in the highland areas in Tanah Datar Districts and lowlands in Padang. The samples were 80 breastfeeding mothers consisting of 40 breastfeeding mothers in the lowlands and 40 mothers in the highlands. Sampling technique was done by proportionate random sampling. The inclusion criteria for this study were breast milk from mothers who had babies aged 3-5 months who were exclusively breastfed, babies with normal weight (2500gr-4000gr), mothers who gave birth at term (enough months), breastfeeding mothers who did not have chronic diseases (kidney disease and diabetes mellitus), mothers who do not have the habit of drinking alcohol and who do not smoke. The research instrument was the Food Frequency Questionnaire (FFQ) to determine maternal food intake containing zinc and calcium.

Breast milk was taken using gloves with breast milk pumps in the morning at 08.00 a.m. to 12:00 p.m. Before the milk is taken, both mother's breasts must be clean. Breast milk is put in a bottle of 10 ml using a 10cc syringe. Then the bottle is labelled the mother's name and then stored in the coolbox within <24hours until it reaches the laboratory. The sample was destructed with nitric acid to clear and yellowish, then added distilled water to the boundary mark and shaken until the solution is homogeneous, then this solution is ready to be measured by AAS (atomic absorption spectrophotometer). Data analyzed using the Mann-Whitney nonparametric test with a significance level of $p<0.05$.

RESULTS

Data of zinc levels and calcium levels analyzed using the Kolmogorov Smirnov normality test. The results of the normality test show data of zinc level, calcium levels are abnormally distributed because of the p-value <0.05. Statistical analysis was continued by using non-parametric namely Mann-Whitney to see the relationship of Topography of the residence area of breastfeeding mothers with zinc and calcium levels in breast milk.

Table 1: Relationships of topography of residential area with zinc levels in mother's breast milk.

Topography	Zinc level in breast milk Mean±SD (mg/100ml)	p value
Highland	0.165±0.0761	0.000
Lowland	0.507±0.254	

It can be seen in Table 1 that zinc levels in the mother's breast milk from the lowlands are higher than in the highlands. Statistically using the Mann-Whitney test shows p-value = 0.000 ($p<0.05$), it can be concluded that there is a relationship between the topography of residential area with zinc levels in breast milk in breastfeeding mothers living in the highlands and lowlands.

From Table 2, it can be seen that the calcium level in breast milk of mothers living in lowlands is higher than in the highlands. Statistically using the Mann-Whitney test shows the p-value = 0.000 ($p<0.05$), it can be concluded that there is a topographic relationship between the area of residence and calcium levels in breast milk in

breastfeeding mothers living in the highlands and lowlands.

Table 2: Relationships of topography of residential area with calcium levels in mother's breast milk.

Topography	Calcium level in breast milk Mean±SD (mg/100ml)	p value
Highland	220.50±52.97	0.000
Lowland	342.01±92.60	

DISCUSSION

The average level of zinc in breastfeeding mothers living in lowland was 0.507±0.254mg/100ml while the mean zinc level of breastfeeding mothers in highland was 0.165±0.076mg/100ml. Statistically using the Mann-Whitney test shows the value of p = 0.000 (p<0.05), it can be concluded that there is a relationship between the topography of the area of residence on zinc levels in breast milk in breastfeeding mothers living in the highlands and lowlands.

This research is in line with Joko (2000) about zinc levels in breast milk in urban, rural and coastal areas in finding that there was a difference (p<0.01). In coastal area there was a significant association of consumption of food containing zinc to zinc levels in breast milk (p<0.01). The results of this study are also in line with Andi (2016). It was found that the average zinc level in breast milk is low in women with a low zink intake.[9,10]

According to the study of Maluwork et al in Ethiopia in 2 population groups in the mountainous area and lowland areas where the basic food sources in the two groups were different, the results showed no significant differences in zinc levels in breast milk (p>0.05).[8]

Zinc concentration in breast milk ranges from 0.5-2.1mg/l. Estimates of zinc nutrient concentrations in mature breast milk are 1.2±0.2 (mg/L±SD). Whereas zinc composition in breast milk is at the ages of 1, 2, 3, 4, 5, 6 respectively with values of 0.5mg, 0.4mg, 0.4mg, 0.35mg, 0.35mg, and 0.3mg.[11,12]

Based on that discussion of the levels of zinc concentration in breast milk shows that the concentration value of 0.5-0.8 is the limit of zinc concentration in breast milk from several theories. It can be seen from the results of this research data it was found that zinc levels in breastfeeding mothers in the lowlands were fits with the theory. However, the average zinc level of breastfeeding mothers in the highlands is less than the concentration value of several research journals about the value of zinc concentrations in breast milk. Lack of zinc concentration in breast milk can cause a negative impact on the baby if there is a deficiency or lack of zinc intake.

Zinc is an important substance in the baby's body, the source of zinc in food is often found in meat, milk and some seafood, which comes from animal sources, where animal sources have better absorption compared to vegetable sources. This is because vegetable sources are often bound by phytate. Breastfeeding mothers in lowland areas contain more zinc in their diet because on average, mothers in the lowlands consume many animal sources from the sea, this directly increases zinc in breast milk (Nutriclub, 2018).[13,14]

The average of calcium levels in breastfeeding mothers living lowland is 342.01±92.60mg/l while the average calcium level of breastfeeding mothers in highland up to 220.50±52.97mg/l. Based on these results, there are significant differences in the calcium levels of lowland and highland's breastfeeding mothers.

Statistically using the Mann-Whitney test shows the value of p = 0.000 (p<0.05), it can be concluded that there is a relationship between topographic the area of residence with the calcium levels in breastfeeding mothers living in the highlands and lowlands.

This study is in line with Maluwork et al (2013) in Ethiopia in 2 population groups in mountainous areas and lowland areas where the main food sources in the two groups were different. The results showed a difference in calcium levels in breast milk of women living in mountainous areas with lowland areas (p<0.01). This difference is influenced by the mother's food intake and the geographical location of the mother's residence.[8]

The research conducted by Chaidir et al (2016) showed that the average level of calcium in breast milk in 37 samples was 344.25mg/l.[15] Oxford in 2015, which was 280mg/l, so in the other two studies conducted in China in 2009 and 2010, the average calcium concentrations detected were 300mg/l and 280mg/l respectively.[7,16,17] In studies conducted in several countries such as Sweden (165mg/l), Taiwan (230mg/1), USA (258mg/l), and Egypt (261mg/l).[18] All detected lower when compared to this study.

CONCLUSION

There is a relationship between the topography of the residential area with zinc levels in breastfeeding mothers which is zinc levels in breastfeeding mothers are higher in mothers who live in the lowlands than in the highlands. There is a regional topographic relationship to calcium levels in breastfeeding mother which is the calcium level in breastfeeding mothers is higher in mothers living in the lowlands than in the highlands. In lowland and highland areas through local health workers, it is necessary to improve health education, especially health promotion about nutrition to increase intake of calcium and zinc because it also affects the production of breast milk.

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