

Conference Paper

## The Correlation of Vitamin A Deficiency and Micronutrient Consumption in Breast-feeding Moms and the Incidence of ARI and Diarrhea in Babies

Arvina Dian Wahyu Permatasari<sup>1\*</sup>, Didik Gunawan Tamtomo<sup>2</sup>, Budiyantri Wiboworini<sup>3</sup>

<sup>1</sup>Department of Human Nutrition Sciences, Postgraduate Student, Sebelas Maret University, Surakarta, Indonesia

<sup>2</sup>Master Program in Public Health, Sebelas Maret University, Surakarta, Indonesia

<sup>3</sup>Department of Nutrition, Faculty of Medicine, Sebelas Maret University, Surakarta, Indonesia

\*Corresponding author:

E-mail: arvinadian20@gmail.com

### ABSTRACT

The incidence of ARI and diarrhea in infants has increased due to the low nutritional content especially vitamin A and other micronutrients in breast milk. This study aimed to determine the relationship between vitamin A deficiency, micronutrient supplement consumption on breastfeeding mothers with ARI (Acute Respiratory Infections) and diarrhea on infant. Cohort study was conducted in four public health center Semarang, Central Java Province from August 2021 to January 2022. Samples were 40 breastfeeding mothers taken by purposive sampling. Data were collected using a questionnaire via Goggle Form to know micronutrient supplement consumption and infant morbidity, and direct interview using 2x24hour food recall questionnaire to know vitamin A deficiency on mothers. Data were analyzed using the spearman rank correlation test. Adequate vitamin A intake was 87.5%, 52.5% mothers consumed micronutrient supplement, 40% infants were suffering from ARI and 32.5% had diarrhea. Relationship between vitamin A deficiency with incidence and frequency of diarrhea was not significant ( $r = -0.10$ ,  $p = 0.54$ ), ( $r = -0.07$ ,  $p = 0.63$ ). Relationship between vitamin A deficiency with incidence and frequency of ARI was not significant ( $r = -0.15$ ,  $p = 0.34$ ), ( $r = -0.17$ ,  $p = 0.28$ ). Relationship between supplement consumption with incidence and frequency of diarrhea was not significant ( $r = -0.13$ ,  $p = 0.44$ ), ( $r = -0.13$ ,  $p = 0.44$ ). Relationship between supplement consumption with incidence and frequency of ARI was not significant ( $r = -0.16$ ,  $p = 0.31$ ), ( $r = -0.16$ ,  $p = 0.29$ ). Thus, vitamin A deficiency and micronutrient supplement consumption was not associated with ARI and diarrhea on infant.

*Keywords: Vitamin A, micronutrient, breastfeeding, ARI and diarrhea on infant*

### Introduction

Acute Respiratory Infections (ARI) and infant diarrhea are infections that are the leading causes of death in Indonesia (Elvandari et al., 2016; Kemenkes RI, 2020). In 2019, the infant mortality rate (IMR) in Semarang City was 35% due to pneumonia and 23% due to diarrhea (Dinas Kesehatan Kota Semarang, 2019). Micronutrient deficiency, especially vitamin A deficiency, is one of the risk factors for ARI and diarrhea. Micronutrients are vitamins and minerals that the human body needs in very small amounts. However, they play an important role in immune system regulation (Subagio & Damayanty, 2021). Vitamin A is a micronutrient that helps the immune system and protects the body from diseases such as measles, ARI, and diarrhea (Hardiansyah, 2017).

#### How to cite:

Permatasari, A. D. W., Tamtomo, D. G., & Wiboworini, B. (2022). The correlation of vitamin A deficiency and micronutrient consumption in breast-feeding moms and the incidence of ARI and diarrhea in babies. *2<sup>nd</sup> Basic and Applied Science Conference (BASC) 2022*. NST Proceedings. pages 15-20. doi: 10.11594/nstp.2022.2503

In children under five, vitamin A deficiency (VAD) can increase the risk of respiratory diseases and diarrhea, which can contribute to growth retardation. VAD decreases antibody production and IgA secretion and has been linked to an increase in infant morbidity and mortality (Huang et al., 2018; Sirisinha, 2015). Because vitamin A status in infants is determined by the nutritional adequacy of breastfeeding mothers, breastfeeding mothers are already at risk of vitamin A deficiency because the body excretes vitamin A in breastmilk (Pratiwi, 2013). This risk occurs when mothers do not get enough vitamin A from their meals. The amount of vitamin A needed for breastfeeding mothers is 960 RE/day (Rahmadani et al., 2020; Kemenkes RI, 2019).

According to study, there is a substantial association between vitamin A consumption and the incidence of diarrhea in toddlers, toddlers with vitamin A deficiency having a 23.5 times risk of diarrhea (Restuti & Fitri, 2019). As shown in a survey taken in one of Semarang City's public health center areas, 62% of breastfeeding mothers have a deficiency in vitamin A, while less than 80% meet the Recommended Dietary Allowances (RDA) (Fauzia & Widajanti, 2016). This implies, the majority of breastfeeding mothers have not met their vitamin A needs through meals. In contrast to another study in Semarang City, which found that vitamin A consumption among 62 breastfeeding mothers was adequate (82%), and inadequate (18%) (Rahmadani et al., 2020). This study aimed to determine the relationship between vitamin A adequacy and micronutrient supplement consumption in breastfeeding mothers with ARI (Acute Respiratory Infections) and diarrhea in infants. The benefit of research for breastfeeding moms is that mothers can prevent diarrhea and ARI in infants by improving the quality of their breastmilk, especially the consumption of vitamin A and other micronutrients.

## Material and Methods

This study uses an observational research design with a cohort study at the Public Health Center (Puskesmas) Mangkang, Puskesmas Karangdoro, Puskesmas Tlogosari Wetan, and Puskesmas Halmahera in Semarang, Central Java Province. The research was conducted for 6 months, starting from August 2021 to January 2022. Purposive sampling was used to select a sample of forty breastfeeding mothers. They were eligible to participate in the study if the delivery was vaginal and they had, at least second parity, and normal birth weight, but they were excluded if they and their family at home had COVID-19 during the research to ensure that the ARI's symptoms in infants were not COVID-19 symptoms. Vitamin A intake was assessed using a 2x24 hour food recall questionnaire. Micronutrient supplement consumption and infant morbidity were assessed using a survey questionnaire via Google Form and completed by participants once every week for two months.

Measurement of the variables used in the enclosed and open questionnaire in each item. Vitamin A adequacy is measured by two indicators: adequate ( $\geq 77\%$  RDA) and less than (77% RDA) (Gibson, 2005). With micronutrient supplement consumption, the incidence of ARI and diarrhea in infant was measured by two indicators, yes and no. The frequency of ARI was determined by three indicators: frequently ( $> 5$  times), rarely ( $< 5$  times), and never. Diarrhea frequency was measured using three indicators: frequently ( $> 2$  times), rarely ( $< 2$  times), and never. The Nutrisurvey software was used to convert vitamin A intake data into grams per day, which were then compared to the Recommended Dietary Allowances (RDA) for vitamin A for breastfeeding mothers per day.

The protocol for this study was approved by the Research Ethical Committee, Faculty of Medicine, Universitas Sebelas Maret, Surakarta with number 74/UN27.06.6.1/kep/ec/2021. The Spearman rank correlation test was used to determine the relationship between vitamin A deficiency and micronutrient supplement consumption and the incidence and frequency of ARI and diarrhea in infants. SPSS for Windows 16 version was used to analyze the data. Statistical testing is done with a significance level of 5%.

## Results and Discussion

The general characteristics of research participants, such as age, education, job, and baby gender, were shown in table 1. Based on age characteristics, participants most commonly are aged 20 – 25 years old (37.5%), have completed their education at senior high school (57.5%), do not work or only as a housewife (62.5%), and have a baby of male gender (60%).

Table 1. Characteristics of research participants

| Characteristics                | n = 40 | %    |
|--------------------------------|--------|------|
| <b>Age</b>                     |        |      |
| 20 – 25 years old              | 15     | 37.5 |
| 26 – 30 years old              | 13     | 32.5 |
| 31 – 35 years old              | 12     | 30   |
| <b>Education</b>               |        |      |
| Elementary School              | 1      | 2.5  |
| Junior High School             | 5      | 12.5 |
| Senior High School             | 23     | 57.5 |
| Diploma/Bachelor               | 11     | 27.5 |
| <b>Job / Employment Status</b> |        |      |
| Not working                    | 25     | 62.5 |
| Employee                       | 8      | 20   |
| Entrepreneur                   | 5      | 12.5 |
| Farmer/labor                   | 1      | 2.5  |
| Other                          | 1      | 2.5  |
| <b>Baby gender</b>             |        |      |
| Male                           | 24     | 60   |
| Female                         | 16     | 40   |

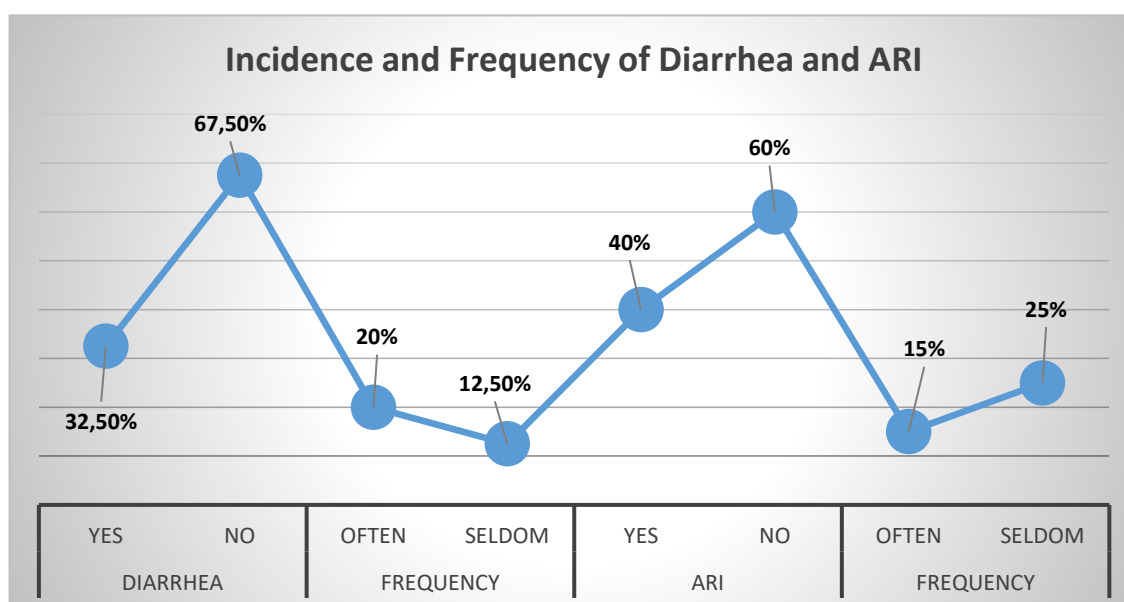


Figure 1. Incidence and frequency of diarrhea and ARI

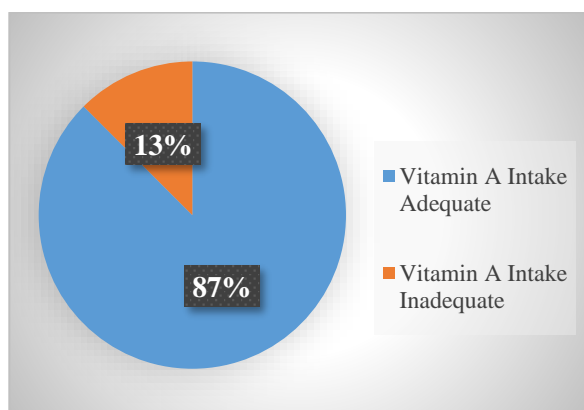


Figure 2. Vitamin A intake

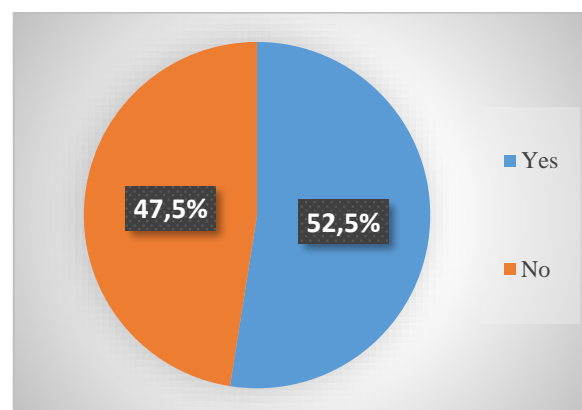


Figure 3. Miconutrient supplement consumption

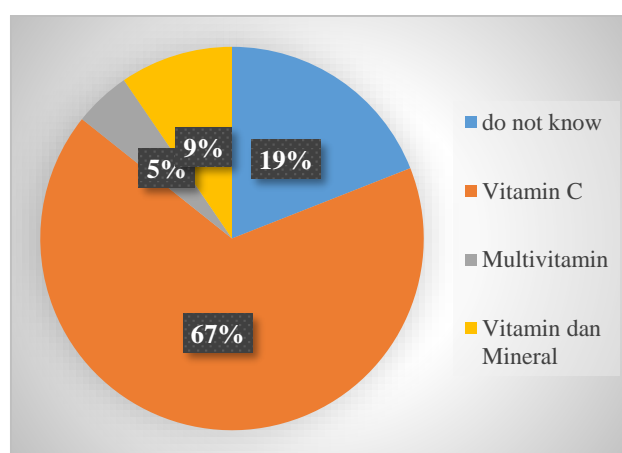


Figure 4. Distribution of micronutrient supplement content

Table 2. Spearman rank correlation test

|                       | Vitamin A intake            |         | Micronutrient Supplement Consumption |         |
|-----------------------|-----------------------------|---------|--------------------------------------|---------|
|                       | Correlation coefficient (r) | p-value | Correlation coefficient (r)          | p-value |
| Incidence of diarrhea | -0.10                       | 0.54    | -0.13                                | 0.44    |
| Frequency of diarrhea | -0.07                       | 0.63    | -0.13                                | 0.44    |
| Incidence of ARI      | -0.15                       | 0.34    | -0.16                                | 0.31    |
| Frequency of ARI      | -0.17                       | 0.28    | -0.17                                | 0.29    |

Diagram in figure 1 showed that the incidence of ARI was found to be 40%, and the incidence of diarrhea was found to be 32,5%. The Diagram in figure 2 showed that breast-feeding mothers most commonly had vitamin A intake that was adequate (87.5%. This result same as the other research in Semarang City, which showed that the consumption of vitamin A in 62 breastfeeding mothers was adequate (82%) (Rahmadani et al., 2020). These results shows that most breastfeeding mothers have met the needs of vitamin A as well. The consumption of micronutrient supplements was shown in figure 3. Breastfeeding mothers most commonly consume supplements at 52.5%. According to the results of the study, supplements consumed by breastfeeding mothers contain several micronutrients (vitamins and minerals) such as Vitamin A,

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Vitamin B6, Vitamin B12, Vitamin D, Vitamin E, Calcium (Ca), Ferrous (Fe), Folic Acid, Zinc (Zn), Magnesium (Mg), and Pottasium (K).

Based on the Spearman rank test correlation coefficient and p-value, it shows that there is no relationship between vitamin A adequacy and diarrhea morbidity in infants, which is why the p-value was less than 0.05. These results are similar to those of Mastin (2015), who showed that vitamin A deficiency was not associated with the incidence of infant morbidity. However, there was a tendency that the better the mother's vitamin A adequacy was, the shorter the duration of infant morbidity (Mastin & Roosita, 2015). This is possible because the Spearman test result shows a negative correlation direction, which means that increasing the consumption of vitamin A and micronutrient supplements will reduce the incidence of diarrhea and ARI, even though the correlation strength level is very weak.

According to this study, the incidence of ARI and diarrhea in infants is decreased in most breastfeeding moms who get enough vitamin A, this is possible because vitamin A status in infants depends on the nutritional intake of breastfeeding mothers (Pratiwi, 2013). This risk occurs when mothers are not getting enough vitamin A from their meals. Breastfeeding mothers needed 950 RE/day of vitamin A (Rahmadani et al., 2020; Restuti & Fitri, 2019). The other study showed a significant correlation between breastfeeding mothers' vitamin A status and their infants. Breastfeeding mothers who are vitamin A deficient have a 17.5 times higher risk of suffering from vitamin A deficiency in their infants (Sandjaja, 2015).

There is no relationship between vitamin A intake and the incidence of ARI and diarrhea in infants can be affected by the type of foods consumed or the form of vitamin A. Preformed Vitamin A (Retinol, Retinyl Esters) and provitamin A carotenoids such as betacarotene that are converted to retinol are the two main forms of vitamin A in the human diet. Animal food products (beef liver, chicken liver, fish eggs, egg yolk, and milk) include preformed vitamin A, as do fortified meals and vitamin supplements. Carotenoids, which are precursors of provitamin A, are found in green vegetables, yellow vegetables, and fruits (mango and papaya) (Almatsier, 2009). According to the result of a 2x24 hour recall interview, cooking oil is the food that contributes the most vitamin A sources.

This study found that breastfeeding mothers who consumed more micronutrient supplements had a lower incidence and frequency of ARI, as well as a lower incidence and frequency of diarrhea. This can be due to variances in the content and dosage of micronutrients consumed by breastfeeding moms it can cause differences in the effectiveness of micronutrients on morbidity. Based on the distribution of the micronutrient supplement content diagram in Figure 4, Vitamin C has the highest micronutrient supplement content. Vitamin C has antioxidant activity and can reduce oxidative stress and inflammation, improve immune cell function, and modify epigenetic immunology (Subagio & Damayanty, 2021).

Infant's Acute Respiratory Infections (ARI) and diarrhea can be caused by several factors, either directly or indirectly. Stunting, lower economic status, lower mother's knowledge, lower nutritional status, frequency of breastfeeding, immunization status, air pollution, smoking habits in parents or other family members in the house, personal hygiene of breastfeeding mothers when preparing food and when giving food to the baby or when breast-feeding, too many of families living in the house are several factors that can cause ARI and diarrhea in infants (Ramani et al., 2016; Imran et al., 2019). Some of the factors that cause ARI and diarrhea in infants as indicated above, were not assessed in this research.

## **Conclusion**

Vitamin A deficiency and micronutrient supplement consumption was not associated with ARI and diarrhea in infant, because this study used a limited number of research participants, so we could not generalize the results to a bigger population like In the Indonesian population, and to improve this research, it is possible to carry out a multifactor analysis such as nutritional status,

protein intake, mother's knowledge, immunization status, air pollution, smoking habits, member of families living in the house, and personal hygiene of breastfeeding mothers.

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