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The Effect of Vitamin A Supplementation on Infant Nutritional Status in Sorong City

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Abstract: Babies will have strong immunity if they get breast milk, because a number of nutrients are transferred from the mother. Breast milk helps protect babies from disease because of the anti-infective substances contained in breast milk and plays an important role in the growth and development of babies. Unfortunately, the target of 80% coverage of breastfeeding in Indonesia is still far from reality. This study aims to determine the effect of high-dose vitamin A supplementation on infant nutritional status. The research design was pre-experimental with a one-group pretest-posttest design conducted from June to September 2024. The statistical analysis used was the Wilcoxon Signed Ranks test with a significance level of 0.05. In this study, the population was all babies at the Remu Health Center, Sorong City. Then, screening of heterogeneous postpartum mothers who had received vitamin A capsules was carried out. Then the heterogeneous study population according to the inclusion criteria with a simple random sampling technique, a homogeneous population was obtained and was willing to fill in the Informed Consent. Two vitamin A capsules were given, namely one capsule on the first day after delivery and one capsule on the second day of delivery. Before being given vitamin A, the baby's weight, height and age were measured. Furthermore, after three months, measurements were taken by measuring BB, PB and Age. Prodia Clinical Laboratory, Sorong Branch for analysis of retinol levels of postpartum mothers. The nutritional status of infants was measured before and after the intervention.

Keywords: Infant Nutritional; Supplementation; Vitamin A.

Introduction

Breastfeeding is an invaluable investment to create a healthy generation of quality physically and emotionally. The benefits of breast milk according to the objectives of the Millennium Development Goals (MDGs) are to reduce infant and child mortality rates and improve maternal health (Huang et al., 2020). Therefore, breastfeeding is the best choice to meet children's nutritional needs during the first two years of their lives (Sudargo & Aristasari, 2018).

If nutrients transferred from the mother are lacking, especially micronutrients (vitamin A and zinc), it will increase the incidence of various diseases such as infections and decreased immune function such as decreased surface function of signaling cell molecules from T cells and lymphokine production. WHO states that around 15% of total cases of infant mortality in developing countries are caused by not breastfeeding (Chen et al., 2012).

Several studies provide clear evidence that vitamin A deficiency not only causes an increase in various diseases but also causes blindness and has a negative impact on the health and overall survival of infants. Infants and children with mild xerophthalmia have a 2-3 times greater risk of suffering from infectious diseases, and can even cause death (Kadir, 2022).

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Breast milk plays an important role in growth and development. Breastfed babies will show very significant weight gain and in accordance with their growth lines (Blixt et al., 2023; Olga et al., 2023). Research shows that 70 babies (89.7%) have normal growth and 8 babies (10.3%) have deficient growth (Hariani et al., 2016). Babies who receive adequate nutrition will experience an average weight gain of: 700-1000 grams/month in the first trimester and 500-600 grams/month in the second trimester. Meanwhile, the average length of a newborn baby is 50 cm, and generally the increase in the child's length reaches 1.5 x birth height at the age of 1 year. The growth of babies who receive breast milk is mostly normal, especially babies who receive exclusive breast milk (Fitri et al., 2014; Sánchez et al., 2021).

The target of 80% coverage of breastfeeding in Indonesia is still very far from reality. The results of the 2013 Riskesdas, breastfeeding only for 6 months was 30.2% and based on the results of the 2010 Riskesdas, the provision of vitamin A capsules for 6-59 months was 69.8% (Balitbangkes, 2010), and the results of the 2013 Riskesdas, the provision of vitamin A capsules was 75.5%, while the national target was 90% (Balitbangkes, 2013).

Vitamin A provision in Indonesia has been carried out since 1978, in an effort to reduce the prevalence of morbidity and prevent vitamin A deficiency by providing high-dose vitamin A capsules of 100,000 IU to infants and 200,000 IU to toddlers. In 2003, HKI together with UNICEF recommended the provision of vitamin A to postpartum mothers or postpartum mothers, namely 200,000 IU twice (Muchlis, 2022).

Nearly 10 million toddlers suffer from subclinical vitamin A deficiency (VAD) (serum retinol ≤ 20µg/dl), and 60,000 of them are accompanied by symptoms of Bitot's spots that threaten blindness. Subclinical VAD or low blood retinol levels are closely related to high rates of infectious diseases and mortality rates or impaired health status of infants and toddlers (Ningtyias & Yusi, 2020). The high proportion of toddlers with serum retinol <20 mcg/100 ml causes toddlers in Indonesia to be at high risk for xeropthalmia and decreased immunity levels so that they are easily attacked by disease (Aritonang, 2010).

Methode

The research design was pre-experimental with a one-group pretest-posttest design. The study was conducted in the Remu Sorong Health Center area. The selection of the research location was due to the provision of high-dose vitamin A supplementation of 67% with a prevalence of malnutrition status in infants based on the BW/A index of 9.9%. The 4-month study started from June to September 2024.

The research sample was postpartum mothers who had babies aged 0 to 3 months. Data collected from postpartum mothers were the results of vitamin A supplementation through blood serum retinol levels.

Sampling was done by random sampling so that postpartum mothers were represented proportionally. The steps for sampling were: Recording all babies in the Remu Health Center area; Screening babies whose mothers received vitamin A capsules and were still breastfeeding (Exclusive Breastfeeding); Determining the sample using the formula; and Determining the babies selected as samples with Simple random sampling using a random number table manually.

Research Tools: Vitamin A capsule dose of 200 SI; Baby weight scale, bath scale with an accuracy of 0.1 Kg; Fixation board to measure the baby's body length, with an accuracy of 0.1 cm; and Blood samples to assess the levels of retinol Vitamin A in postpartum mothers.

Measurement procedure

Babies whose weight is measured by removing footwear and head covering, clothing is minimized. Placed on the bath scale, eyes facing straight ahead. Measured by looking at the scale bath scale. Measurements are taken 3 times to reduce measurement bias. Measurements are taken by 2 people.

Body Length Data

Babies whose body length is measured must remove footwear and head covering. Lay between the fixation boards, heels, and head against the board wall, eyes facing straight ahead. Length is measured by sliding the board on one side to see the baby's body length value. Measurements are taken 3 times to reduce measurement bias. Measurements are taken by 2 people.

Vitamin A Supplementation Data

Collected through the administration of vitamin A at a dose of 200 IU immediately after delivery and 1 week after delivery. Determination of serum retinol levels begins with blood sampling by nurses from the Sorong Ministry of Health Polytechnic. Blood sampling is carried out between 08.00 and 10.00 am. The blood sampling procedure is as follows: The nurse brings blood sampling equipment to the sampling location; Blood is taken as much as 3 ml, put into a vacuum teener and put into an Icecooler that already has Blue Ice; Taken to the Prodia Laboratory with a distance from the laboratory that can be reached in 10 - 15 minutes; and In the laboratory, the blood is put into a centrifuge tube. The sample is centrifuged at a speed of 8000 RPM to

separate the blood and serum, so that the serum is ready to be examined using the ELISA Method.

Data Analysis Technique

Data analysis was carried out descriptively and analytically using a computer. The data were analyzed descriptively and presented in the form of frequency distribution, cross tabulation, mean value and Standard Deviation (Menekse et al., 2021). The statistical analysis to test the hypothesis is the Wilcoxon signed rank test, which is to test the difference in nutritional status of infants after being given high-dose vitamin A supplements.

Result and Discussion

Identification of Baby Characteristics

The characteristics of infants studied in this study were age and gender. This study showed that there were fewer female infants than male infants, namely 17 (45.9%). The average age of the infants was 20.03 ± 10.710.

Infants experience extraordinary changes. Growth during infancy occurs faster than in the subsequent life period. Within a year after birth, a normal infant will gain three times their weight, while their body length will increase by 50%. The fastest growth in life occurs during the first four months after birth (Amir & Djokosumojono, 2017). The next four to eight months is a transition period to a slower growth pattern. At eight months of age, the infant's growth pattern is the same as at two years of age. Assessment of physical growth patterns is the main way to determine the nutritional status of infants (Mariyati et al., 2021).

Table 1. Distribution of Infants by Gender

Gender	Frequency (n)	Percentage (%)
Male	20	54.1
Female	17	45.9
Total	37	100

Based on the research results, it is known that the female gender is less, namely 17 (45.9%).

Table 2. Average Age, Weight and Length of Babies

Indicators	Age	Initial body weight (kg)	Final body weight (kg)	Initial body lengt (cm)	Final body length (cm)
Mean	20.03	3.917	6.024	51.589	60.532
Std. Deviasi	10.710	0.8566	0.9536	3.7858	6.2680

Based on the results of the study, it is known that the age of the baby is 20.03 ± 10.710, Initial body weight 3.917 ± 0.8566, final body weight 6.024 ± 0.9536, initial PB 51.589 ± 3.7858, and final body length 60.532 ± 6.2680.

Identification of Infant Nutritional Status

Table 3. Differences in Infant Nutritional Status Before and After Vitamin A Supplementation

Nutritional status	Before Supplementation		After Supplementation	
	n	%	n	%
BW/BL				
Very thin	3	8.1	1	2.7
Thin	4	10.8	4	10.8
Normal	24	64.9	28	75.7
Fat	6	16.2	4	10.8
Total	37	100	37	100
BL/A				
Very Short	2	5.4	0	0
Short	7	18.9	4	10.8
Normal	28	75.7	33	89.2
Total	37	100	37	100
BW/A				
Less	6	16.2	2	5.4
Good	31	83.8	34	91.9
More	0	0	1	2.7
Total	37	100	37	100

Infant growth monitoring is carried out by anthropometric measurements consisting of body weight (BW), body length (BL). Assessment of infant growth is one of the bases for assessing the adequacy of infant nutrition. This assessment can also be reflected in the infant's nutritional status which must be known every month (Fenton et al., 2022; Haiden et al., 2025; Saurina, 2016). Nutritional status is defined as a person's nutritional condition which is stated according to the type and severity of malnutrition. This provides an indication of whether or not a person is suffering from malnutrition (Bossi et al., 2021; Lauwers et al., 2022).

The emergence of nutritional problems can be identified by knowing a person's nutritional status. Determination of a child's nutritional status is done anthropometrically using the Z-score with BW/A, BL/A and BW/BL indices. These three indices are one way to determine a child's current nutritional status (Ginanti et al., 2017).

The results of the study showed that nutritional status based on the BW/BL index before supplementation was highest in the normal category, namely 24 babies (64.9%) and after supplementation increased to 28 babies (75.7%). Nutritional status based on the PB/U index before supplementation was highest in the normal category, namely 28 babies (75.7%) and

after supplementation increased to 33 babies (89.2%). Nutritional status based on the BL/A index before supplementation was highest in the normal category, namely 28 babies (75.7%) and after supplementation increased to 33 babies (89.2%). Average Initial Body Weight 3.917 ± 0.8566, Final Body Weight 6.024 ± 0.9536, Initial Body Weight 51.589 ± 3.7858, and Final Body Weight 60.532 ± 6.2680.

This proves that vitamin A supplementation can contribute to infant growth or infant nutritional status. Although based on the results of the Wilcoxon Signed Ranks test, namely nutritional status according to the BW/BL, BL/A and BW/A indices were not significantly different (p> 0.05). This is because the increase in BB and PB values is not too much/high, although the reality is that there is an increase in infant BW and BL for 3 months after high-dose vitamin A administration to postpartum mothers. Vitamin A affects bone growth by modulating it through changes in bone shape.

The vitamin is needed for the normal cycle of growth, maturation and degeneration of cells in the epiphyseal plate (Thurnham & Northrop-Clewes, 1999). This study is in line with Fitri et al. (2014) research, that breastfeeding on growth and development is not significant and this study is not in line with Zakaria et al. (2016) research, that the intervention group of moringa leaves containing lots of vitamin A is positively related to infant growth. Not in line with Chhagan et al. (2010) research, that the combination of multi-micronutrient supplements with vitamin A increases growth. Also not in line with Muchina & Waithaka (2010) research in Kenya, infants who have been introduced to prelactal food before breastfeeding will have an impact on malnutrition.

Statistical Analysis of Infant Nutritional Status Before and After Vitamin A Supplementation

Table 4. Recapitulation of Statistical Analysis Results of Infant Nutritional Status Before and After Vitamin A Supplementation

Nutritional status	Statistical Test	P	Interpretation
BW/BL	Wilcoxon Signed Ranks	0.672	Not significantly different
BL/A		0.070	Not significantly different
BW/A		0.096	Not significantly different

Based on the results of the Wilcoxon Signed Ranks test, namely nutritional status according to the BW/BL, BL/A and BW/A indexes were not significantly different (p> 0.05).

According to Vitaloka et al. (2019), breastfed babies will show a very significant weight gain and in accordance with their growth line, due to the transfer of nutrients from breast milk to the baby. Based on Lidya & Rodiah (2012) research, 70 babies (89.7%) had normal growth and 8 babies (10.3%) had deficient growth. Babies who receive adequate nutrition will experience an average weight gain of: 700-1000 grams/month in the first trimester and 500-600 grams/month in the second trimester. Meanwhile, the average length of a newborn baby is 50 cm, and generally the increase in the child's length reaches 1.5 times the birth height at the age of 1 year. The growth of babies who receive breast milk is mostly normal, especially babies who receive exclusive breastfeeding. This is because the nutritional content in breast milk is very complete and in accordance with the baby's needs (Sampe et al., 2020).

Conclusion

The average age of the infants was 20.03 ± 10.710, and the gender of the female infants was less, namely 17 (45.9%). The nutritional status of infants based on the weight/length index before supplementation was mostly in the normal category, namely 24 (64.9%) and after supplementation there was an increase of 28 (75.7%). Based on the length/age index before supplementation, the most were in the normal category, namely 28 (75.7%) and after supplementation there was an increase of 33 (89.2%). Based on the weight/age index before supplementation, the most were in the good category, namely 31 (83.8%) and after supplementation there was an increase of 34 (91.9%). Changes in nutritional status according to the weight/length index, length/age, and weight/age after vitamin A supplementation were not significantly different (p>0.05).

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Conflicts of Interest
The authors declare no conflict of interest.

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