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Meta-analysis

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Meta Analysis: Effects of Prelacteal Feeding and Vitamin A Supplementary Intake on Stunting in Children Aged 6-59 Months

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ABSTRACT

Background: Stunting describes the condition of failure to thrive in children under five years old (toddlers) due to chronic malnutrition and recurrent infections, especially in the first 1,000 days of life as a golden period with proper nutrition. This study aimed to examine the effect of prelacteal feeding and vitamin A on the incidence of stunting in children aged 6-59 months using a meta-analysis.
Subjects and Method: The meta-analysis was carried out using the PRISMA flowchart and the PICO model. Population: children aged 6-59 months. Intervention: giving prelacteal feeding and vitamin A. Comparison: not giving prelacteal feeding and vitamin A. Outcome: stunting. The online databases used are Google Scholar, ProQuest and Elsevier with the keywords "Stunting" AND "Prelacteal feeding" AND "Vitamin A" AND "Children Aged 6–59 Months" AND "Multivariate" AND "Cross Sectional". There were 15 cross-sectional studies published in 2013-2023 that met the inclusion criteria. Analysis was performed with RevMan 5.3.
Results: A meta-analysis of 15 articles with a cross-sectional study design from different countries, namely Ethiopia, Uganda, Somalia, Indonesia and Sudan in children aged 6-59 months with a total sample of 94,212 research subjects. The results of the meta-analysis showed that there was an effect of not being given prelacteal feeding on the reduced risk of stunting in children aged 6-59 months. Children who were not given prelacteal feeding had 0.57 times the risk of stunting compared to those who were given prelacteal feeding (aOR= 0.57; 95% CI= 0.38 to 0.84; p= 0.005), Children who were not given vitamin A had a risk of being stunted 1.19 times compared to children who were given vitamin A (aOR= 1.19; 95% CI= 1.00 to 1.41; p= 0.050).
Conclusion: Children who are not given prelacteal feeding and children who are given vitamin A reduce the risk of stunting in children aged 6-59 months.

Keywords: prelacteal feeding, vitamin A, stunting, children aged 6-59 months.

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BACKGROUND

Nutrition is the foundation for the survival and development of a child. Children who have adequate nutrition will have better growth, development, learning abilities, play, resilience, and participation in their environment than those who experience malnutrition. Currently, many children are not getting the nutrition they need to survive and develop, especially the poorest and most vulnerable children. There is 1 in 3 children under the age of 5 years experiencing malnutrition such as stunting. Approximately 144 million children under the age of 5 have age-appropriate (short) stature and low cognitive abilities (UNICEF, 2021b).

Stunting is one of the challenges and global nutritional problems that are being faced by people in the world. Ambitious World Health Assembly In 2020, globally, 149.2 million children under the age of 5 years were stunted, 45.4 million were underweight, and 38.9 million were overweight. The number of children with stunting is declining in all regions except Africa (UNICEF, 2021a).

Ensuring adequate nutrition during the first 1,000 days from conception to a child's second birthday, also known as the 'window of opportunity' can have enormous potential for both short and long term impacts (WFP, 2018).

Based on the results of the Indonesian Nutrition Status Study (SSGI) Ministry of Health, the prevalence of stunting under five is 21.6% in 2022. This means that nearly a quarter of under five stunting is a global and national health problem. The World Health Organization determines that if the prevalence of stunting is between 30% -39%, it means that the area is experiencing a serious problem and if the prevalence is more than 40%, it means that the area is experiencing a serious problem.

Research conducted in Indonesia reports that children who are deficient in vitamin A will experience failure to thrive. In addition, vitamin A also greatly affects the function of the human immune system. As a result, a lack of vitamin A causes the body's resistance to decrease, making it susceptible to infection, for example, if it occurs on the surface of the intestinal wall, it will cause diarrhea. Vitamin A is important in many other tissues and metabolic processes (Simanjuntak et al., 2018).

Research conducted in Ethiopia states that prelacteal feeding affects timely initiation of breastfeeding and exclusive breastfeeding. Globally, suboptimal infant feeding, including prelacteal feeding, contributes to 45% of neonatal deaths, 30% of deaths from diarrhea and 18% of acute respiratory deaths. Prelacteal feeding reduces the immunological benefits derived from colostrum and increases the risk of susceptibility to infection (Hitachi et al., 2019).

Based on the existing literature, a statistical summary is needed to estimate the effect of prelacteal feeding and vitamin A on the incidence of stunting in children aged 6-59 months. Meta-analysis is a statistical combination of results from two or more separate studies, with the objectives of: (1) Increasing precision; (2) Answering questions that were not discussed by previous primary studies; and (3) Addressing controversies arising from primary studies or generating new hypotheses (Deeks et al., 2021). This study aims to analyze previous primary studies in assessing the effect of prelacteal feeding and vitamin A on the incidence of stunting in children aged 6-59 months.

SUBJECTS AND METHOD

1. Study Design

This study uses a systematic review method and meta-analysis using primary data, namely data from previous research results. Article search using 3 databases, namely:

Google Scholar, Elsevier, and ProQuest. The keywords used are "Stunting" AND "Prelacteal feeding" AND "Vitamin A" AND "Children Aged 6–59 Months" AND "Multivariate" AND "Cross Sectional". There were 15 primary studies that met the inclusion criteria of this study.

2. Steps of Meta-Analysis

1) Formulate research questions in PICO (Population, Intervention, Comparison, Outcome). The study population is children aged 6-59 months. The research intervention was prelacteal feeding and vitamin A. The research comparison was not giving perlacteal feeding and vitamin A. The research outcome was stunting.
2) Search for primary study research articles from 3 online databases namely Google Scholar, Elsevier, and ProQuest.
3) Conduct screening and quality assessment of primary research articles.
4) Extracting and analyzing data into the RevMan 5.3 application.
5) Interpret the results and draw conclusions.

3. Inclusion Criteria

Full paper articles are those that use a cross sectional design. The analysis used is multivariate with Adjusted Odds Ratio (aOR). Article publications are in English.

4. Exclusion Criteria

Articles that are not in English and articles published before 2013.

5. Operational Definition of Variable

Stunting is a condition of impaired growth and development in the first 1,000 days of a child's life due to chronic malnutrition. The instrument uses a questionnaire and a measurement scale that is categorical.

Prelacteal feeding is providing food or other drinks besides breast milk during the first three days after birth. The instrument uses anthropometry and a measurement scale that is categorical.

Vitamin A is a fat-soluble vitamin that is essential for maintenance of health and survival. The instrument uses a questionnaire and a measurement scale that is categorical.

6. Instrument

The quality assessment of the main articles in this study used a critical assessment checklist for cross-sectional studies published by the Joanna Briggs Institute (JBI).

7. Data Analysis

The articles in this study were collected using the PRISMA diagram and analyzed using the Review Manager 5.3 application (RevMan 5.3) by calculating the effect size and heterogeneity (I^2) to determine the combined research model and form the final results of the meta-analysis. The results of data analysis are presented in the form of forest plots and funnel plots.

RESULTS

The process of searching for primary articles in this meta-analysis study was carried out on 3 online databases and the results obtained were 15 articles (Figure 1). The total articles were 55,571 articles with details of 78 articles from the ProQuest, 226 articles from the Google Scholar, and 55,298 articles from the Elsevier. Then, 6,492 articles were deleted and 586 full text articles were eligible, 15 articles were included in the meta-analysis.

Figure 2 shows the distribution area of the 14 primary articles used in this study, namely from the African continent (Ethiopia, Uganda, Somalia, Sudan) and 1 primary article used from the Asian continent (Indonesia).

Table 2 presents the Adjusted Odds Ratio (aOR) and 95% Confidence Interval (95% CI) data on the effect of prelacteal feeding on the incidence of stunting.

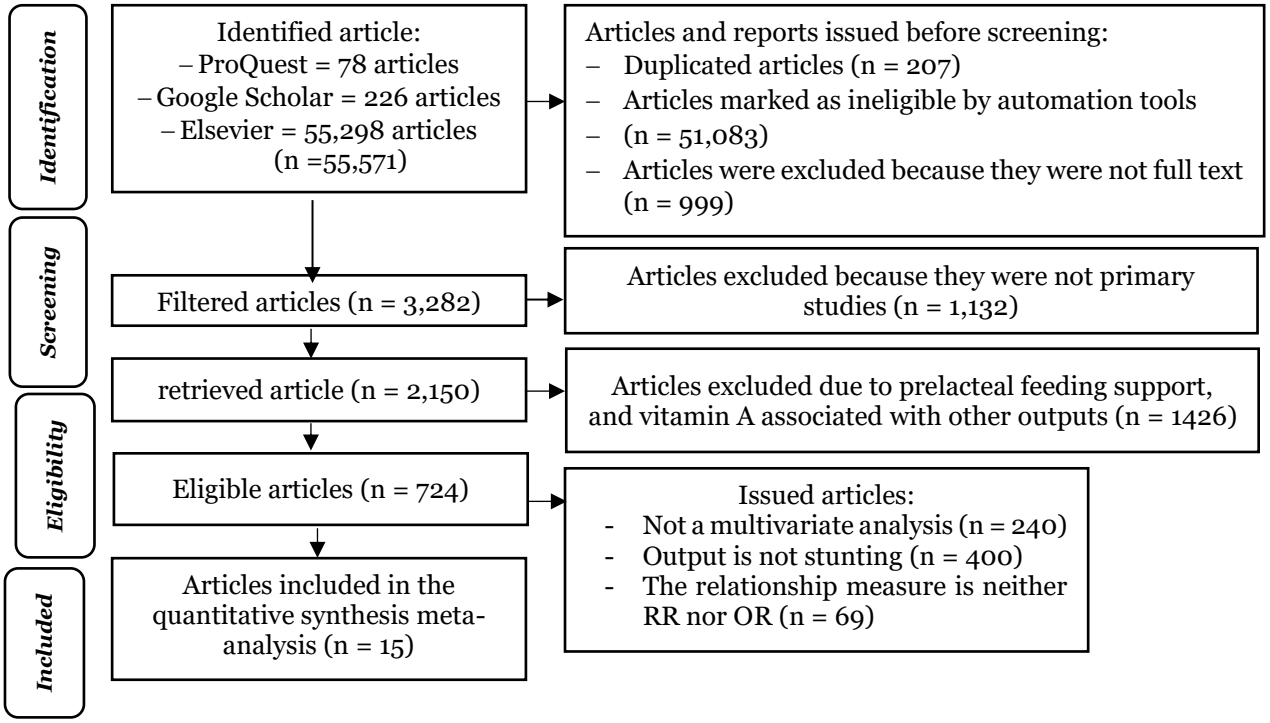

Figure 1. PRISMA 2020 flow diagram of the effects of prelacteal Feeding and vitamin A supplementary intake on stunting in Children aged 6-59 months

Figure 2. Map of the study area on the effects of prelacteal feeding and vitamin A supplementary intake on stunting in children aged 6-59 months

The effect of prelacteal feeding on the incidence of stunting

Table 1 presents descriptions of the 7 primary articles with cross-sectional studies that were included in the meta-analysis of the effect of prelacteal feeding on stunting, with a total sample of 5,307 samples.

Table 1. PICO table summary of cross-sectional articles from primary study sources with sample size (n = 5.307)

Author (Year)	Country	Sample	P	I	C	O
Abebe et al. (2017)	Ethiopia	764	Children aged 6-59 months	Receives prelacteal nourishment	Prelacteal food is not given	Stunting
Azmeraw et al. (2021)	Ethiopia	845	Children aged 6-59 months	Prelacteal feeding	Not given prelacteal food	Stunting
Mengistu et al. (2013)	Ethiopia	820	Children aged 6-59 months	Prelacteal food/liquid	Prelacteal food/liquid not given	Stunting
liben et al. (2016)	Ethiopia	401	Children aged 6-59 months	Get prelacteal feeding	Not getting prelacteal feeding	Stunting
Akalu (2018)	Ethiopia	840	Children aged 6-59 months	prelacteal feeding	Prelacteal feeding is not given	Stunting
Mulatu et al. (2022)	Ethiopia	841	Children aged 6-59 months	Prelacteal feeding	Not given prelacteal feeding	Stunting
Asfaw et al. (2015)	Ethiopia	796	Children aged 6-59 months	Feeding the prelacteals	Not given prelacteal feeding	Stunting

Table 2. Data of adjusted Odd Ratio (aOR) and 95% Confidency Interval (95%CI) for the effect of prelacteal feeding on the incidence of stunting with a sample size (n= 5,307)

Author (Year)	aOR	95% CI	
		Upper Limit	Lower Limit
Abebe et al. (2017)	0.96	0.48	1.92
Azmeraw et al. (2021)	0.79	0.48	1.30
Mengistu et al. (2013)	0.32	0.18	0.57
liben et al. (2016)	0.98	0.50	1.92
Akalu (2018)	0.42	0.17	1.00
Mulatu et al. (2022)	0.42	0.16	1.10
Asfaw et al. (2015)	0.26	0.08	0.85

Table 3 shows the results of the primary research quality assessment used for this study. The primary study quality assessment in this study was carried out using a cross-sectional appraisal study by JBI (Joanna Briggs Institute, 2017).

Based on the results obtained from the study quality assessment, the total scores in the 15 selected primary studies ranged from 15 to 16. This indicates that the quality of all primary articles used in this study is worthy of meta-analysis.

Table 3. Critical appraisal checklist for cross-sectional studies in meta-analyses

Article	Questions of Checklist								Total
	1	2	3	4	5	6	7	8	
1. Wulandari dan Trini (2021)	2	2	2	2	2	2	2	2	16
2. Abebe et al. (2017)	2	2	2	2	2	2	2	2	16
3. Azmeraw et al. (2021)	2	2	2	2	2	2	2	2	16
4. Mengistu et al. (2013)	2	2	2	2	2	2	1	2	15
5. Liben et al. (2016)	2	2	2	2	2	2	2	2	16
6. Akalu (2018)	2	2	2	2	2	2	2	2	16
7. Mulatu et al. (2022)	2	2	2	2	2	2	2	2	16
8. Asfaw et al. (2015)	2	2	2	2	2	2	1	2	15
9. Muche et al. (2017)	2	2	2	2	2	2	2	2	16
10. Ssentongo et al. (2020)	2	2	2	2	2	2	2	2	16
11. Teferi dan Teshome (2021)	2	2	2	2	2	2	2	2	16
12. Kinyoki et al. (2016)	2	2	2	2	2	2	2	2	16
13. Bukulu (2020)	2	2	2	2	2	2	2	2	16
14. Feleke et al. (2021)	2	2	2	2	2	2	2	2	16
15. Kiarie et al. (2021)	2	2	2	2	2	2	2	2	16

Description of the question criteria:
1= Are the criteria for inclusion in the sample clearly defined?
2= Were the research subjects and settings explained in detail?
3= Is exposure measured in a valid and reliable way
4= What are the standard criteria used for measuring objective conditions?
5= Were confounding factors identified?
6= Were strategies for dealing with confounding factors stated?
7= Are the results measured in a valid and reliable way?;
8= Was proper statistical analysis used?

Answer score description:
0= No
1= Can't tell
2= Yes

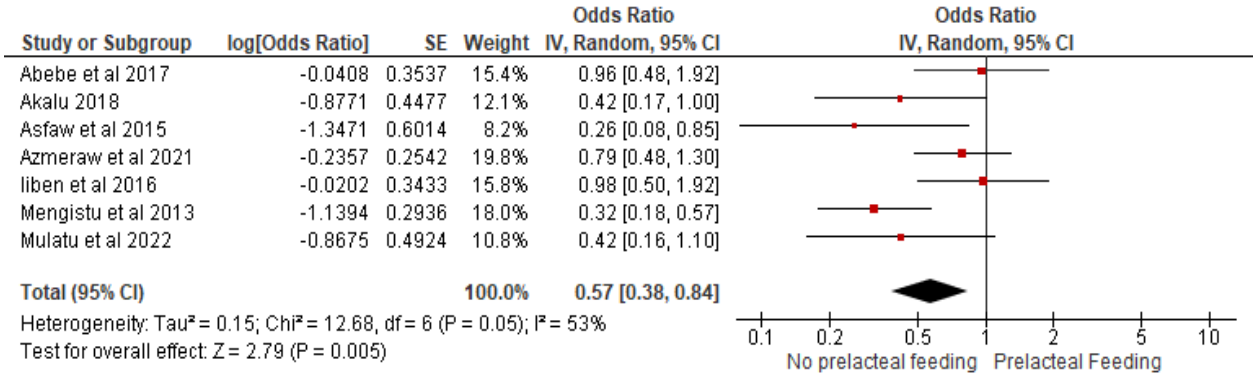

Figure 3. Forest plot of the effect of prelacteal feeding on the incidence of stunting in children aged 6-59 months

The forest plot in Figure 3 shows that there is an influence between not being given prelacteal feeding on reducing the risk of stunting in children aged 6-59 months. Children who were not given prelacteal feeding had 0.57 times the risk of stunting compared to those who were given prelacteal feeding (aOR= 0.57; 95% CI= 0.38 to 0.84; p=

0.005). The forest plots also show high heterogeneity of effect estimates between primary studies with (I^2 = 53%; p= 0.050). Thus, the calculation of effect estimation is carried out using a random-effect-model approach.

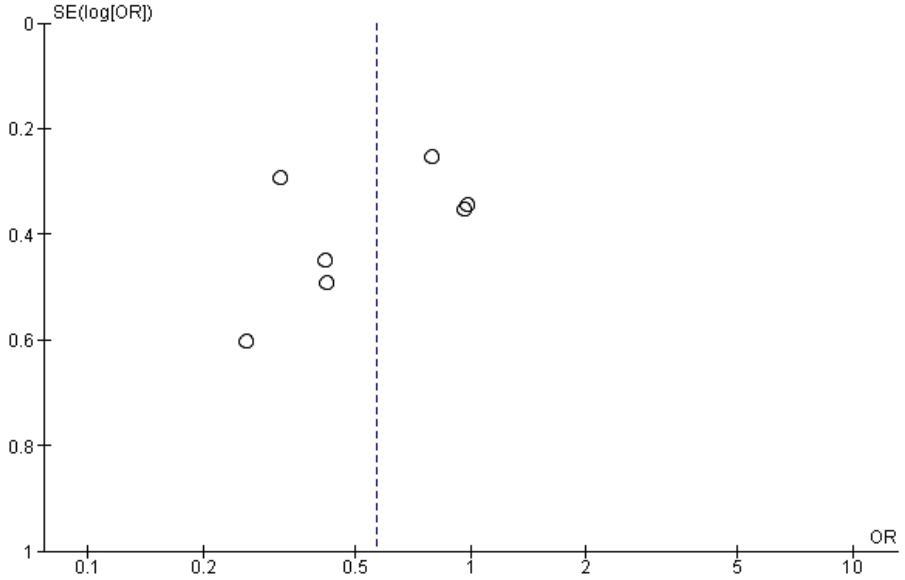

Figure 4. Funnel plot of the effect of prelacteal feeding on the incidence of stunting in children aged 6-59 months

The funnel plot in Figure 4 shows that the distribution of effect estimates between studies is asymmetric, that is, the distribution or distribution of effect estimates to the left of the vertical line of the average effect estimate is relatively larger than to the right (overestimate). Thus, this funnel plot indicates publication bias.

Table 4. Table PICO summary of cross-sectional articles from primary study sources with sample size (n = 88.905)

Author (Year)	Country	Sample	P	I	C	O
Muche et al. (2017)	Ethiopia	8,117	Children aged 6-59 months	Given vitamin A	Not given vitamin A	Stunting
Ssentongo et al. (2020)	Uganda	4,765	Children aged 6-59 months	Provides vitamin A	Not getting vitamin A	Stunting
Teferi and Teshome (2021)	Ethiopia	227	Children aged 6-59 months	Vitamin A supplementation	Vitamin A supplementation is not given	Stunting
Kinyoki et al. (2016)	Somalia	73,778	Children aged 6-59 months	vitamin A supplement	Vitamin A supplements are not given	Stunting
Bukulu (2020)	Ethiopia	357	Children aged 6-59 months	Get vitamin A	Not getting vitamin A	Stunting
Feleke et al. (2021)	Ethiopia	419	Children aged 6-59 months	Take vitamin A	Not taking vitamin A	Stunting
Wulandari and Trini (2021)	Indonesia	612	Children aged 6-59 months	Vitamin A intake	Vitamin A intake is not given	Stunting
Kiarie et al. (2021)	Sudan	630	Children aged 6-59 months	Receiving vitamin A	Not receiving vitamin A	Stunting

The effect of vitamin A on the incidence of stunting

Table 4 presents descriptions of the 8 primary articles with cross-sectional studies that were included in the meta-analysis of the effect of vitamin A on stunting, with a total sample of 88,905 samples.

Table 5 presents the Adjusted Odds Ratio (aOR) and 95% Confidence Interval (95% CI) data on the effect of vitamin A on stunting events.

Table 5. Data of adjusted Odd Ratio (OR) and 95% Confidence Interval (95%CI) of the effect of vitamin A on the incidence of stunting with a large sample (n = 88.905)

Author (Year)	aOR	CI 95%	
		Upper Limit	Lower Limit
Muche et al. (2017)	1.00	0.89	1.12
Ssentongo et al. (2020)	1.43	1.08	1.89
Teferi and Teshome (2021)	2.00	1.05	3.80
Kinyoki et al (2016)	1.00	0.94	1.06
Bukulu (2020)	1.02	0.68	1.53
Feleke et al. (2021)	3.20	1.50	6.83
Wulandari and Trini (2021)	1.58	1.07	2.33
Kiarie et al. (2021)	0.70	0.38	1.29

The forest plot in Figure 5 shows that there is an effect of giving vitamin A on the risk of stunting. Children who were not given vitamin A had a risk of stunting 1.19 times compared to children who were given vitamin A (aOR= 1.19; 95% CI= 1.00 to 1.41; p= 0.050).

The forest plots show high heterogeneity of effect estimates between primary studies (I^2 = 72%; p < 0.001). Thus, the calculation of effect estimation is carried out using the random effect model approach.

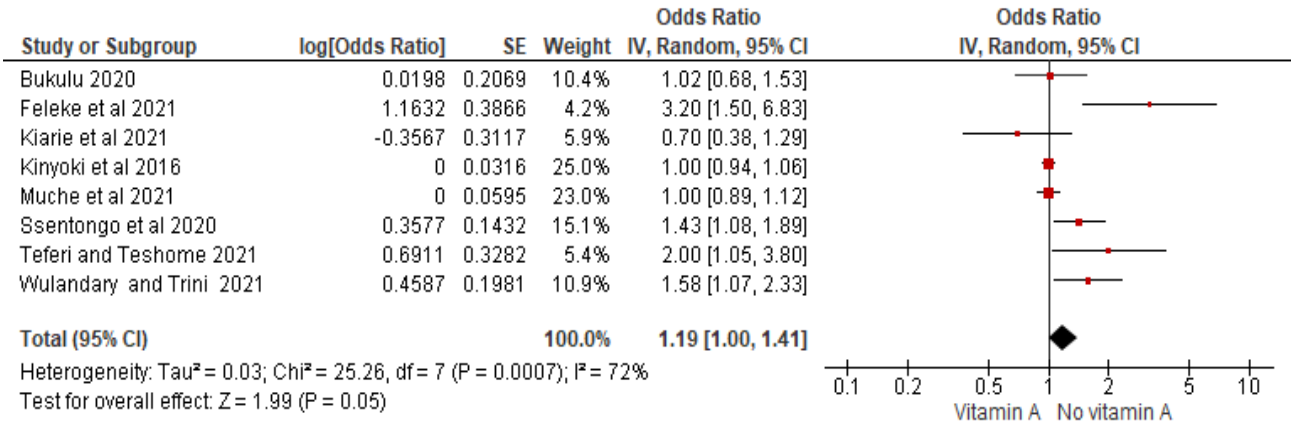

Figure 5. Forest plot of the effect of vitamin A on the incidence of stunting in children aged 6-59 months

The funnel plot in Figure 6 shows that the distribution of effect estimates between studies is asymmetric, that is, the distribution or distribution of effect estimates on the left and right is not equally (overestimated). Thus, this funnel plot indicates publication bias.

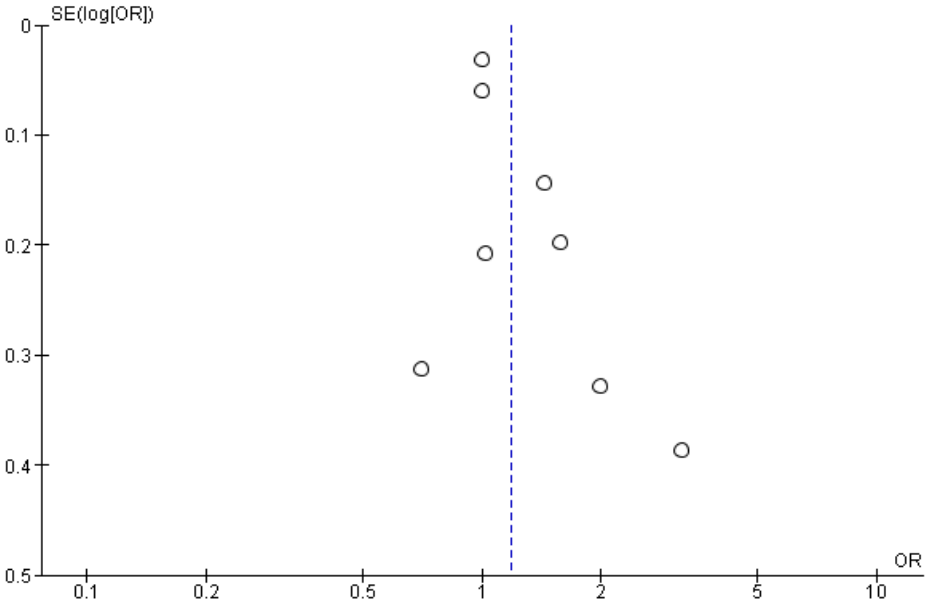

Figure 6. Funnel plot of the effect of vitamin A on the incidence of stunting in children aged 6-59 months

DISCUSSION

The effect of prelacteal feeding on the incidence of stunting

Prelacteal feeding influences timely initiation of breastfeeding and exclusive breastfeeding. Globally, suboptimal infant feeding, including prelacteal feeding, contributes to 45% of neonatal deaths, 30% of deaths from diarrhea and 18% of acute respiratory deaths. Prelacteal feeding reduces the immunological benefits obtained from colostrum and increases the risk of susceptibility to infection (Hitachi et al., 2019).

Stunting can result in decreased intelligence (IQ), so that learning achievement becomes low and students cannot continue their studies. Children who suffer from stunting have an impact not only on their shorter physique, but also on their intelligence, productivity and achievement as adults, so that it will become a burden on the state. Besides that, from an aesthetic aspect, someone who grows proportionally will look more attractive than his body. Failure to thrive due to malnutrition during this golden age will have disastrous consequences in the next life and will be difficult to repair (Wahida, 2019).

Based on the results of a meta-analysis of the 7 primary studies in this study, it is known that there is an effect of not being given prelacteal feeding on the reduced risk of stunting in children aged 6-59 months. Children who were not given prelacteal feeding had a 0.57 times the risk of stunting compared to those who were given prelacteal feeding (aOR= 0.57; 95% CI= 0.38 to 0.84; p= 0.005). The results of this study are in line with research by Abebe et al. (2017) which showed that children who were given prelacteal feeding had a risk of 0.96 times experiencing stunting compared to children who were not given prelacteal feeding (aOR= 0.96; 95% CI= 0.48 to 1.94; p=0.050). Research by Akalu (2018) also showed similar results showing that prelacteal feeding was significantly related to stunting. Children who were given prelacteal feeding had a 0.42 times risk of experiencing stunting compared to children who were not given prelacteal feeding (aOR= 0.42; 95% CI: 0.17 to 1.00; p= 0.050).

There are also studies that differ from

the statement above. The study conducted by Fikadu et al. (2014) revealed that the likelihood of stunting was higher among children from large families compared to children from families with less than three members. This is due to the fact that when families are large and resources are limited, the available food is shared by all members, reducing the amount that individuals get. In addition, poor quality food and inappropriate feeding practices can lead to a high prevalence of malnutrition.

The Effect of vitamin A on the incidence of stunting

Children who are deficient in vitamin A will experience failure to thrive. In addition, vitamin A also greatly affects the function of the human immune system. As a result, a lack of vitamin A causes the body's resistance to decrease, making it susceptible to infection, for example, if it occurs on the surface of the intestinal wall, it will cause diarrhea. Vitamin A is important in many other tissues and metabolic processes. It is important to note that in populations with vitamin A deficiency, effects on metabolism and immune function are already present. Vitamin A supplementation reduces the severity of diarrhea and complications of measles, but in some trials, supplementation has been associated with an increase in respiratory tract infections. In addition, vitamin A deficiency contributes to the development of anemia and stunting (Simajuntak et al., 2018).

Based on the results of a meta-analysis of the 8 primary studies in this study, it is known that there is an effect of giving vitamin A on the risk of stunting. Children who were not given vitamin A had a risk of stunting 1.19 times compared to children who were given vitamin A (aOR= 1.19; 95% CI= 1.00 to 1.41; p= 0.050).

The results of this study are in line with research by Feleke et al. (2021) which showed that children who were not consistently given vitamin A supplementation were 3.2 times more likely to experience stunting compared to children who were regularly given vitamin A supplementation (aOR= 3.2; 95% CI= 1.5 to 6.7; p= 0.050). research by Ssentongo et al. (2020) showed a significant relationship between vitamin A deficiency and growth failure in children in Uganda. The study evaluates that growth in children who are deficient in vitamin A is stunted with a stunting prevalence of 27%. Children who were not given vitamin A supplementation were 1.43 times more likely to experience stunting compared to children who were regularly given vitamin A supplementation (aOR= 1.43; 95% CI= 1.08 to 1.89; p= 0.050).

Even though the research above shows that Vitamin A is related to the incidence of stunting. The study conducted by Hadi et al. (1999) revealed a randomized study among Indonesian preschool children, found that vitamin A supplementation increased linear growth. In addition, the effect was higher among children who were not breastfed. This shows that vitamin A supplementation can protect against stunting or can prevent stunting. Another study conducted by Sedgh et al. (2000) revealed however in a randomized controlled trial conducted in Northern Ghana found no significant association between vitamin A supplementation and linear growth in children.

AUTHOR CONTRIBUTION

Aulia Alifariani as the main researcher is in charge of selecting research topics, searching and evaluating articles, as well as data analysis. Bhisma Murti and Rita Benya Adriani acted as supervisors.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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