

## Meta-Analysis: Breastfeeding and Its Correlation with Stunting

Alfi Makrifatul Azizah<sup>1)</sup>, Yulia Lanti Retno Dewi<sup>2)</sup>, Bhisma Murti<sup>1)</sup>

<sup>1)</sup>Master's Program in Public Health, Universitas Sebelas Maret

<sup>2)</sup>Faculty of Medicine, Universitas Sebelas Maret

### ABSTRACT

**Background:** Stunting is a problem of chronic malnutrition in the first 100 days of life, which can be prevented by breastfeeding in children. This study aims to analyze the relationship between breastfeeding and the incidence of stunting based on the results of a number of similar primary studies previously.

**Subjects and Method:** This research was conducted using a meta-analysis study with PICO as follows: P= Children under five, I= Breastfeeding, C= Not Breastfeeding, O= Stunting. Article searches were conducted using electronic databases, namely PubMed, Google Scholar and Science Direct. Article searches were conducted using the keyword and Mesh methods as follows "Breastfeeding" AND "Stunting" AND "Children" "Breastfeeding and Malnutrition" OR "Breastfeeding Benefits". sectional, the articles were analyzed using the Review Manager 5.3 application.

**Results:** There were 8 articles from the continents of Africa, Asia and South America which included Ethiopia, Rwanda, Tanzania, Zambia, Pakistan, Indonesia, and Ecuador from 2001-2022 which were analyzed using PRISMA flow diagrams. Research studies show that children who are breastfed have a risk of experiencing stunting as much as 0.62 times compared to those who are not breastfed (aOR= 0.62; CI 95%= 0.41 to 0.94; p= 0.020).

**Conclusion:** Breastfeeding can reduce the risk of children experiencing stunting.

**Keywords:** breastfeeding, stunting, children under five.

### Correspondence:

Alfi Makrifatul Azizah. Master's Program in Public Health, Universitas Sebelas Maret. Jl. Ir. Sutami 36A, Surakarta 57126, Central Java, Indonesia. Email: [alfimakrifatulazizah@gmail.com](mailto:alfimakrifatulazizah@gmail.com). Mobile: +6285375335480.

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### BACKGROUND

According to data from the United Nations International Children's Emergency Fund (2021) over the last 20 years from 2000-2020 stunting cases have decreased by around 11%. The prevalence of stunting in 2000 was 33.1% and in 2020 it was 22.0%. The number of stunted children under 5 years of age worldwide decreased from 203.6 million in 2000 to 149.2 million in 2020. However, at the same time, the number is increasing at an alarming rate in

West and Central Africa from 22.8 million to 29.3 million children with stunting. In 2020, there were 3 regions with very high prevalence of stunting in the world with a third of children in the region experiencing stunting, namely in West and Central Africa at 32.5%, East and South Africa at 32.3%, and South Asia at 31.8%. Meanwhile, two regions in Europe, Central Asia and North America, have a low prevalence of stunting, namely Eastern Europe and Central Asia at 8.1%, Europe and Central Asia at 5.7%,

North America at 3.2% and Western Europe at 2.8% (UNICEF, 2021).

Indonesia is included in the 3rd country with the highest prevalence of stunting in the South-East Asian Region after Timor Leste (50.5%) and India (38.4%) which is 36.4%. This figure is still above 20%, meaning that it has not reached the WHO target of below 20% (Teja, 2019). Even though Indonesia has improved and decreased stunting based on the 2013-2018 Riskesdas, which was 37.2% to 30.8%, the prevalence is still high and above the WHO Public Health threshold (Kemenkes RI, 2019).

Stunting is a form of child malnutrition, with an estimated 155 million children worldwide experiencing malnutrition with a Z-score for height for age (TB/U) below -2 Standard Deviation (SD) based on WHO standards in 2016. After years of years of neglected stunting, stunting is now recognized as a leading indicator of children's well-being and a reflection of social inequality in the world. Stunting is at the heart of the Global Nutrition Targets 2025 and the 2030 Sustainable Development Goals (de Onis et al. 2019).

One of the efforts to reduce stunting is to improve the quality of baby food by providing baby food according to WHO recommendations, namely babies aged <6 months are given exclusive breastfeeding, newborns are given Early Breastfeeding Initiation (IMD), babies aged >6 months are given complementary feeding and continue to breastfeed until the child is 2 years old. The Law of the Republic of Indonesia Number 36 article 128 paragraph 1 of 2009 states that every baby has the right to get exclusive breastfeeding since birth for 6 months except for medical indications. The word of God in the Qur'an Surah Al-Baqarah verse 233 also mentions the recommendation of mothers to breastfeed their children for 2 years. Many primary studies

have been found that examine the relationship between breastfeeding and the incidence of stunting, so a deeper analysis needs to be done to get a convincing conclusion. This study aims to analyze the relationship between breastfeeding and the incidence of stunting by conducting a meta-analysis based on data from previous researchers.

## SUBJECTS AND METHOD

### 1. Study Design

This study was designed using a systematic review and meta-analysis. Article searches were conducted using 3 electronic databases, namely: PubMed, Google Scholar, and Science Direct, which were published from 2001-2022.

This is done by using keywords and Mesh as follows: "Breastfeeding" AND "Stunting" AND "Children" "Breastfeeding and Malnutrition" OR "Breastfeeding Benefits". The article review process can be seen in the search flow using PRISMA flow diagrams and analyzed using Review Manager application 5.3.

### 2. Inclusion Criteria

The inclusion criteria include full paper article with a cross-sectional study design, published articles in English, the relationship measure used is Adjusted Odds Ratio or Odds Ratio with research subjects being children under five, the intervention given is breastfeeding and the research outcome is stunting.

### 3. Exclusion Criteria

The exclusion criteria were published articles in languages other than English, types of experimental research, and articles published before 2001-2022.

### 4. Operational Definition of Variables

The formulation of the research problem was carried out using PICO as follows: The population is children under five. The intervention used was breastfeeding with the comparison being non-breastfeeding. The

end result is stunting.

**Breastfeeding** is the process of providing food to infants in the form of breast milk (ASI) which has complete nutrition needed for newborns up to 2 years of age to prevent stunting. Stunting is a condition of impaired growth and development in the first 1,000 days of a child's life due to chronic malnutrition. This condition results in the child's body not being able to reach the height according to his age accompanied by lower cognitive abilities.

**5. Instrument**

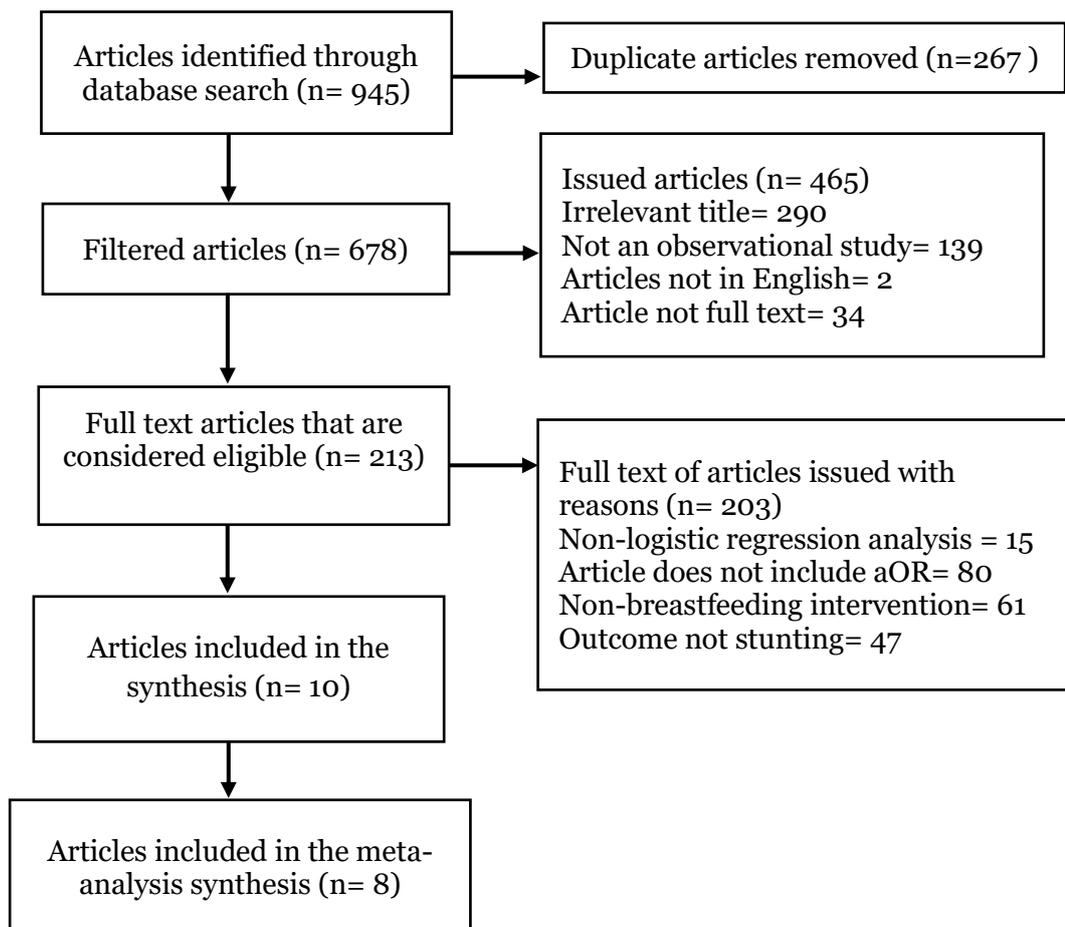
This research was conducted using a checklist for critical appraisal of a cross-sectional study (Survey) sourced from the CEBMa (center for evidence based management) to assess articles obtained through the database.

**6. Data Analysis**

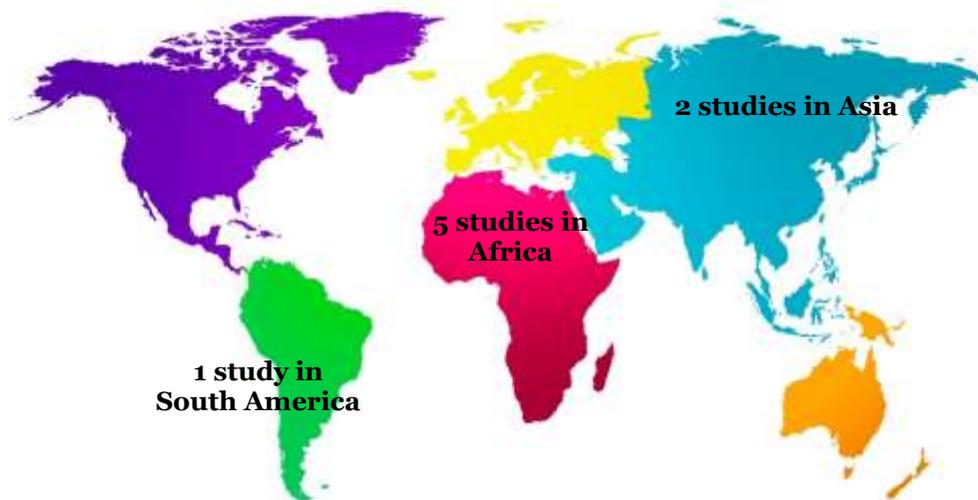
Data analysis was performed using Software Review Manager (RevMan) 5.3 issued by the Cochrane Collaboration. RevMan serves to calculate the overall OR value by describing the 95% Confidence Interval (CI) using the effect model and also the heterogeneity of the data.

**RESULTS**

Research on the relationship between breastfeeding and stunting consists of 10 articles from the continents of Africa, Asia, and South America which include Ethiopia, Rwanda, Tanzania, Zambia, Pakistan, Indonesia, and Ecuador. The article review process can be seen in the search flow using the PRISMA flow diagram as follows:



**Figure 1. PRISMA Flow Diagram**



**Figure 2. Map of Research Locations for Breastfeeding Relationships with Incidence**

The search results of this article obtained as many as 945 articles which were then selected using the PRISMA flow diagram as shown in Figure 1. The initial article search process resulted in 945 articles, then through the process of deleting duplicate articles, 267 articles were issued with 678 articles successfully filtered to meet the requirements. The requirements for a full text review that are included in the exclusion criteria are due to the following reasons:

1. Article analysis is not a logistic regression.
2. Article does not include aOR.
3. Intervention is not breastfeeding.
4. Outcome is not stunting.

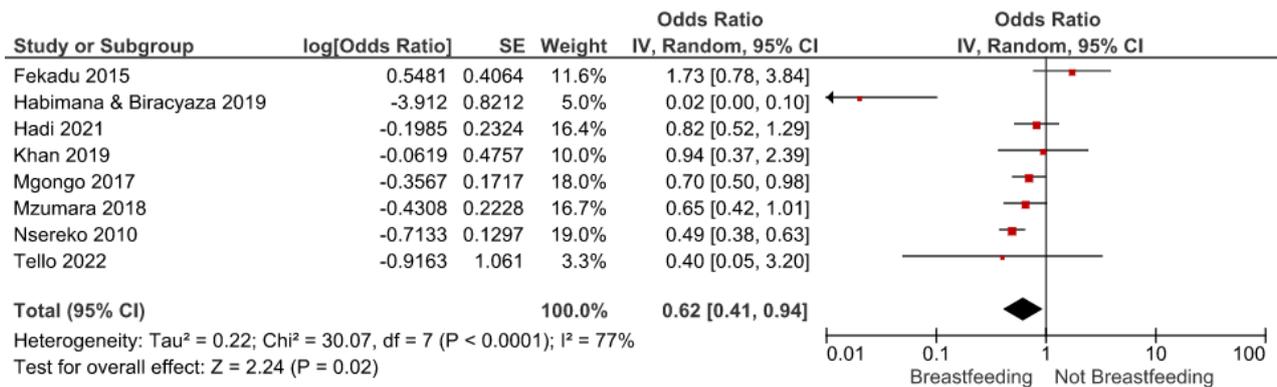
The final result of filtering articles using the PRISMA flow diagram was obtained as many as 10 articles that met the synthesis requirements. Furthermore, the 8 articles were reviewed again to ensure that the articles were truly in accordance with the PICO and could be used to answer research objectives. After being reviewed repeatedly, all articles were declared eligible to be included as quantitative articles in a meta-analysis of the relationship between breastfeeding

and stunting.

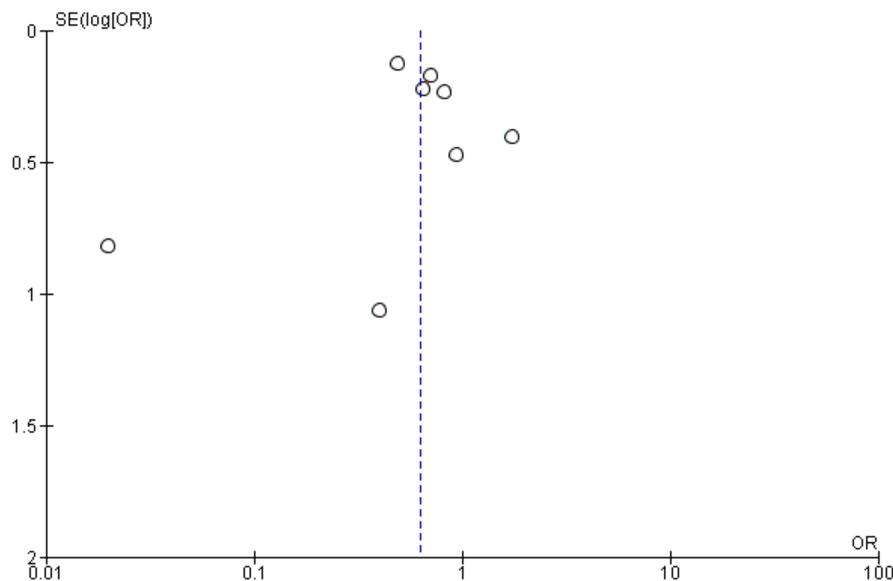
This study uses a checklist for critical appraisal of a cross-sectional study (Survey). This assessment criterion consists of twelve criteria, with each measure given a score of 2 = if the answer is Yes, 1= if the answer is Don't know, and 0 = if the answer is No. The following are the assessment criteria from the cross-sectional study checklist published by the CEBMa (center for evidence-based management), as follows:

1. Does the study address clearly focused questions/problems?
2. Is the research method (research design) appropriate to answer the research question?
3. Is the sampling method clearly explained?
4. Can the way in which the sample is obtained lead to bias (selection)?
5. Is the sample of subjects representative of the population to which the findings will be referred?
6. Was the sample size based on pre-study considerations of statistical power?
7. Was a satisfactory response rate achieved?

- 8. Does the measurement (questionnaire) tend to be valid and reliable?
- 9. Was statistical significance assessed?
- 10. Was a confidence interval given for the main outcome?
- 11. Could there be a confounding factor that has not been taken into account?
- 12. Can the results be applied to your articles?



**Figure 3. Forest Plot Relationship of Breastfeeding with Stunting Incidence**



**Figure 4. Funnel Plot Relationship of Breastfeeding with Stunting Incidence**

Figure 3 shows that there is a relationship between breastfeeding and the risk of stunting. Breastfed children have a 0.62 times risk of stunting compared to those who are not breastfed (aOR= 0.62; CI 95% = 0.41 to 0.94; p= 0.020). The heterogeneity of the research data shows I<sup>2</sup>= 77%, which means that the effect estimation results between these studies are high and come from different populations so that the

combined effect estimation of all studies uses a random effects model approach.

Figure 4 shows that there is publication bias which is indicated by the asymmetry of the right and left plots. The funnel plot image shows an overestimated publication bias, which means that the combined OR estimation results from these meta-analytical studies are greater than the actual value.

**Table 4. 1 Critical Appraisal Question for Cross Sectional**

No	Questions of Checklist	Author and Year							
		Fekadu et al. (2015)	Habimana & Biracyaza (2019)	Hadi et al. (2021)	Khan et al. (2019)	Mgongo et al. (2017)	Mzumara et al. (2018)	Nsereko et al. (2010)	Tello et al. (2022)
1	Does the study address clearly focused questions/problems?	2	2	2	2	2	2	2	2
2	Is the research method (research design) appropriate to answer the research question?	2	2	2	2	2	2	2	2
3	Is the sampling method clearly explained?	2	2	2	2	2	2	2	2
4	Can the way the sample is obtained give rise to bias (selection)?	2	2	2	2	2	2	2	2
5	Is the sample of subjects representative of the population to which the findings will be referred?	2	2	2	2	2	2	2	2
6	Was the sample size based on pre-study considerations of statistical power?	2	2	2	2	2	2	2	2
7	Was a satisfactory response rate achieved?	2	2	2	2	2	2	2	2
8	Do measurements (questionnaires) tend to be valid and reliable?	2	2	2	2	2	2	2	2
9	Was statistical significance assessed?	2	2	2	2	2	2	2	2
10	Was a confidence interval given for the main outcome?	2	2	2	2	2	2	2	2
11	Could there be a confounding factor that hasn't been taken into account?	2	2	2	2	2	2	2	2
12	Can the results be applied to your articles?	2	2	2	2	2	2	2	2
<b>Total</b>		<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>24</b>

**Answer: 2= Yes; 1= Can't tell; 0 = No**

**Table 2. Description of Primary Studies included in the meta-analysis**

No	Author (Year)	Country	Study Design	Sample	P Population	I Intervention	C Comparison	O Outcome	aOR (CI 95%)
1	Fekadu et al. (2015)	Ethiopia	Cross-Sectional	214	Children aged 6-23 months taken from the Ethiopian Demographic and Health Survey (EDHS) and anthropometric measurements	Exclusively breastfeeding for 6 months	Not Breast-feeding	Stunting	aOR = 1.73 (0.78 to 3.82)
2	Habimana & Biracyaza (2019)	Rwanda	Cross-Sectional	1,905	Children aged 6-59 months taken from interview data and secondary data from the Rwanda Demographic Health Survey (RDHS) 2014/2015 and anthropometric measurements	Breastfeed exclusively for 6 months and continued for more than 6 months	Not Breast-feeding	Stunting	aOR = 0.02 (0.004 to 0.036)
3	Hadi et al. (2021)	Indonesia	Cross-Sectional	408	Children aged 6-24 months taken from quantitative survey data on household demographics and socioeconomic factors and anthropometric measurements	Exclusively breastfeeding for 6 months	Not Breast-feeding	Stunting	aOR = 0.82 (0.52 to 1.30)
4	Khan et al. (2019)	Pakistan	Cross-Sectional	3,071	Children aged 0-59 months were drawn from the 2012-2013 Pakistan Demographic and Health Survey (PDAS) dataset and anthropometric measurements	Breastfeed exclusively for 6 months and continued for more than 6 months	Not Breast-feeding	Stunting	aOR = 0.94 (0.37 to 2.43)
5	Mgongo et al. (2017)	Tanzania	Cross-Sectional	1,870	Children aged 0-24 months were taken through interviews with structured questionnaires on sociodemographic, economic, feeding, and child information as well as anthropometric measurements	Breastfeed exclusively for 6 months and continued for more than 6 months	Not Breast-feeding	Stunting	aOR = 0.7 (0.5 to 1.0)

<b>No</b>	<b>Author (Year)</b>	<b>Country</b>	<b>Study Design</b>	<b>Sample</b>	<b>P Population</b>	<b>I Intervention</b>	<b>C Comparison</b>	<b>O Outcome</b>	<b>aOR (CI 95%)</b>
6	Mzumara et al. (2018)	Zambia	Cross-Sectional	12,328	Children aged 0-59 months drawn from interviews using the Zambian health demographic survey and anthropometric measurements	Breastfeed exclusively for 6 months and continued for more than 6 months	Not Breast-feeding	Stunting	aOR = 0.65 (0.42 to 1.00)
7	Nsereko et al. (2010)	Rwanda	Cross-Sectional	1,634	24-month-old children drawn from the 2010 Rwandan demographic and health survey and anthropometric measurements	Exclusively breastfeeding for 5 months	Not Breast-feeding	Stunting	aOR = 0.49 (0.38 to 0.63)
8	Tello et al. (2022)	Ekuador	Cross-Sectional	625	Children aged 0-23 months taken from the 2012 Ecuador National Health and Nutrition Survey (ENSANUT) and anthropometric measurements	Exclusively breastfeeding for 6 months	Not Breast-feeding	Stunting	aOR = 0.40 (0.05 to 3.42)

## DISCUSSION

Meta-analysis in this study were themed on the relationship between breastfeeding and the incidence of stunting. The systematic review represents a structured scientific approach to conducting a literature review on previous research studies addressing focused questions based on the desired PICO (Patient, Intervention, Comparison and Outcome). Systematic reviews are closely tied to meta-analysis, that is, a statistical method for combining data from previous studies (Patole, 2021).

In the cross-sectional study used in this study, it was explained that the primary study was the result of demographic surveys, interviews and the use of structured questionnaires conducted in households accompanied by anthropometric calculations (weight and height) to measure stunting in children under five. The independent variable analyzed was breastfeeding.

Estimates of the relationship between breastfeeding and the incidence of stunting in this study were processed using the RevMan 5.3 application. The results of the systematic study and meta-analysis are presented in the form of forest plots and funnel plots. The forest plots provide an overview of the information from each of the studies examined in the meta-analysis and estimate the results. The Forest Plot shows visually the magnitude of variation (heterogeneity) between study results (Ako-beng in Murti, 2018). A funnel plot is a diagram in a meta-analysis used to show possible publication bias. The funnel plot shows the relationship between the magnitude of the study effect and the sample size of the effect size of the various studies studied which can be measured in a number of different ways overall (Murti, 2018).

The modeling of the RevMan application in this study shows a random effect model which assumes that there are studies

that come from populations from different countries, namely Ethiopia, Rwanda, Tanzania, Zambia, Pakistan, Indonesia, and Ecuador with heterogeneity of  $I^2 = 77\%$ , which means the heterogeneity of this study is high. Heterogeneity is influenced by differences in research locations (countries), the size and age of the sample used in the study and the p value which shows  $<0.05$ , which means the heterogeneity of the study is high.

The results of this research regarding the relationship between breastfeeding and the incidence of stunting indicate that there is a relationship between breastfeeding and the risk of stunting. Children who are breastfed have a risk of experiencing stunting as much as 0.62 times compared to those who are not breastfed (aOR= 0.62; CI 95% = 0.41 to 0.94; p= 0.020). In line with the research of Sirajuddin et al. (2020) which states that breastfeeding can prevent stunting.

Meanwhile, children who are not breastfed are at risk for stunting. Research Bogale et al. (2020) in Ethiopia at the age of 6-59 months stated that the highest factor causing stunting was that children were not given exclusive breastfeeding. A similar study states that children who are not exclusively breastfed are 61 times more likely to experience stunting than those who are exclusively breastfed (Sampe et al. 2020).

Stunting is a physical manifestation of malnutrition which results in a child's height being less than -2 standard deviations or below the average height of children his age. Stunting is also linked to poor cognitive development in childhood and adolescence, reduced motor development, and lower IQ. Risk factors for stunting include the lack of exclusive breastfeeding (Musicians and Jacobson, 2015).

The problem of stunting indicates a long-term inadequacy of nutritional intake due to lack of energy and protein, as well as several other micronutrients. Therefore, it is necessary to emphasize the provision of balanced nutritional intake at the age of toddlers, especially the fulfillment of nutrition for infants aged 0-6 months. Breastfeeding is one of the efforts to reduce the risk of stunting. This also answers the challenge of the demographic bonus in preparing human resources from an early age so that later they produce quality and highly competitive human resources. This is in line with research by Anissa and Dewi (2021) that one of the foods containing protein that is ideal and appropriate for the physical and psychological health of infants is breastfeeding. Exclusive breastfeeding can provide benefits in increasing intelligence and the immune system for babies, with children getting enough breast milk, it will create the next generation of the nation that is able to meet the demographic bonus of Indonesia Gold 2045.

WHO and UNICEF recommend starting breastfeeding within the first hour of birth and breastfeeding exclusively for the first 6 months of a child's life. Furthermore, after 6 months, the child is only given complementary foods and continues to breastfeed for up to 2 years and beyond (WHO, 2022). Breastfeeding children will reduce the risk of stunting because breast milk is the most perfect food for babies that contains digestive enzymes, easy to digest and absorb. Breast milk also contains a series of unsaturated fatty acids which are important for the growth and development of a child's brain (Yuliarti, 2010). Breastfeeding has a positive impact on the growth and development of a child. This is in line with the research of Campos et al. (2020) in children aged 6 to 35 months in Mexico who stated that breastfeeding for < 6

months or > 6 months was a protective factor to prevent stunting.

Breastfeeding is one way that can be used to increase children's nutritional intake and prevent stunting, so it is hoped that the government and various parties who take part in accelerating stunting prevention can collaborate more in promoting and campaigning for the benefits of breastfeeding for pregnant women. It is hoped that many pregnant women will know better, are willing and able to breastfeed their unborn child and achieve the 2030 SDGs target to reduce all forms of malnutrition including stunting and welcome the 2045 Golden generation for Indonesia.

#### **AUTHOR CONTRIBUTION**

Alfi Makrifatul Azizah as the main character of the research who chooses the topic, conducts searches and collects data in this study. Yulia Lanti Retno Dewi and Bhisma Murti played a role in conducting data analysis and reviewing research documents.

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This study is self-funded.

#### **CONFLICT OF INTERESTS**

There is no conflict of interest in this study.

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