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Association between Exclusive Breastfeeding and Stunting in Children: A Systematic Review

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ABSTRACT

Stunting is defined as being below 2 standard deviations (SD) from the median height-for-age z-score (HAZ), as determined by the World Health Organization (WHO) Child Growth Standards. Several studies report that exclusive breastfeeding has protective effects againts stunting. Study concluded that children with low socioeconomic conditions can benefit from exclusive breastfeeding to reduce the incidence of stunting. However results of studies are contraty. The purpose of this study was to examine the association between exclusive breastfeeding and stunting in children. This systematic review research includes journals from the Google Scholar, Sciencedirect, and PubMed databases according to PRISMA which include the following requirements: last 5 years, abstract available, English language. The search terms used were "Breastfeeding" AND "Children" AND "Stunting" AND "Comparison". From 270 articles found, 7 journals related were selected for further review. From this systematic review, it was shown that exclusive breastfeeding is associated with a reduction in the prevalence of stunting in children. But keep in mind that prolonged breastfeeding can cause impaired growth and development and compromised immune system. Education about the importance of exclusive breastfeeding is expected to reduce the incidence of stunting and short or long term related complications.

1. INTRODUCTION

Stunting in children (low height for age) is one of the important public health problems that should not be ignored. Stunting limits a child's growth potential due to inadequate nutritional intake. Stunting is defined as being below 2 standard deviations (SD) from the median height-for-age z-score (HAZ), as determined by the World Health Organization (WHO) Child Growth Standards [18]. Childhood stunting is the best indicator of well-being children and can reflect social inequality. While there is a global consensus on how to define stunting, it is often not recognized in societies where short stature is the norm because linear growth is not routinely assessed. Impaired growth often begins in utero and continues for at least the first 2 years of postnatal life. Linear growth failure serves as a marker of various pathological disorders associated with

increased morbidity and mortality, loss of physical growth potential, reduced neurodevelopmental and cognitive function, and an increased risk of chronic disease in adulthood [20], [7].

When viewed based on national prevalence in Indonesia, stunting is still quite high. In 2013 the incidence of stunting in children under five was 37%. When assessed, the prevalence of stunting by region in Indonesia is quite high and varied. Prevalence of stunting based on region was: Riau 26% and East Nusa Tenggara 52% [31]. There are many possible causes of stunting in Indonesia, including maternal nutritional status, breastfeeding practices, complementary feeding practices, and exposure to infection. Influential external factors include maternal education, food systems, health care, water and health infrastructure and services [31].

The growth and development of children begins in the womb and several factors before and after birth can have an impact on nutritional status. Maternal health can have an impact on the birth weight of the baby. In addition, feeding practices such as breastfeeding and the introduction and access to solid foods can have an impact on children's health. Other factors, such as exposure to contamination from non-human milk and other liquids, can result in the deterioration of a child's health. Lack of optimal nutrition in children can have an impact on permanent accumulative effects on children's growth and development such as height, low education, poverty and even death [8], [33]. One of the causes of stunting in Indonesia is poverty. Poverty has been recognized as one of the strongest risk factors for stunting [6], [2], [24]. Several studies report that this factor can be eliminated by exclusive breastfeeding. Therefore, it can be concluded that children with low socioeconomic conditions can benefit from exclusive breastfeeding to reduce the incidence of stunting [11].

Breastfeeding is considered the gold standard for infant feeding. Breastfeeding can have a beneficial effect. Nutritional, environmental, socioeconomic, psychological and genetic factors can influence the benefits of breastfeeding on health outcomes. Therefore, it is recommended to provide exclusive breastfeeding in the first 6 months of life and can be continued thereafter [29]. Breastfeeding has many advantages for both the short and long term. There are several reports linking breastfeeding with long-term protective effects against chronic diseases. It was explained that breastfeeding can improve cognitive development, reduce the risk of obesity, type 1 and 2 diabetes, hypertension, heart disease, hyperlipidemia and some cancers [5]. A systematic review study shows that exclusive breastfeeding compared to breastfeeding for only 3 to 4 months can reduce morbidity and mortality in childhood diarrhea and other infectious diseases. In addition, it also has an impact on intelligence, educational attainment and income as adults [12]. Recent evidence reports that there are interventions other than breastfeeding for child health outcomes such as micronutrients, food supplements, maternal education and kangaroo care (skin to skin) [19].

Population based studies around the world report conflicting results. Some studies in developing countries show little or no relationship between breastfeeding and undernutrition, whereas other studies show that breastfeeding inhibits growth when given after the first year of life [32]. However, studies that discuss the protective effect of breastfeeding on stunting have been reported [15], [25], [35]. Therefore, this study was conducted to determine the relationship between breastfeeding and stunting in children under 2 years.

Formulation of the problem

How is efficacy of breastfeeding in children below 2 years old with stunting?

PICO

P: Stunting in children below 2 years old

I: Breastfeeding
C: Placebo
O: Efficacy

2. Methods

2.1 Literature Searching Strategy

A literature search was done on the Google Scholar, Springerlink, and PubMed databases on March 10, 2022. The literature search used the keywords “breastfeeding”, “stunting”, “children” and other related keywords. (Table 1). The results of the literature search can be seen in Figure 1.

2.2 Literature Criteria

This systematic review is carried out by limiting English or Indonesian journals and published in the last 5 years. The research method used was a journal with a placebo comparison. The initial search took up 270 literature. After setting the inclusion and exclusion criteria and reading the literature completely, 7 literatures were obtained.

Table 1. Search strategy in PubMed, Google Scholar and Sciencedirect conducted on 10 February 2021.

Source	Keyword	Relevant literature
Google Scholar	(((breastfeeding) AND (stunting)) AND (children)) AND (Comparison))	28
PubMed	(((breastfeeding) AND (stunting)) AND (children)) AND (Comparison))	44
Sciencedirect	(((breastfeeding) AND (stunting)) AND (children)) AND (Comparison))	198

This systematic review includes studies by [27], [34], [23], [1], [9], [26] dan [21].

2.3 Literature search flow

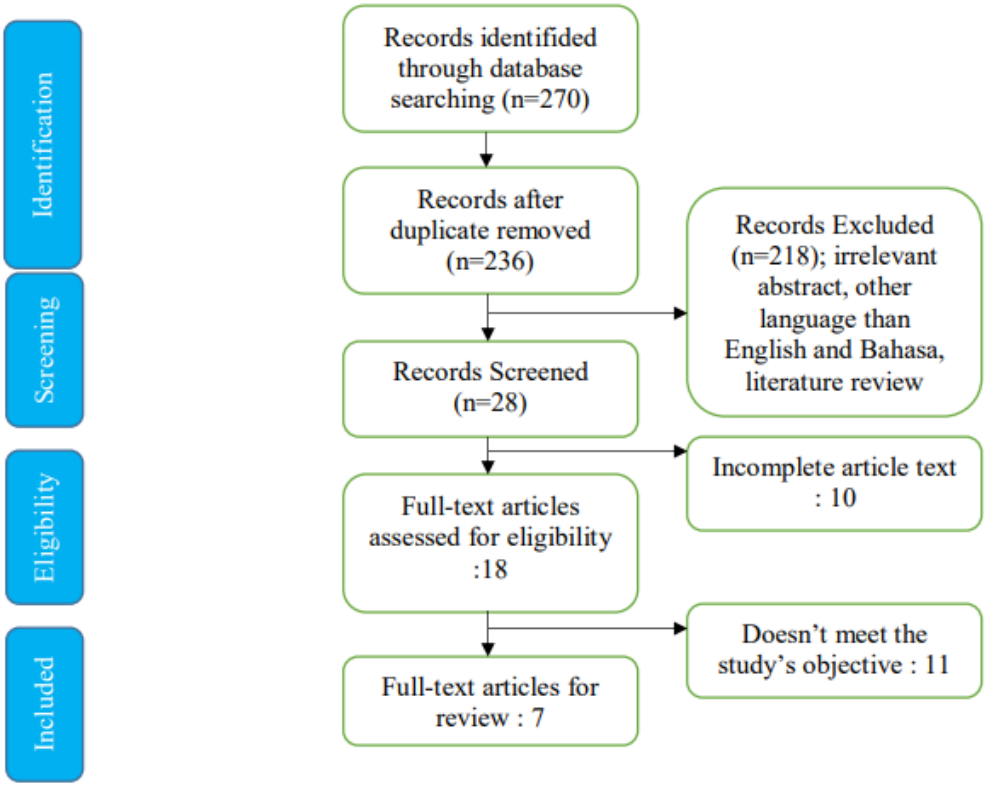

Figure 1. Literature Search Flow

3. Results

The study by Nurhalina et al aimed to analyze the relationship between a history of exclusive breastfeeding and stunting in children aged 12-23 months in Banjar Margo District. This study used a cross-sectional design on 193 children aged 12-23 months. Primary data were taken in April and May 2018 using a questionnaire. Data analysis showed that there were 23.9% of children who were stunted. Children who were not exclusively breastfed had a 3.1 times higher risk of developing stunting than subjects who were exclusively breastfed [27].

The study by [34] aimed to find a relationship between exclusive breastfeeding and the incidence of stunting in children under five at the Banyuputih Health Center, Situbondo Regency. This study includes 274 subjects with proportional random sampling method. The results of this study indicate that exclusive breastfeeding is associated with the incidence of stunting in children under five at the Banyuputih Community Health Center. It is explained based on the OR value of 2.451 which means that children who do not receive exclusive breastfeeding have a 2,451 times higher risk of stunting.

Research by [23] described the relationship between exclusive breastfeeding and the incidence of stunting in toddlers aged 24-59 months. This study concludes that exclusive breastfeeding has a significant relationship with the incidence of stunting in toddlers aged 24-59 months.

Study by [1] analyzed the relationship between exclusive breastfeeding and maternal height with the incidence of stunting based on the nutritional status of children under five. It was explained in this study that the prevalence of children who were not exclusively breastfed and experienced stunting was 75.5%. The prevalence of stunting in this study was 83.7%. It is explained in this study that maternal height and exclusive breastfeeding are associated with stunting.

The study by [9] aimed to analyze the relationship between breastfeeding patterns and stunting in Gandatapa village, Sumbang, Banyumas. It is explained in this study that the breastfeeding pattern in Gandatapa village is categorized as bad with a stunting rate of 22 subjects (55%). Analysis with Chi Square shows that there is a significant relationship between breastfeeding patterns and the incidence of stunting.

The research by [26] aims to find a relationship between exclusive breastfeeding and the incidence of stunting. It was explained in this study that the prevalence of stunting in children was 12.7% and 10 of them did not receive exclusive breastfeeding. This study explains that although the incidence of stunting is higher in the group that is not exclusively breastfed, there is no significant relationship between the two.

Research by [21] aims to find out the relationship between exclusive breastfeeding and stunting in children aged 6-23 months in Indonesia. It is explained in this study that exclusive breastfeeding is not the only factor that contributes to the incidence of stunting. It is explained in this study that low socioeconomic status is associated with stunting.

4. Discussion

In the world, the prevalence of stunting in children has decreased significantly. However, the number of children experiencing stunting is still very worrying (About 149 million in 2018) and there are long-term consequences, especially in developing countries [8]. Therefore, it is important to understand the factors that can prevent stunting, one of which is exclusive breastfeeding. One of the factors that causes an increase in infant growth associated with breastfeeding is growth hormone. It was explained that breastfeeding had an effect on the IGF Axis and therefore had a positive effect on linear development. In addition, it is known that there are many bioactive components such as hormones and several nutrients in breastfeeding. These bioactive components in addition to playing a role in growth, are also associated with immune response, immune system development, energy homeostasis and regulation of appetite [17]. In addition, exclusive breastfeeding also contains the hormones calcitonin and somatostatin. It was explained that calcitonin and procalcitonin are found in large amounts in breast milk. Enteric neurons express calcitonin receptor immunoreactivity (CTR-ir) in late gestation. Somatostatin is rapidly degraded in the jejunum and is not transferred through the interstinal walls, but when present in exclusive breast milk, somatostatin is not degraded and retains its bioactive components [4]. In addition, fats, carbohydrates and proteins contained in exclusive breastfeeding also play an important role in the growth of children. Breastmilk's fat is critical to infant growth and health supplying approximately 50% of milk energy and supporting development and maturation of the central nervous system, immune function and inflammatory responses. Fat also carries soluble vitamins, taste and aroma, contributing to infant appetite control. Further, lipids have also been shown to have anti-infection effects with a recent publication showing that healthy infants received milk with more palmitic acid and lauric acid containing triglycerides [22].

The government has established a national policy regarding the exclusive breastfeeding program as outlined in the Government Regulation of the Republic of Indonesia Number 33 of 2012. The 2015-2019 Strategic Plan target is exclusive breastfeeding coverage of 50 percent in 2019 [13]. Based on data from the Central Statistics Agency as of 2021, the lowest coverage of exclusive breastfeeding is in the Gorontalo area at 52.75%, while the highest is in West Nusa Tenggara at 81.46% [3]. Based on study by [30] there are 6 factors that cause the low coverage of exclusive breastfeeding, namely the implementation of government regulations that are still not evenly distributed, lack of family support, low maternal education, infants who are not full term, and cultural factors. One of the most important factors is the mother's education. The level of education that can be completed by a person can reflect the intellectual level of that person and can also improve social status in society. Therefore, the higher the level of education that is completed by a person, the abilities,

insights, ways of thinking will be wider and more advanced. Nationally, the percentage of the population 15 years of age and over who have completed high school education is higher than those who have not completed high school education, both women and men. The percentage of men 15 years and over who have completed high school education and above is higher than women with a large percentage of 37.70 percent and 32.53 percent, respectively. On the other hand, the percentage of women 15 years and over who have not completed primary school education and have not/never attended school is higher than that of men with percentages of 20.74 percent and 15.29 percent, respectively. [14].

The majority of the studies we reviewed explained that exclusive breastfeeding was associated with a reduced risk of stunting. Research by [27] include 193 children reported which 29.5% of them were diagnosed with stunting. This study explains that children who are not exclusively breastfed have a 3.1 times higher risk of developing stunting. Another study by [34] also reported similar results. This study included 274 children at the Banyuputih Health Center and explained that children who were not exclusively breastfed had a 2.45 times higher risk of developing stunting. Another study by [23], [1], [9] also reported that exclusive breastfeeding can reduce the incidence of child stunting.

According to theory, the macro and micronutrients in breast milk are best suited to meet the dietary needs of infants up to 6 months of age. Breast milk, in contrast to formula milk, contains a relatively low protein content and a high whey-to-casein fraction of about 90% during the first days of life. This high whey fraction is very beneficial in supporting antimicrobial activity. The casein protein fraction of breast milk facilitates the absorption of calcium, iron, and zinc. The micronutrients in breast milk have a high bioavailability. Up to 80% of breast milk iron is absorbed compared to absorption of heme iron, which is usually between 12 and 25%, and nonheme iron, which is below 5%. During the first month of life, the composition of breast milk changes daily, starting with colostrum, then into mature breast milk, meeting the specific needs of newborns for optimal growth, gastrointestinal function, and body defense. The first breast fluid, or colostrum, is very high in protein and fat-soluble vitamins such as vitamin A as well as growth factors and immunological components [28]. Research shows that colostrum contains components that are able to promote bone formation and inhibit bone resorption. Although many colostrum-based nutritional supplements have been developed as growth promoters, few studies have investigated their functional effects [37]. Research by Lee et al used bovine colostrum fraction 1–30 kDa, Growth Protein-Colostrum (GP-C) and administered to juvenile rats as a dietary supplement to determine its effect on growth and development. GP-C enhances limb bone growth and mineralization as evidenced by an increase in serum osteocalcin and bone mineral density. Elevated serum levels of growth hormone and insulin-like growth factor-1 suggest that the mechanism of growth enhancement is controlled by endocrine factors. GP-C can also increase osteoblast proliferation in vitro, a finding indicating a possible mechanism of action of GP-C. Based on these findings, it is hypothesized that colostrum promotes bone growth and development in humans [16]. In addition to having an effect on bones, exclusive breastfeeding can also interact with the intestinal microbiome. Proteins, lipids and carbohydrates, including lactose, the free oligosaccharide found in exclusive breast milk can affect the gut microbiome, leading to more efficient utilization of food when the child begins to eat complementary foods. More efficient use of food or nutrition will have an indirect impact on children's growth [36]. Other studies confirm that the growth of infants who are exclusively breastfed is different from infants who are mostly formula-fed. The average height of children included in the WHO study was higher than that of formula-fed children, but the rate of weight gain was lower after two months in exclusively breastfed infants [10]. However, another study that we reviewed by [26] reported the opposite where although the incidence of stunting was higher in the group that was not exclusively breastfed, there was no significant difference in the data. This is likely because the researchers used relatively few stunting samples so that it could affect the results. This is different from other research by [21] where it is explained that exclusive breastfeeding is

indeed protective against stunting in children, but if given for more than 6 months it will actually increase the risk of stunting. Exclusive breastfeeding that is given longer than recommended (> 6 months) will cause delays in giving complementary feeding. Thus, children do not get adequate intake of nutrients for growth and development. After the age of 6 months, complementary foods should be given to breast milk because if only breast milk is given, it will not be able to meet the needs of substances and energy. It was explained that prolonged exclusive breastfeeding causes a delay in the introduction of complementary foods into the diet and as a result, the child can never develop a healthy appetite for complementary foods. This makes the child too dependent on breast milk and can also cause difficulty chewing both of which can lead to a weakened immune system and impaired growth and development [32].

5. Summary

From this systematic review, it was shown that exclusive breastfeeding is associated with a reduction in the prevalence of stunting in children. But keep in mind that prolonged breastfeeding can cause impaired growth and development and compromised immune system. Education about the importance of exclusive breastfeeding is expected to reduce the incidence of stunting and short or long term related complications.

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