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Risk Factors of Stunting in Children Under Five Years Old

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ABSTRACT

Stunting has several risk factors that have been done by several researchers. Systematic literature review studies are conducted to determine the most powerful risk factors and directly influence the occurrence of stunting in toddlers or children under five years old. The study examined 27 papers with various research designs such as cross-sectional, case-control, cohort, and intervention using RCT. The study subjects in the paper studied an average of >40 samples as well as data analysis by the design of the research. The results of this study found that the strongest risk factors for stunting were food diversity and household food security, environmental sanitation and drinking water, early initiation of breastfeeding and breastfeeding, birth weight, and parenting and child health care. Handling stunting requires appropriate government policies for the community, especially improvement in the economic sector, in addition to the involvement of community participation in providing education and early detection stunting. It is necessary to further investigate the control of nutritional intake to modify these risk factors.

Keywords: risk factors of stunting; food diversity; history of infectious diseases; environmental sanitation; parenting

INTRODUCTION

Stunting is a failure of child development due to long nutrient deficiency so the child looks shorter than normal children as well as his age. Stunting is a problem that occurs generally in developing countries. Indonesia is one of the countries with the largest prevalence of stunting toddlers in southeast Asia [(1)].

Stunting is influenced by several risk factors that have been widely researched by researchers such as diversity and food security, parenting and utilization of health facilities, micronutrient deficiency, history of infectious diseases, birth weight, breastfeeding, early breastfeeding initiation and others [(2, 3).]

Therefore it is necessary to research whether some of the risk factors studied are strong evidence-based to be used as a theory of the causes of stunting so that it is expected to be an alternative solution to preventing stunting of toddlers because it will have a next impact on the physical and intellectual development of children. This literature review study is to determine the strong risk factors stunting.

METHODS

This study was a systematic research of the literature review was conducted to identify risk factors for stunting in children under five years old. The search strategy can be seen in Figure 1. This review required a broad approach to stunting search terms so that it was possible to identify multiple risk factors.

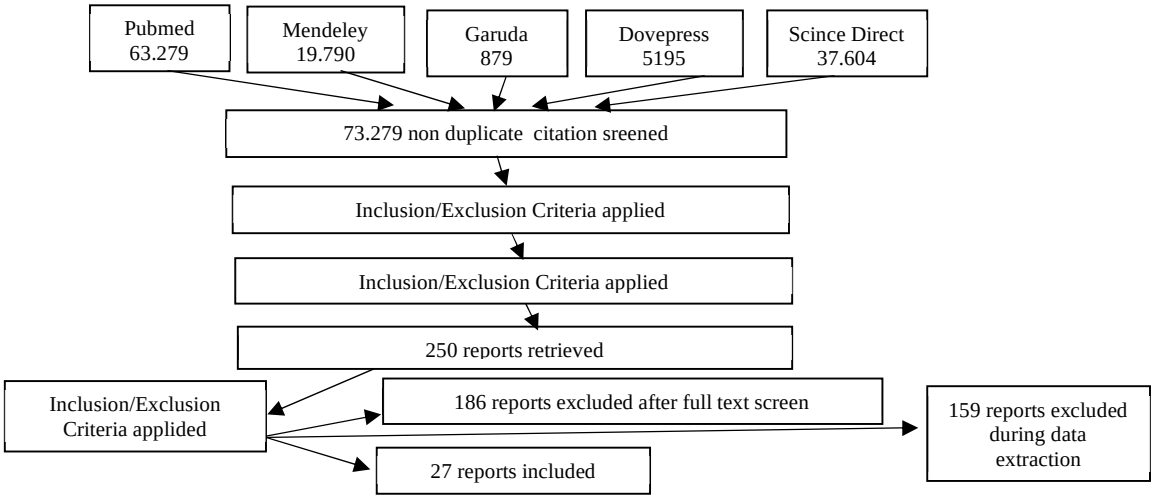

Figure 1. Flow of studies through the selection process

This study used a systematic approach to the literature review and meta-analysis (protocol PRISMA-P) [4]. Literature search was carried out to find relevant articles in PubMed, Mendeley, Garuda, Dovepress dan ScienceDirect since 2016-2020. The keywords used in the combinations were 'stunting', 'growth', 'height', 'risk factor of stunting'. Medical subject titles were used where the database allows such PubMed.

Articles were selected for study if they used an outcome stunting measurement and were examined if they were exposed to the risk of stunting and examined exposures that occurred from infancy to under five years old. Selected articles were in Indonesian as well as English and focus on the risk of stunting which could be modified through activities such as health promotion. The article was not chosen as research material even though it examined stunting, if it was considered that it could not be modified by intervention such as in disasters, the health service environment, for example health workers because it could be biased. Based on reference searches, 73, 279 articles were obtained, and after being filtered and adjusted for the purposes of this study, 25 articles were obtained (Figure 1).

RESULTS

The factors that influence stunting in children under five years old were grouped into several categories as follows:

Food Diversity and Household Food Security

This grouping was based on 9 papers had been researched and it was found that an incidence of stunting is influenced by less varied dietary diversity and family food security. The results of the study in Ethiopia show that generally stunted children with a value of ≤5 tend to have less diet, such as vegetables, fruit and milk. [5-7].

The diet of stunted children was positively related to HAZ (Height-for-age z score), which means that if you eat a high intake of milk, vegetables and fruit, the HAZ will increase, and it'll be conversely [5]. Less food diversity was also directly affected by low family income [7], furthermore, the child also stopped breastfeeding too quickly <24 months[6]. Moreover of dietary diversity, according to other researchers, household food security affects the incidence of [11]. Other researchers found that 75.5% of stunted children were given complementary breastfeeding lacking diversity (not consisting of carbohydrate, protein, fat, vitamin and mineral sources) and given at <6 months of years old [12].

History of Infectious Diseases and Metabolic Disorders

The paper found discussing the history of infectious disease and metabolic disorders amounted to two articles. In a paper that examined the history of infectious diseases and metabolic disorders, it was found that the results of intervention studies with RCT using multivariate analysis showed that systemic inflammation at 6 weeks (earlier) significantly (p = 0.002) influenced the incidence of future stunting.

Systemic inflammatory conditions increase the release of CRP, AGP and IL6 as inflammatory markers that cause a decrease in the IGF1 response so that it inhibits the release of growth hormone, if this is at a critical stage of growth at the starting point of life, the child will become stunted later [14]. In another study, it was found that stunted children decreased the expression of the αPPAR (Peroxisome Proliferator-Activated Receptor) gene (ΔCT: 5.81) compared to those who were not stunted (ΔCT 5.0. ΔCT).

This decrease causes the expression of lipoprotein lipases to decrease so that it will reduce the synthesis of triglycerides from lipoprotein particles and ultimately disrupt energy metabolism, especially from fatty acids, but also trigger an increase in inflammatory responses such as NF-kB (nuclear factor-kappaB) and cytokines especially in stunted children with chronic disease [15].

Environmental Sanitation and Drinking Water

The paper that examined seven articles explained that environmental sanitation conditions, especially in areas with limited resources, are related to the incidence of stunting in children under five years because it can cause environmental enteric dysfunction [16]. Another study conducted in Jambi found that drinking water sources were significantly related to the incidence of stunting in children under five years, as evidenced by the data that 57% of these families source drinking water from wells with inadequate drinking water quality such as smell / bad / and colored [14].

The results of other studies with cohort design also found that there is a significant relationship between hygiene and environmental sanitation (OR = 1.63, 95% CI). [17, 22]. Study in Bangladesh, it was found that stunted children were significantly associated with air pollution exposure at levels of PM**2.5** µg/m3 from the inside of uterin [18]. Air pollution in question is particulate matter, for example fossil fuels from vehicles through Polycyclic aromatic hydrocarbons entering mother's bloodstream, which can cause slow fetal development and low birth weight, this is one of the causes of stunting [18]. Other researchers also found that 89.5% of families with stunted children had poor sanitation quality (p = 0,000; OR = 31,875) [19].

Another study also found that exposure to pesticides was also a risk factor for stunting in children (OR = 4.21, 95% CI: 1.77-10.04) and exposure during pregnancy was not significantly associated[20].

Birth Weight

The results of the study that examined birth weight were six articles, one of which was conducted in Jambi province and found that there was a significant relationship between birth length and stunting, it is evident that 27% of stunted children (499) had a birth length of less than 48 cm and low birth weight. [7, 14, 22, 23, 24]

Early Initiation of Breastfeeding and Breastfeeding

The paper that examined the risk factors for early initiation of breastfeeding and breastfeeding consisted of seven articles. Research conducted in Jambi in 2015 on 1814 toddlers 6 - 59 months, it was found that 27.5% were stunted and 54.1% of them did not immediately do early breastfeeding. Based on the statistical test analysis, it was found that children who did not immediately undergo initiation early breastfeeding were significantly associated with the incidence of stunting (p=0.024) [14], Likewise children who are not given exclusive breastfeeding or breastfeeding, especially at 0-24 months [8, 23, 26, 27].

Parenting and Child Health Care

There are six papers studied on parenting and child health care. The results of this study showed that parenting style (OR = 1.63, 95% CI), and health care in children (OR = 1.76, 95% CI) were significantly associated with the incidence of stunting [24]. The parenting style referred to is in the way of feeding the child, and psychoscoially being able to have a close relationship with the child so as to create a close bond, especially mother and child. The health aspects referred to by the researchers in this case are maintaining personal hygiene and health as well as children, maintaining the health of the environment around the house and maintaining children's health and how to handle it when the child is sick [8, 17].

Another study in Madagascar found that stunted children generally have mothers who work outside their own land, so the possibility of children being neglected [25]. In addition, the behavior of the residents of the house will also affect the parenting style of children, especially in providing food [19]. Other researchers also found that child health care was also included in the less use of posyandu, such as carrying children irregularly, even never being a risk factor for stunting [28].

Micronutrient Deficiency

The study that examined micronutrient deficiency found four articles. The results showed that zinc deficiency most affected (the main risk factor) for stunting in children under five (OR = 9.24; 95% CI = 2.02-42.12, followed by others such as vitamin C (OR = 2.97; 95% CI = 1.41 - 6.31), iron (OR = 2.87; 95% CI = 1.44-5.71) [29]. Another study explained that the value of serum zinc in stunted children was lower (34.17 ng/mL) than those who were not stunted (50.83 ng/mL) (p = 0.023) (30). Another micronutrient deficiency, also a risk factor for stunting, is the provision of iodized salt to children with a concentration of 0-7 ppm [22, 25].

Mother Age of Pregnant

Three articles were found to discuss the mother age of pregnant. Research conducted by Sani et al found that 64.5% of children with stunting were significantly related to maternal age at pregnancy, namely <20 and >35 years [31], likewise other studies, besides being too young, mothers also experience nutrition during pregnancy [8, 24].

General View

Based on the description of the results of the study article above, it can be understood as follows:

Table 1. Overview of the strength of the evidence of each stunting risk factor

Risk factors	Number of studies	Strength of evidence-based
Food diversity and household food security	9	Strong
History of infectious disease and metabolic disorders	2	Inconclusive evidence
Environmental sanitation and drinking water	7	Strong
Birth weight	6	Strong
Early initiation of breastfeeding and breastfeeding	7	Strong
Parenting and child health care	6	Strong
Micronutrient deficiency	4	Inconclusive evidence
Mother age of pregnant	3	Inconclusive evidence

The study based on Table 1 showed that affects the occurrence of stunting as causal diagram of risk factors and stunting on figure 2 as follow.

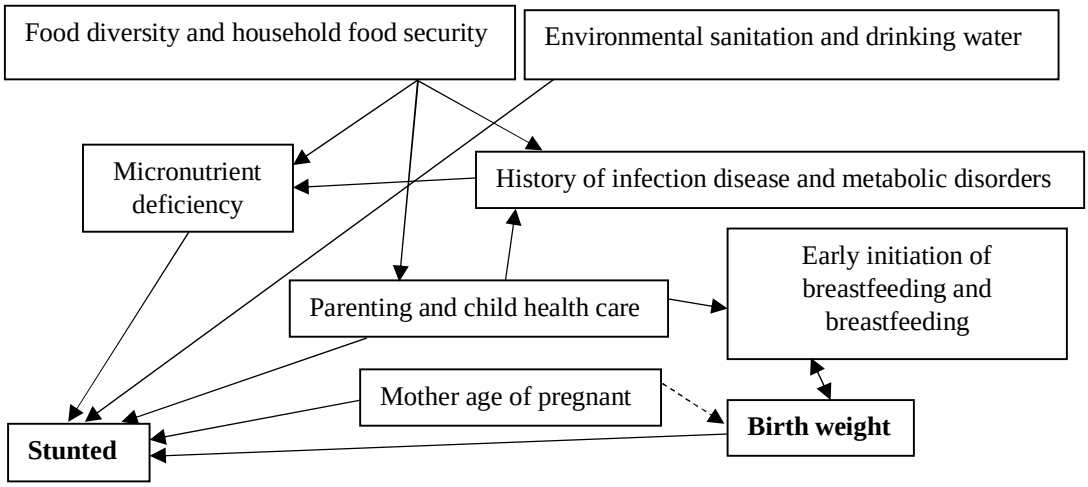

Figure 2. Causal diagram of risk factors and stunting

DISCUSSION

Based on the result review article so we have known food diversity and household food security, environmental sanitation and drinking water, early initiation of breastfeeding and breastfeeding, birth weight, parenting and child health care are evidence-based on the possibility of stunting in children under five years old. In contrast, the identified literature does not allow for a definite conclusion such as history of infectious disease and metabolic disorders, micronutrients deficiency, and mother age of pregnant because it does not meet the predetermined criteria. Even so, it does not mean that these risk factors are ignored, but it remains a special concern in the prevention of stunting. The limited number of papers studied may also be the result of not many similar studies that have been studied by other researchers. In addition, the authors also suspect that the paper under study makes it impossible to conclude whether the association occurs independently, so for the time being it is concluded that this relationship cannot be said to be a strong thing for the occurrence of stunting.

The authors conclude that five strong risk factors are a direct cause of stunting in children under five as shown in Figure 2. Further research can be carried out by modifying these risk factors to control nutritional intake, so that the actual effects that occur can be better understood. The weakness in this study is that not all of the papers studied were presented in English and a search with a broader term might result in not getting more and varied sources. The results of the studied study are heterogeneous, so it is not possible to collect statistical results. Even so, the research design found in the paper under study has not too large a variation, so in this case the writer is sure about the conclusions obtained based on the paper studied, however, the specific variables used in each study vary, for example the food diversity and household food factors. Security has different contexts such as poverty, parental knowledge, a large number of families, the order of children under five being stunted and others. Therefore, the contribution of this review article is the global focus of stunting in children under five years with various risk factors.

The risk factor for food diversity and household food security reflects a quality of food eaten by toddlers, in this case if the food diversity is less then it is a risk of stunting in the future[6]. When viewed from the diversity of food in stunting toddlers are generally dominated from food sources of energy and low intake of vegetables, fruit and milk [6]. Stunting toddlers consume rice, noodles and corn more often, meanwhile, the intake of green vegetables, fruit sources of vitamin A, eggs, nuts, and milk is lower, also low food diversity than those with normal nutritional status[5, 6]. In addition, stunting is also influenced by the parenting pattern that is when the practice of feeding with the habit of delaying when feeding to toddlers, regardless of their nutritional needs, so that the intake of food of toddlers becomes less good in terms of quality and quantity [6].

This reflects the family's helplessness in maintaining food due to poverty factors, a low level of knowledge can result in parenting, especially in providing less food and maintenance of their health will certainly be low[1]. If the condition is not immediately handled properly, it can directly result in stunting due to micronutriet deficiency will hibit stimulus for growth [29, 30]. In addition, the condition of environmental sanitation and inadequate utilization of health services causes children to easily experience infectious diseases such as diarrhea, infection of upper trakturs respiratoriurs (ISPA) and others.

This condition can be caused by limited resources such as lack of hygiene sanitation, inadequate sources of drinking water or pollutants from the inside of the womb, although research does not agree with this. Repeated exposure to disease, is not enough to convince families to take children to undergo health checks at basic health facilities such as basic health community service (Puskesmas) or centre health service by communities (Posyandu) on a regular basis, but it creates a perception that this is a curse, even mothers sometimes feel embarrassed because of their child's condition [(9)].

Birth low weight low that occurs with complications from pregnancy such as anemia, malnutrition, may not be able to immediately initiate early breastfeeding, exclusive breastfeeding or breast milk for up to two years. If mother from a family with a low level of knowledge, inadequate income, it will result in less parenting and health care, resulting in stunting.

Based on the above descriptions, handling stunting requires the involvement of the government, such as policies that mainly address economic, socio-cultural, political and other problems, so it is expected to increase family income and resources to utilize health services regularly at toddlers so in the end it will reduce the stunting rate in a country, besides that the active participation of the community is to provide education as well as assistance to families with children under five years [(1)].

CONCLUSION

Based on study these paper are found as follos stunting adalah food diversity and household food security, environmental sanitation and drinking water, early initiation of breastfeeding and breastfeeding, birth weight, and parenting and child health care. For further researchers, it is necessary to study one of the strongest risk factors by modifying them using proper control of nutritional intake, so that the real factors that occur can be understood.

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