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Literature Review

Stunting Prevention in the Preconception Period

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A B S T R A C T

Background: The stunting rate in Indonesia in 2022 was 21.6%. I was reduced when compared to the SSGI data in 2021 of 24.4%. The stunting rate appears to be decreasing from year to year, but a joint commitment is still needed to achieve the target of reducing stunting to 14% by 2024. Stunting prevention is a much more effective step than stunting treatment itself. Prevention of stunting can be done by optimizing the role of mothers in the golden phase of child development. stunting prevention in Indonesia still focuses on pregnancy and toddlers, while prevention during the preconception period is still limited.

Purpose: To synthesize and critically effective steps that can be taken to prevent stunting in the preconception period

Methods: The research method employed was a literature review, conducted by using primary studies from PubMed, google scholar, and ScienceDirect with the keywords “stunting; prevention; praconception” published between 2017-2023, in English, open access, and relevant to the topic

Results:A total of 397 research articles were screened for eligibility, and 15 articles met the inclusion criteria. Based on the 15reviewed articles, devide into three themes: Nutritional status during preconception, Supplementation during preconception and Lifestyle during preconception

Conclusion: This review found that there are several efforts made in preventing stunting in the preconception period. it is recommended that health workers can optimize the prevention of stunting in the preconception period.

INTRODUCTION

Stunting, which is a failure to thrive that refers to children who are too short for their age, is associated with chronic malnutrition. Stunting is used as one of the target indicators of child nutrition achievement [1]. In 2022, the WHO estimates that the global incidence of stunting is 22.3%. In Southeast Asia, the incidence of stunting is higher than the global incidence, where stunting is estimated to affect 26.4% of children under five [2]. Data from the Indonesian Nutrition Status Survey (SSGI) 2022, the stunting rate in Indonesia has decreased compared to the previous year. The stunting rate in Indonesia in 2022 was 21.6%. This figure is reduced when compared to the SSGI data in 2021 of 24.4% and the 2018 Basic Health Research (Riskesdas) data which showed a stunting rate of 20.8%. The stunting rate appears to be decreasing from year to year, but a joint commitment is

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still needed to achieve the target of reducing stunting to 14% by 2024 [3]. Stunting in children is not just short stature, but more broadly causes short and long-term problems and consequences that affect a child's health and quality of life. Increased morbidity rates, increased mortality rates are short-term consequences of stunting for the health sector. Stunting also affects child development, both cognitive, motor and language development. Stunting will also affect the economy with increased health costs incurred as a result of illness. Stunting also has long-term consequences associated with health, social and economic development. Stunting is associated with an increased risk of degenerative diseases, decreased reproductive function, decreased learning capacity and achievement and decreased work productivity [4].

Stunting prevention is a much more effective step than stunting treatment itself. Prevention of stunting can be done by optimizing the role of mothers in the golden phase of child development. The golden phase of child development for stunting prevention is divided into three phases which include: preconception phase, prenatal phase and infant-toddler phase. Various roles can be played by mothers in preventing stunting, including: fulfilling maternal, fetal, infant, and child nutrition, initiating early breastfeeding, exclusive breastfeeding, and appropriate complementary foods, optimizing the environment for child development, optimizing family support, and avoiding various psychosocial factors that can be detrimental during pregnancy, growth, and child development [5]. The Government of Indonesia implements a nutrition-specific program aimed at addressing direct causes, which consists of nine points: supplementary feeding for pregnant women and underweight children; blood supplementation tablets for adolescents, women of childbearing age, and pregnant women; breastfeeding promotion and counseling; infant and young child feeding promotion and counseling; malnutrition management; growth monitoring and promotion; micronutrient supplementation; antenatal screening and immunization; and management of sick children. The implementation of stunting prevention programs can be maximized with cross-sectoral cooperation, such as Family Planning to increase promotion of parenting for the First 1000 Days of Life (1000 HPK), the Ministry of Religion to increase premarital guidance [6]. stunting prevention in Indonesia still focuses on pregnancy and toddlers, while prevention during the preconception period is still limited. For this reason, It is important to know the factors that cause stunting in the preconception period and to know the effective steps that can be taken to prevent stunting in the preconception period.

METHOD

This research uses a literature review method. This review was written based on the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines for reporting events evaluated based on health care interventions and behaviors. Questions regarding population, intervention, control and outcomes (PICO) used in this review are: P (population): preconception women, I (intervention): Promotional effort OR Preventive effort OR Health promotion, C (comparison/control): -, O (Outcome): Stunting prevention. The articles used were taken from the online databases PubMed, ScienceDirect, google scholar using the same keywords, namely preconception, stunting, prevention. Then identify relevant articles using inclusion and exclusion criteria, according to table 1 below:

Table.1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
1. Articles published in Indonesian and English 2. Articles published from 2017-2023 3. Articles from qualitative and quantitative research 4. Articles that can be accessed full text for free 5. Articles that focus on preconception stunting prevention efforts	1. Report articles, dissertations, opinions, literature reviews 2. Articles that cannot be accessed with full text 3. Title duplication

RESULT DAN DISCUSSION

After conducting a literature search from the PubMed, ScienceDirect, google scholar databases and filtering again according to predetermined inclusion criteria, 15 articles were found that were suitable for further review. The stages of search results and article selection are displayed using the PRISMA diagram as follows:

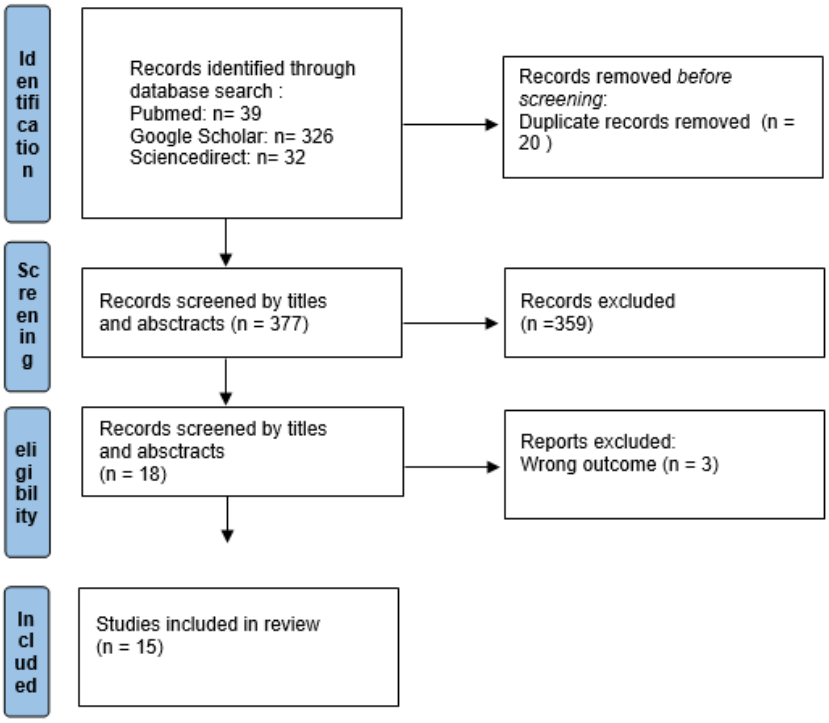

Figure 1. PRISMA diagram of the article search process

Of the 15selected articles, 4 studies were conducted in India, 3 study in Vietnam, 2 study in Indonesia, 2 study in China, 1study in Africa, 1 study in asutralia, 1 study in europe and 1 studies in America. Based on the 15 articles obtained, seven studies were randomized controlled trials, six studies were cohorts and two studies were cross-sectional.

Table 2. Summary of Selected Article Results

No.	Researchers and Locations	Objective	Method	Sample/informant	Results
1	Melissa F. Young, et al 2018, Vietnam [7]	The role of maternal preconception nutrition on child growth and risk of stunting at 1000 HPK	randomized controlled trial	Preconception women	• Women with preconception height < 150 cm or weight < 43 kg are at increased risk of having stunted children at 2 years of age • Low BMI (< 17.5 kg/m2 or < 18.0 kg/m2) was significantly associated with a 1.3-fold increased risk of child stunting • Maternal nutritional status at preconception influences child linear growth and risk of stunting in the first 1000 days of life
2	Nancy F Krebs, et al, 2022, India [8]	determine the benefits of improving maternal nutritional status before conception and during early	randomized clinical trial	Preconception women	Substantial improvements in postnatal growth depend on increased intrauterine growth, especially during early pregnancy.

No.	Researchers and Locations	Objective	Method	Sample/informant	Results
		pregnancy on fetal and early postnatal growth through two years of age early postnatal growth up to two years of age.			
3	Gino Agbota,et al 2019 Africa [9]	Association between maternal BMI and infant length at birth and during the first year of life, and stunting and wasting at 12 months of age	Prospective cohort	Preconception women	underweight in the preconception period is associated with reduced birth weight and during the first year and with a higher risk of stunting at 12 months of age.
4	K Michael Hambidge, et al, 2019 India [10]	Comparing the effect on LBW size, in mothers who took the supplement since 3 months before pregnancy (group 1), compared to women who took the supplement at the end of the first trimester (group 2) or not at all (group 3). women who took the supplement at the end of the first trimester (group 2) or not at all (group 3).	randomized controlled trial	Preconception women	• the average length per age z score of group 1 and group 2 did not differ, group 1 was greater than group 3. • The incidence of stunting was smaller in group 1 than in group 3. • Premature birth rates did not differ between groups • To benefit fetal growth and related birth outcomes come from nutritional supplements started before conception or at the end of the first trimester.
5	Emily Gamboa, et al, 2020 Indonesia[11]	understanding how participation in IPC activities influences knowledge, attitudes/intentions, and consumption of blood tablet supplements and folic acid and iron-rich supplements and foods among Indonesian pregnant women	Cross-sectional	Pregnant women	Educated women were reported to have significantly higher knowledge about folic acid tablets iron supplementation and nutrient-rich foods, and improved attitudes/intentions towards folic acid consumption, compared to unexposed women. Exposure was not associated with actual consumption behavior.
6	Dyah Dwi Astuti et al, 2020 Indonesia [12]	Analyzing the association of secondhand smoke with stunting in children aged 25-59 months.	Cross-sectional	children 25–59 months old	• There is an association of stunting with prolonged exposure to cigarette smoke, water source (p-value, hygiene, exclusive breastfeeding, history of respiratory problems in pregnancy and recurrent respiratory infections. • Logistic regression analysis shows that long smoking increases the risk of stunting.
7	Chao Li,2019 China [13]	to identify the influence of averaging at different time points and to determine theinfluence of maternal BMI before pregnancy	cohort	Preconception women	• The effect of mean maternal BMI and weight gain on weight-for-age Z scores, length-for-age Z scores and mental development indices at various infant time points was significant. • Maternal BMI and weight gain were positively and significantly associated

No.	Researchers and Locations	Objective	Method	Sample/informant	Results
		and weekly gestational weight gain on infant mental development and physical growth.			with WAZ and LAZ in infants of different ages. • positive effects of pre-pregnancy and prenatal nutrition on infant physical growth
8	Dereje G. Gete, et al, 2021 Australia [14]	Knowing the relationship between the quality of the mother's diet before pregnancy and BMI in her offspring.	cohort	Preconception mother	• maternal diet quality before pregnancy is associated with a lower risk of having underweight offspring • better adherence to maternal diet quality before pregnancy is associated with reduced risk of underweight and obesity in childhood
9	Sangappa M. Dhaded, 2019 India[15]	Identify quantitative improvements in birth anthropometric deficits with mothers taking supplements at least three months before conception or in the first trimester of pregnancy	Randomized Controlled Trial	Preconception mother	• there is a difference in birth weight between group 1 and group 3 • there was a difference in length-for-age z scores in children in groups 1 and 3. • continuous anthropometric results were consistently better when maternal nutritional supplements were started 3 months before conception showing benefits to fetal growth
10	Xiaojing Liu, 2021, China [16]	examine the association between preconception hemoglobin (Hb) concentration and the risk of low birth weight (LBW) and small for gestational age (SGA).	Cohort	women with singleton live births delivered at gestational ages of 28–45 weeks who were registered before pregnancy	• women with preconception anemia accounted for 2.28%. The incidence of LBW/SGA was 2.37%/6.30%. • mild anemia in preconception increased LBW and small for gestational age by 17% (95% CI: 1.07, 1.21) and 14% (95% CI: 1.07, 1.21), respectively.
11	Sunita Taneja, et al, 2022 India[17]	determine the impact of providing integrated health, nutrition, water, sanitation services and psychosocial care interventions during the preconception period only, during pregnancy and early childhood, and during preconception, pregnancy, and early childhood compared with birth outcomes and linear growth at 24 months compared with routine care	Randomized Controlled Trial	women were randomised to receive preconception interventions	• The proportion of low birth weight infants was lower in the preconception intervention group than in the no preconception intervention group. • There was a greater effect on the proportion of low birth weight infants in the preconception and pregnancy intervention group compared to the control group.
12	Phuong H Nguyen, et al, 2017 vietnam [18]	Evaluate the impact of multi-micronutrient supplementation (iron and folic acid supplementation) in the preconception period compared to folic acid alone on growth and development of children up to 2 years of age.	Randomized Controlled Trial	Preconception women	• At 24 months of age, the iron and folic acid group had significantly higher length-for-age z scores and reduced risk of stunting. • Children in the iron and folic acid group had improved motor development, especially fine motor skills • Preconception supplementation with iron and folic acid improved linear growth and fine motor development at 2 years of age compared to folic acid alone

No.	Researchers and Locations	Objective	Method	Sample/informant	Results
13	Phuong Hong Nguyen, et al, 2020 vietnam [19]	To determine the relationship between preconception maternal nutritional status, pregnancy weight gain and child growth during pregnancy the first 1000 days of pregnancy with body size attainment at 6-7 years of age	Randomized Controlled Trial	Preconception women	• Maternal preconception nutritional status is positively associated with child height at 6-7 years of age • For every 1 SD higher maternal height and BMI, offspring had higher length-for-age z scores • Higher BMI and weight gain during pregnancy is associated with faster linear growth, especially from 6 to 24 months of age
14	Richard C. Chang, et al, 2019 America [20]	To determine the long-term impact of preconception paternal alcohol use on the growth and metabolism of the child	Randomized Controlled Trial	Preconception women	Paternal alcohol exposure before conception increases the incidence of intrauterine growth restriction (IUGR)
15	Judith S. Brand, et al, 2019, european union [21]	the association of maternal quitting, reducing, and continuing smoking during pregnancy with prolonged fetal growth by triangulating evidence from 3 analytical approaches to strengthen causal inference	cohort	European liveborn singletons in 2 population-based pregnancy cohorts	• Maternal smoking during pregnancy is a risk factor for LBW • This finding reinforces the importance of preconception smoking cessation education

Table 3. Themes that emerged regarding Stunting Prevention in Preconception period

Theme	Sub Theme	Article
Nutritional status during preconception	Women with height and weight deficiencies in the preconception period are at higher risk of having stunted children	**1,3,2**
	women with preconception anemia contributed to the BLR/SGA incidence rate	**11**
	Low BMI in the preconception period is significantly associated with increased risk of stunting	**1,8,14**
Supplementation during preconception	Lipid-based micronutrient supplementation and protein supplementation in the preconception period affect length per age z score in children	**4, 10,12**
	Preconception supplementation with iron and folic acid improves linear growth and fine motor development at 2 years of age compared to folic acid alone	**13**
	education on folic acid tablets and iron supplementation and nutrient-rich foods improves attitudes/intentions towards folic acid consumption	**5**
Lifestyle during preconception	smoking duration increases stunting risk	**6,16**
	Alcohol exposure increases the risk of IUGR	**15**

Table 3 shows that there are several factors that can be modified as prevention of stunting in the preconception period, including nutritional status in the preconception period, supplementation and lifestyle in the preconception period.

The first theme found in this literature review is about nutritional status in the preconception period with stunting prevention. In this literature review there are three articles that link nutritional status in the preconception period with the incidence of stunting. Articles on this theme include explaining that underweight in the preconception period is associated with reduced LBW weight and during the first year and with a higher risk of stunting at 12 months of age [9]. Another article

on this theme also explains that maternal nutritional status in preconception affects children's linear growth and risk of stunting in the first 1000 days [7].

Maternal nutrition plays a critical role in fetal growth, infant health and survival and long-term child health and development. During the first half of the 1000 HPK period (conception to 6 months) the mother is the sole source of nutrition for the developing child [22].Diet and nutrition before pregnancy can modify maternal and perinatal outcomes through effects on BMI. Both maternal underweight and overweight are associated with substantial risks to maternal and child health. Obesity is associated with an increased risk of the most adverse maternal and perinatal outcomes, from inability to conceive to complications of pregnancy (preeclampsia, gestational diabetes) and labor (macrosomia), congenital abnormalities, stillbirth, and low birth weight, unsuccessful breastfeeding and even maternal death [23].

Previous research conducted by Young (2018) entitled The role of maternal preconception nutrition on growth and the risk of stunting in the first 1000 days corroborates the results of this study. The results of Young's research show that women who have a low Body Mass Index (BMI) are significantly associated with the risk of stunting, with this it can be concluded that height, weight and BMI before pregnancy affect the linear growth of offspring and the risk of stunting in the first 1000 days [24]. Research from Dean (2014) entitled Nutritional Inteventions in Preconception Care is also in line with the theme of this study. Dean's results showed that maternal weight before pregnancy was a significant factor in the preconception period. Being underweight contributes to a 32% higher risk of preterm birth, and obesity doubles the risk of preeclampsia and gestational diabetes. Overweight women are more likely to undergo cesarean delivery, and their newborns have a higher chance of being born with neural tube or congenital heart defects [25].

The second theme found in this literature review is preconception supplementation with stunting prevention. In this literature review there are five articles that link supplementation in the preconception period with the incidence of stunting. Articles on this theme explain that to provide benefits to fetal growth and related birth outcomes come from nutritional supplements starting before conception or at the end of the first trimester [10].

Impaired fetal growth is one of the predictors that will be detrimental to the fetus, which can lead to various unfavorable circumstances, such as impaired neurodevelopment, stunting, or even infant mortality [26]. The concept of the First 1000 Days of Life (HPK) is one of the steps to optimize maternal nutrition. Preconception supplementation is a recommended practice to correct a woman's readiness for pregnancy and avoid micronutrient deficiencies [27].

This theme is in line with research conducted by Nguyen (2016) on the effect of folic acid and iron micronutrient consumption on iron status during pregnancy and postpartum. The results of this study showed that iron and folic acid supplementation in the preconception period resulted in a slight increase in iron stores in mothers and infants [28].Research from Dean (2014) is in line with the theme of this study. Among specific nutritional interventions, preconception folic acid supplementation had the strongest evidence of effect, preventing 69% of recurrent neural tube defects. Supplementation of various micronutrients shows promise for reducing congenital anomaly rates and preeclampsia risk. Although more than 40% of women worldwide are anemic in the preconception period, only one study has shown a risk of low birth weight [29].

The third theme found in this literature review is lifestyle in the preconception period with stunting prevention. In this literature review, there are three articles that link lifestyle in the preconception period with the incidence of stunting. The article in this theme explains that mothers who smoke during pregnancy are a risk factor for LBW, this finding reinforces the importance of preconception smoking cessation education [21].This theme is reinforced by an article from Muchlis (2023) which states that the results of logistic regression analysis show that smoking duration increases the risk of stunting [12].

Smoking in the preconception period can cause several complications related to the mother and fetus during pregnancy, including premature birth, low birth weight, birth defects (including oral clefts, limb wasting defects, clubfoot, eye defects and digestive system, especially gastroschisis and abdominal hernia), sudden infant death syndrome. More than half of pregnant women who smoked before pregnancy continue to smoke during their early pregnancy. Only 20% of smoking

women successfully control tobacco dependence during pregnancy. Smoking cessation is recommended before pregnancy, when the woman has more choice of methods for smoking cessation [30].

Alcohol consumption during pregnancy can have adverse effects on fetal alcohol spectrum disorders, a general term used to describe a range of neurodevelopmental conditions of varying severity, including fetal alcohol syndrome, which is often associated with lifelong disability. The prevalence of fetal alcohol syndrome is usually reported as 0.5-2 per 1000 live births, but in some communities the rate can be as high as 2-7 per 1000 live births. Since the damage may already be done by the time the woman suspects she is pregnant, the optimal time to intervene is before conception. Continued prenatal exposure to alcohol and drugs can cause neonatal withdrawal syndrome in the newborn [30].

CONCLUSION

This review found that there are several efforts made in preventing stunting in the preconception period. it is recommended that health workers can optimize the prevention of stunting in the preconception period.

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