

## Factors Affecting Stunting in Indonesia: A Study PRISMA (Preferred Reporting Items for Systematic Review & Meta-Analysis)

## Faktor-Faktor yang Mempengaruhi Stunting di Indonesia : Studi PRISMA (Preferred Reporting Items for Systematic Review & Meta Analysis).

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### Abstract

Stunting, a long-term nutritional problem that arises from insufficient food intake and is caused by vitamin deficiencies, has a broad and complex impact on children's health. Stunting can appear when the child is still in the womb and can occur until the child is two years old. This study explores the factors that influence stunting in Indonesia. Using the PRISMA (Preferred Reporting Items for Systematic Review & Meta-Analysis) method. Through a literature review from various sources such as Google Scholar and PubMed, this research aims to identify crucial factors related to stunting in toddlers by defining the keywords "stunting" and "stunting factors". In the identification, screening, eligibility, and analysis stages, 20 articles were selected that met the criteria for this research. Twenty (20) articles from 2019-2024 have been analysed using the PRISMA diagram. Articles from various journals were found to originate from Indonesia. Research studies show that the factors that influence stunting in Indonesia are 27.27 times compared to mothers with a higher level of education (aOR = 27.27; 95% CI = 4.37 to 170.11), with statistical significance (p = 0.00001). Internal factors influence stunting in Indonesia.

**Keywords:** External Factors, Internal Factors, Stunting, PRISMA

### Abstrak

Stunting merupakan masalah gizi dalam jangka panjang yang timbul akibat kurangnya asupan makanan dan disebabkan oleh kekurangan vitamin, mempunyai dampak yang luas dan kompleks terhadap kesehatan anak. Kondisi stunting dapat muncul ketika anak masih dalam kandungan dan bisa terjadi hingga anak berusia 2 tahun. Penelitian ini mengekplorasi faktor-faktor yang mempengaruhi stunting di ndonesia. Menggunakan metode PRISMA (Preferred Reporting Items for Systematic Review & Meta Analysis). Melalui tinjauan literatur dari berbagai sumber seperti Google Scholar dan PubMed, penelitian ini bertujuan untuk mengidentifikasi faktor-faktor penting terkait stunting pada balita, dengan mendefinisikan kata kunci "stunting" dan "faktor stunting". Pada tahap identifikasi, penyaringan, kelayakan, dan dipilih 20 artikel yang memenuhi kriteria penelitian ini. Sebanyak dua puluh (20) artikel dari tahun 2019-2024 telah dianalisis menggunakan diagram PRISMA. Artikel dari berbagai jurnal ditemukan berasal dari Indonesia. Studi penelitian menunjukkan bahwa faktor-faktor yang mempengaruhi stunting di Indonesia adalah 27.27 kali dibandingkan dengan ibu dengan pendidikan lebih tinggi (aOR = 27.27; 95% CI = 4.37 to 170.11), dengan signifikansi statistik (p 0,00001). Kesimpulan adalah faktor-faktor yang mempengaruhi stunting di Indonesia lebih banyak dipengaruhi faktor internal.

**Kata Kunci:** Faktor eksternal, Faktor internal, Stunting, Prisma



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## Introduction

Stunting is a long-term nutritional problem caused by various factors and occurs across generations. [1]. Indonesians often perceive short or tall stature as a genetic [2]. Society, government, and relevant authorities must pay close attention to this misconception. Studies show that genetic factors contribute only 15%, while nutrition, growth hormones, and recurrent infectious diseases are the significant factors.[3]. Cigarette smoke and air pollution are other factors influencing stunting growth.[4].

The first 1000 days of life (1000 HPK) are crucial as during this period, toddlers experience stunting, which has long-term and recurring effects throughout the life cycle. [5]. Nutritional deficiencies as a direct factor, especially in toddlers, have short-term effects, such as increasing the incidence of illness. This chronic nutritional problem will impact cognitive function and human resource quality. Children who experience malnutrition in their early lives (1000 HPK) are more vulnerable to non-communicable or degenerative diseases as adults due to recurring conditions in the life cycle. [6].

Stunting is a social health problem that requires serious attention. Riskesdas results show that the stunting rate in 33 provinces in Indonesia is relatively stable, from 36.8% in 2007 to 37.2% in 2013[7]. More than half of them have a higher prevalence than the national average.[8][9]. For example, the remarkable difference between DIY (22.5%) and NTT (58.4%) indicates a separation and inequality in development. The prevalence of LBW, according to Riskesdas, is 11.1% (2010) and 10.2 (2013); the proportion of short births (<48 cm) is 20.25% (2003). Over six months, the proportion of exclusive breastfeeding is low at 15.3% [10].

According to previous research, there is a significant correlation between stunting and low birth weight. [10]. Additionally, research has found that inclusive breastfeeding and suboptimal supplementary feeding are correlated factors. Stunting occurring at an early age can persist and pose risks to short stature as adolescents. Children who are short at a young age (0-2 years) and still short at ages 4-6 years have a 27-fold increased risk of being short until puberty; conversely, children who usually grow at a young age may experience growth disturbances at ages 4-6 years and have a 14-fold increased risk of being short in pre-puberty. As a result, even after 1000 HPK, interventions to prevent stunting are still needed.

With its increasing prevalence, stunting remains the most critical public health issue. Malnutrition during the first 1000 days of life (HPK), a crucial period in one's life, causes stunting. Stunting in toddlers indicates previous nutritional problems, especially maternal nutrition issues during pregnancy. [11].

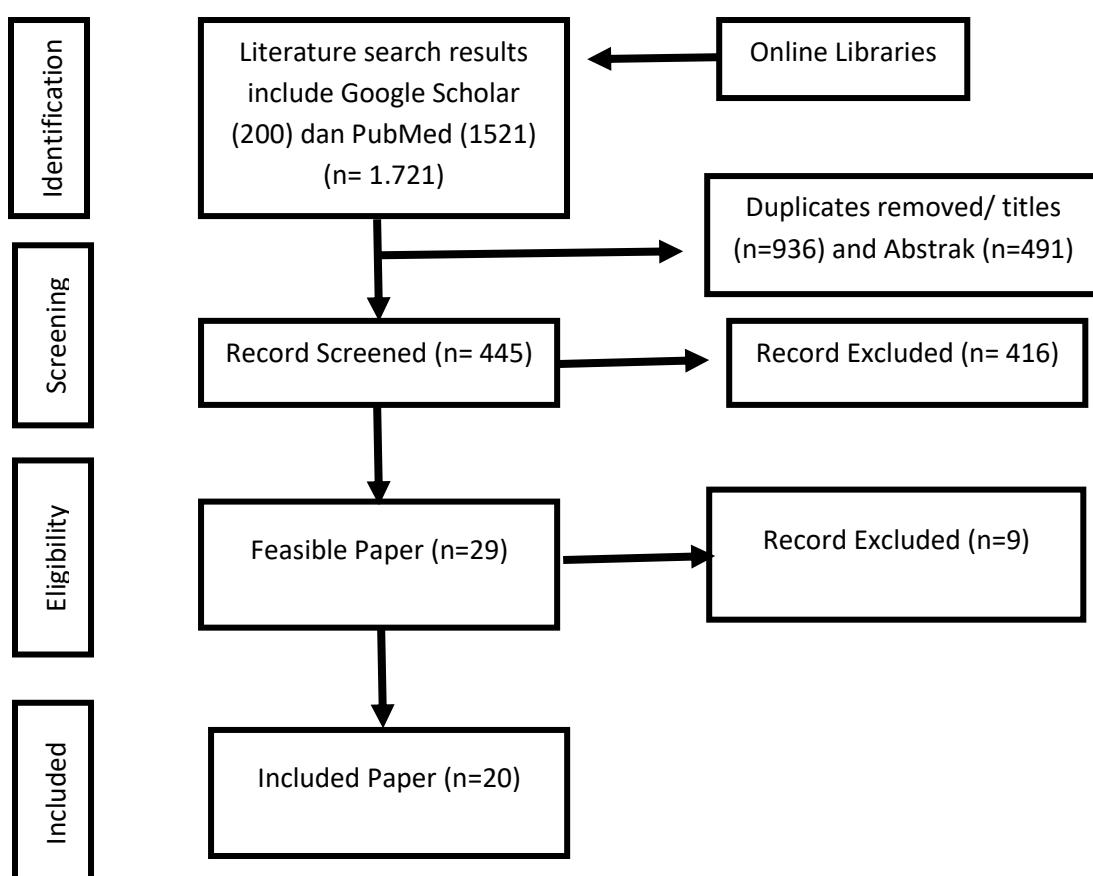
Children's nutritional status indicators are based on the height/age index developed. This indicator provides information on indications of long-term nutritional problems caused by poverty, lifestyle, and poor dietary patterns that hinder growth. In 2020, there were 149 million toddlers in Indonesia experiencing stunting. Stunting, which is related to nutritional problems and found in several regions in Indonesia, is considered a social phenomenon by some people. In contrast, others still see it solely as a health problem.[12].

Families play a crucial role in preventing child stunting. Providing nutrition from the fetus in the womb, exclusive breastfeeding, and feeding practices for toddlers are some actions that families can take[13]. However, in field situations, families continue to be influenced by local culture regarding child nutrition fulfilment. This includes following myths and beliefs about what pregnant mothers should not eat, believing that the first breast milk is dirty food for babies (when, in fact, the first breast milk contains many nutrients). Many babies are given complementary feeding, like baby porridge, before six months of age. However, this

hurts child development and growth [14]. Cultural factors in one's environment directly influence how one responds to one's health needs, including eating habits applied to children.

The above facts are intriguing to study because stunting has significant impacts. These include short-term effects related to infant or toddler illness and death, medium-term effects related to decreased intellectual and cognitive abilities, and long-term effects related to human resource quality and degenerative diseases in adulthood.

In writing this article, a literature review has been conducted from various research journals. This ensures that the produced review article is of high quality. The data sources used are Google Scholar and PubMed. In this study, the keywords "stunting" and "stunting factors" were used. This research aims to find factors related to stunting in toddlers. Articles must have complete manuscripts and be published in nationally and internationally accredited journals. PRISMA (Preferred Reporting Items for Systematic Review & Meta-Analysis) uses four stages in the search strategy. It consists of identification, screening, eligibility, and inclusion in this study, with the keywords "stunting" and "stunting factors" used. The purpose of this research is to determine the factors that contribute to stunting cases. Publication years (2019–2024), article type "research articles," and public access were considered. Identification through searches aided by Harzing's Publish or Perish application with publication limitations from 2019-2024: Google Scholar (200) and PubMed (1521). Screening based on titles (936) and then based on abstracts (491). Adequate full papers eligibility (29), then articles not included (9) due to the absence of stunting discussion but addressing malnutrition and lack of free access. Articles analysed (20). Journals that are not full text, preprinted journals, and not peer-reviewed in the background are excluded. Then, the journal manuscripts in the proofreading stage are not included because changes may occur in the research reporting results.



**Figure 1** PRISMA Flow Diagram m for Database Search of Studies

## Main Text for Discussion

Table 1 shows all the articles included in this research and meet the inclusion criteria published in the 2019-2024 range from various journal databases.

**Table 1.** Results of Data Extraction

No	Author	Title	Population	Result	Year	Country	Name of Journal
1.	Atamou et al.	Analysis of the Determinants of Stunting among Children Aged below Five Years in Stunting Locus Villages in Indonesia	238	The prevalence of stunting among children aged below five years in the villages was 22.3%. Lack of maternal knowledge (AOR: 5.310; 95% CI: 0.671-41.997) and hostile parenting (AOR: 3.026; 95% CI: 1.191-7.871) were associated with a higher risk of stunting. Meanwhile, children below five years with close birth spacing (AOR: 0.304; 95% CI: 0.087-1.063) had a low risk of stunting.	2023	Indonesia	Healthcare
2.	Muchlis et al.	Cigarette Smoke Exposure and Stunting Among Underfive Children in Rural and Poor Families in Indonesia	403	The outcome measured is child stunting (height-for-age Z-score). The prevalence of stunting was estimated at 145 (65.6%). Children living with smoking parents were counted for 157 (71%), and most smoking exposure comes from fathers 147 (67.4%). The predictors of stunting in children under five years were a smoker father with (AOR 1.8; 95% CI 1.281-4.641), both parents are smokers increasing the risk of stunting with (COR 3.591; 95% CI 1.67-3.77), being exposed of smoke for more than 3hours a day increase the risk of stunted children (COR 2.05; 95% CI 1.214-3.629), and using traditional cigarette or kretek expand the risk of stunting (AOR 3.19; 95% CI 1.139-67.785).	2023	Indonesia	Environmental Health Insights
3.	Wicaksono & Harsanti	Determinants of Stunted Children in Indonesia: A Multilevel Analysis at the Individual, Household, and Community Levels	76,165	The prevalence of stunting in the sample population was 36.7%. The odds of stunting increased significantly among under-five boys and children living in slum areas, and the increase of household members (aOR = 1.11, 95 %CI: 1.06-1.15; 1.09, 95%CI: 1.04-1.15; and 1.03, 95%CI: 1.02-1.04 respectively). The odds of	2020	Indonesia	Kesmas: National Public Health Journal

				stunting decreased significantly among children whose parents were more educated (aOR = 0.87, 95 %CI: 0.83–0.91 and 0.87, 95%CI: 0.83–0.9, respectively), who live in an urban area, in a province with higher Gross Domestic Product (GDP) per capita, and a province with a higher ratio of professional health worker per 1,000 population aged 0-4 years (aOR = 0.85, 95%CI: 0.81–0.89; 0.89; 95%CI: 0.79–1.00; and 0.99; 95%CI: 0.99–1.00, respectively)			
4.	Titaley et al.	Determinants of the Stunting of Children Under Two Years Old in Indonesia: A Multilevel Analysis of the 2013 Indonesia Basic Health Survey	24,657	The odds of stunting increased significantly among children living in households with three or more children under five-years-old (aOR = 1.33, 95%CI: 1.03–1.72), households with five to seven household members (aOR = 1.11; 95%CI: 1.03–1.20), children whose mothers during pregnancy attended less than four antenatal care services (aOR = 1.22, 95%CI: 1.08–1.39), boys (aOR = 1.33, 95%CI: 1.22–1.45), children aged 12–23 months (aOR = 1.89; 95%CI: 1.54–2.32), and children who weighed <2500 g at birth (aOR = 2.55; 95%CI: 2.05–3.15)	2019	Indonesia a	Nutrients
5.	Saito et al.	Maternal and Child Health Handbook and under-6 child overweight in greater Jakarta, Indonesia: a cross-sectional web-based survey	233	Significantly more cases of overweight were observed among children whose mothers used the MCH handbook (adjusted OR [aOR]: 5.829; 95% Confidential Interval [CI]: 1.618–20.999) whereas no relationship was observed between MCH handbook use and child undernutrition. Significant associations with child overweight were found for mother's education (tertiary) (aOR: 0.294; 95%CI: 0.098–0.885), employment type (fulltime) (aOR: 0.185; 95%CI: 0.061–0.562), watching television (more than one h) (aOR: 4.387; 95%CI: 1.648–11.678) and recognition of child overweight by mother (yes) (aOR: 3.405; 95%CI: 1.05–11.03).	2023	Indonesia a	BMC Nutrition

6.	Dewi et al.	Nutritional Factors Affecting Stunting Among Toddlers	133	The multivariate analysis with multiple logistic regression included a total of six variables. Multiple logistic regression analysis showed that the factors associated with stunting in toddlers were colostrum feeding history (OR=3.755; 95% CI=1.383 – 10.193), exclusive breastfeeding history (OR=4.558; 95% CI=1.860– 11.171) and history of birth weight (OR=4.418; 95% CI=1.549 – 12.605).	2023	Indonesia	Amerta Nutrition
7.	Hafid et al.	Prevalence and Determinants Stunting Among Children Under Two Years in Indonesian District	As a stunting locus, there are 23 villages in nine sub-districts. The locus of stunting in a sample of 300 children aged 0-23 months	The Results of this research show that 33.7% of children under the age of two are stunted. Stunting in children under the age of two is associated with child age, birth weight, and food insecurity. In addition to a history of low birth weight (AOR=2.7, 95% CI: 1.2-5.7) and experiencing food insecurity (AOR=1.9, 95% CI: 1.1-3.5), children aged 12-23 months (AOR=3.5, 95% CI: 1.7-7.2) have a higher tendency to experience stunting than those who are not.	2023	Indonesia	Poltekita: Jurnal Ilmu Kesehatan
8.	Aditianti et al.	Prevalence And Stunting Risk Factors In Children 24-59 Months In Indonesia: Analysis Of Basic Health Research Data 2018	10.128	The result of this study showed that the prevalence of stunting in children between the ages of 24-59 months was 29.1 per cent. Logistic regression analysis showed that the risk factors associated with stunting in children between the ages 24-59 months were the father's education (AOR 1,56; 95%CI 1,22-1,99), mother's education (AOR 1,44; 95%CI 0,89-1,23), mother's body height (AOR 2,32; 95%CI 1,94-2,77), father's	2020	Indonesia	Penelitian Gizi Dan Makanan (The Journal of Nutrition and Food Research)

9.	Nomura et al.	Risk Factors Associated with Stunting among Children Under Five in Timor Leste	4,581	BMI (body mass index (AOR 1,15; 95%CI 0,98-1,36)), and location of birthplace(AOR 1,63; 95%CI 1,35-1,96).	2023	Indonesi a	Annals of Global Health
10.	Outsuka et al.	Risk Factors for Undernutrition and Diarrhea Prevalence in an Urban Slum in Indonesia: Focus on Water, Sanitation, and Hygiene	228	Compared to women of <145 cm of height, those of $\geq$ 145 cm height had a lower likelihood of having a stunted child (OR: 0.62, 95% CI: [0.48–0.80], $p < 0.001$ ). It was also interesting to note that the risk of stunting was lower among female children than male children [OR: 0.75, 95% CI: (0.64–0.88)].	2019	Indonesi a	The American Society of Tropical Medicine and Hygiene
11.	Wicaksono et al.	Risk factors of stunting in Indonesian children aged 1 to 60 months	194	On multivariate logistic regression analysis, not using a towel for handwashing practices (adjusted odds ratio [AOR] = 2.37; 95% confidence interval [CI] = 1.13–4.96) was significantly associated with an increased risk of stunting. Regarding household environments, children from households using tap water as drinking water were significantly associated with an increased risk of stunting and thinness compared with households using tank water (AOR = 2.26; 95% CI = 1.03–4.93; and AOR = 2.88; 95% CI = 1.13–7.35, respectively). Moreover, children from households using open containers for water storage were significantly associated with an increased risk of diarrhoea (AOR = 5.01; 95% CI = 1.08–23.15).	2021	Indonesi a	Paediatrica Indonesian a

				1.38 to 4.49; P=0.002), low paternal educational level (OR 2.98; 95%CI 1.62 to 5.48; P<0.001), low maternal educational level (OR 2.64; 95%CI 1.38 to 5.04; P=0.003), and living in households with >4 family members (OR 1.23; 95%CI 0.69 to 2.17; P=0.469). Regression analysis showed that the dominant risk factor of stunting was chronic diarrhoea (OR 5.41; 95%CI 2.20 to 13.29; P<0.001).			
12.	Sudikno et al.	Sociodemography of stunting among children under five years in indonesia	This study was a nation wide survey in 514 districts with 32,000 census blocks (320,000 households)	Multivariate regression analysis showed that children 12 months old and older living in rural areas (AOR=1,444; 95% CI: 1,442-1,447) in the Nusa Tenggara region (AOR=1,874; 95%CI: 1,866-1,882), and suffering from diarrhoea (AOR=1,409; 95%CI: 1,401-1,417) were more at risk of becoming stunted	2021	Indonesia	Penelitian Gizi Dan Makanan (The Journal of Nutrition and Food Research)
13.	Laksono et al.	Stunting among children under two years in Indonesia: Does maternal education matter?	70,293	The results show that the proportion of stunted children under two years in Indonesia nationally is 20.1%. Mothers in primary school and under education categories are 1.587 times more likely than mothers with a college education to have stunted children under two years (95% CI 1.576-1.598). Meanwhile, mothers with a junior high school education have a chance of 1.430 times more than mothers with a college education to have stunted children under two years (95% CI 1.420-1.440). Moreover, mothers with education in the senior high school category have 1.230 times more chances than mothers with a college education to have stunted children under two years (95% CI 1.222-1.238).	2022	Indonesia	PLoS ONE

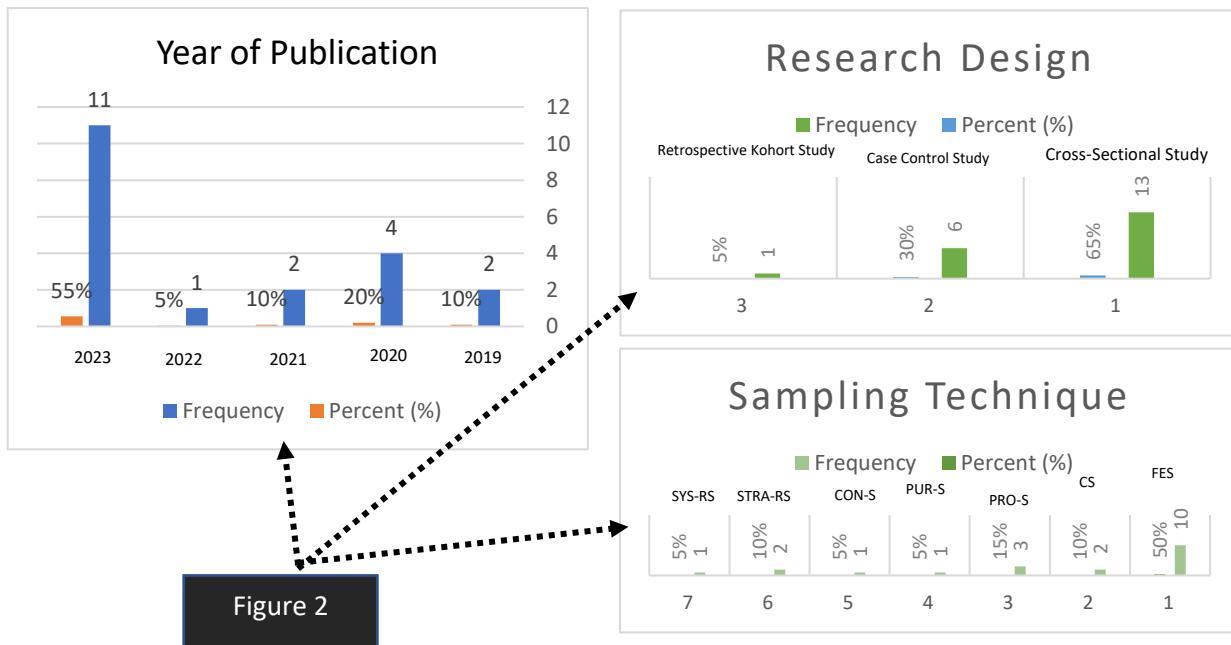
14.	Thahir et al.	Exploring Factors Associated with Stunting in 6-Month-Old Children: A Population-Based Cohort Study in Sulawesi, Indonesia	152	The prevalence of stunting during early infancy (first two months) was 18.4%, which decreased to 15.8% in later infancy (at six months). Factors such as small-for-gestational-age (AOR = 11.29; 2.73–46.66), preterm birth (AOR = 6.33; 1.25–31.97), short birth length (AOR = 4.31; 1.11–16.78), maternal mid-upper arm circumference (MUAC) below 23.5 cm, and female infants (AOR = 3.27; 95%CI: 1.04–10.27) were associated with stunting at six months	2023	Indonesia	Nutrients
15.	Zarmawi & Haryanto	The Association of Children's Blood Lead Levels and Prevalence of Stunting in Tin Mining Areas in Indonesia	193	The odds stunted blood lead concentration was elevated about ten times higher [adjusted odd ratio (AOR) = 9.75 (95% Confidence interval (CI): 3.1–30.7)	2023	Indonesia	Annals of Global Health
16.	Permatasari et al.	The association of sociodemographic, nutrition, and sanitation on stunting in children under five in rural areas of West Java Province in Indonesia	247	Binary logistic regression analysis shows that the mother's height is the dominant factor associated with stunting in children under five (AOR = 3.45, 95% CI: 1.12–4.67, p = 0.008). In addition, children's age (AOR = 0.250, 95% CI: 0.104–0.598, p = 0.002); balanced diet practices (AOR = 1.57, 95% CI: 0.965–2.56, p = 0.069), and building materials (AOR = 1.869, 95% CI: 0.87–4.00, p = 0.108 are also related to stunting in children under five.	2023	Indonesia	Journal of Public Health Research
17.	Sadariah et al.	Analysis of factors affecting the incidence of stunting in toddlers aged 6-59 months	198	The results showed an odds ratio (OR) value of 4.681, which means toddlers 6-59 years old with a significant parenting style will be at risk of stunting 4.68 times accompanied by a confidence interval of 95% (CI) (CI 95%), obtained a Lower Limit (LL) value of 1.641 and Upper Limit (UL) 13.350.	2023	Indonesia	Jurnal Ilmiah Kesehatan Sandi Husada
18.	Nugraheni et al.	Determinant Factors on Stunting Incidence among Children Age 6-24 Months, Pemalang, Central Java: A Case Study	142	Results: Mother's occupation (OR= 0.26; 95% CI= 0.01 to 0.78; p= 0.035);, history of exclusive breastfeeding (OR= 0.07; 95% CI= 0.02 to 0.25; p= 0.001), history of infectious disease (OR= 0.008; p= 0.010), Nutritional intake (OR= 9.44; 95% CI=1.88 to 47.43; p= 0.006),	2020	Indonesia	The 7th International Conference on Public Health

				and they were statistically significant.			
19.	Siswati et al.	Stunting among children in Indonesian urban areas: What are the risk factors?	13.248	Children characteristics such as low birth weight (AOR 1.2 CI 95% 1.09-1.32); and short newborn length (AOR 1.16 CI95%:1.99-1.23) and stature father (AOR 1.24, CI95% 1.18-1.31) and mother (AOR 1.23, CI95% 1.17-1.29); maternal low education (AOR 1.14, CI 95% 1.02-1.23); paternal low education(AOR 1.13, CI95% 1.02-1.23), low, middle economic level (AOR 1.12, CI 95% 1.06-1.19; AOR 1.24, CI95% 1.15-1.33) were factors associated with urban stunting children.	2020	Indonesia	Jurnal Gizi dan Dietetik Indonesia (Indonesia Journal of Nutrition and Dietetics)
20.	Aditia et al.	Factors Associated with Stunting in Children Under Five Years	303	Data analysis was univariate and bivariate with a chi-square test. The results showed that exclusive breastfeeding (OR = 10,247), quality of complementary feeding (OR = 9,362), Infectious Diseases (OR = 4,1940, Mother's Knowledge (OR = 9,4410, and parenting patterns (OR = 10,065) associated with stunting	2023	Indonesia	Jurnal Kesehatan Komunitas (Journal of Community Health)

**Table 2** Characteristics of Study

Author	Year of Publication	Research Design	Sampling Technique
Atamou et al.	2023	Cross-Sectional Study	Fixed Exposure Sampling
Muchlis et al.	2023	Case-Control Study	Purposive Sampling
Wicaksono & Harsanti	2020	Cross-Sectional Study	Proportional Sampling
Titaley et al.	2019	Cross-Sectional Study	Fixed Exposure Sampling
Saito et al.	2023	Cross-Sectional Web-based Survey	Fixed Exposure Sampling
Dewi et al.	2023	Case-Control Study	Fixed Exposure Sampling
Hafid et al.	2023	Cross-Sectional Study	Stratified Random Sampling
Aditianti et al.	2020	Cross-Sectional Study	Fixed Exposure Sampling
Nomura et al.	2023	Cross-Sectional Study	Cluster Sampling
Outsuka et al.	2019	Cross-Sectional Study	Proportional Sampling
Wicaksono et al.	2021	Case-Control Study	Consecutive Sampling
Sudikno et al.	2021	Cross-Sectional Study	Fixed Exposure Sampling
Laksono et al.	2022	Cross-Sectional Study	Cluster Sampling
Thahir et al.	2023	Retrospective Cohort Study	Fixed Exposure Sampling
Zarmawi & Haryanto	2023	Cross-Sectional Study	Fixed Exposure Sampling

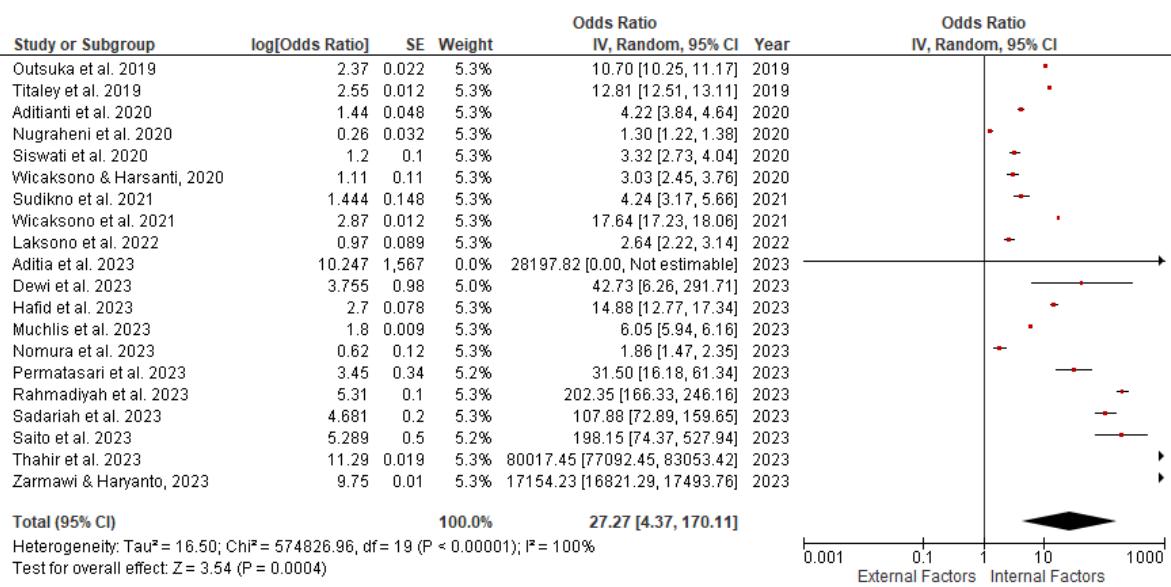
Permatasari et al.	2023	Cross-Sectional Study	Systematic Random Sampling
Sadariah et al.	2023	Case-Control Study	Fixed Exposure Sampling
Nugraheni et al.	2020	Case-Control Study	Fixed Exposure Sampling
Siswati et al.	2020	Cross-Sectional Study	Proportional Sampling
Aditia et al.	2023	Case-Control Study	Stratified Random Sampling



**Figure 2** Meta-analysis results graph of Factors Affecting Stunting in Indonesia using RevMan

As mentioned in the research methodology section, 20 articles were selected, along with the meta-analysis results, using RevMan.

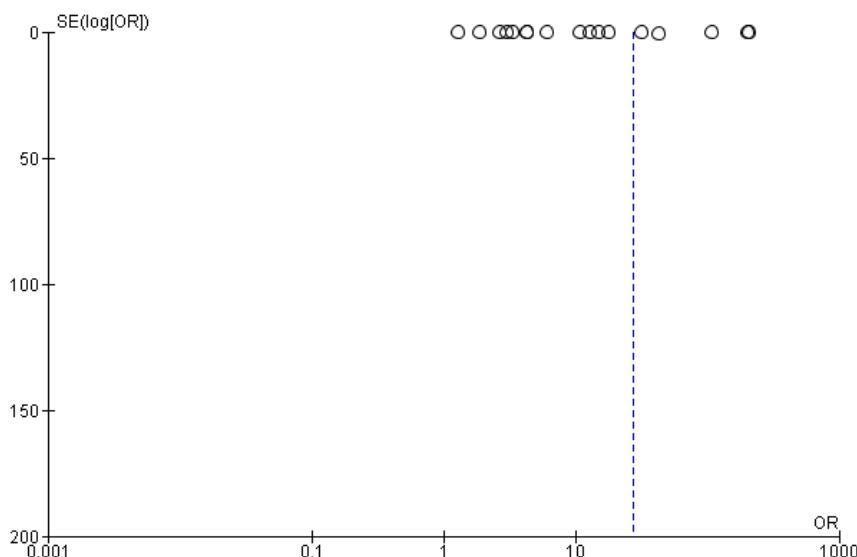
#### Forest Plot



**Figure 3** Forest Plot Factors Affecting Stunting in Indonesia

Based on Figure 3, it can be observed that the factors influencing stunting in Indonesia internally are 27.27 times greater compared to external factors, with statistical significance ( $p=0.00001$ ). The heterogeneity and research indicate  $I^2 = 100.0\%$ ; thus, the data distribution is declared heterogeneous (*random effect model*).

### Funnel Plot



**Figure 4** Funnel Plot Factors Affecting Stunting in Indonesia

Based on Figure 4, there is publication bias marked by the asymmetry of the plots on the right and left, where three plots are on the left and four are on the right. The plots on the left side of the graph have a standard error of 0. The plots on the right have a standard error of 0.

Bias also occurs due to the imbalance between the study distances on the right and left sides of the funnel plot.

### Here are the internal factors:

#### Inclusive/Exclusive Breastfeeding

Inclusive/exclusive breastfeeding is associated with a decrease in the prevalence of stunting in children. Consequently, children who do not receive exclusive breastfeeding are at risk of stunting. [15][16]; two recent studies show that babies weaned before six months of age are at higher risk of stunting [17][18]. Additionally, breastfeeding from 0 to 5 months reduces the risk of stunting. [19].

#### Low Birth Weight Delivery

Premature baby deliveries pose a risk of Low Birth Weight (LBW), which significantly increases the risk of stunting. Research findings indicate that babies born with LBW are 1.74 times more likely to experience height/length growth retardation. [20]. Based on other studies, babies born with LBW have a 5.87 times higher risk of stunting. [21][22]. Research conducted in Brebes shows LBW records a 6.63 times stunting incidence.

#### Birth Length of the Baby

Research conducted in Kulon Progo states that if the baby's length is less than 48cm, they are at risk of stunting later in life.[23]. Based on research in India, babies born with short stature are at risk of stunting. [24]. Research in Depok found that babies with short stature are at risk of stunting later in life.[25].

#### External factors also exist, including:

#### Family Economic and Social Status

Family income is a socio-economic indicator that meets and fulfils family needs, supported by research findings stating that farming families are at risk of stunting.[26]. Low income poses a risk of stunting.[23]. Research conducted in 3 provinces in Indonesia, Bali, West Java, and NTT, show that the risk factors for

stunting are low father's income [27]. Whereas research conducted in Semarang shows that families with low socioeconomic status have an 11-fold risk of stunting [28].

### **Mother's Education**

Mothers play a primary role in determining their child's health, therefore, quality maternal education makes mothers more selective and creative in providing nutritious food to their children. Research findings show that low maternal education has a 1.6 times higher risk of stunting [29][30]. Research conducted in Banjar Baru shows that low maternal education leads to a 5.1 times stunting occurrence in children[21][22].

### **Infectious Diseases Based on the WHO Concept**

Infectious diseases often afflict stunted children, such as diarrhea, worms, inflammation, malaria, and respiratory disorders. The most significant risk detected is diarrhea, caused by incomplete immunization. Based on research findings in pre-prosperous and rural communities, infectious diseases such as diarrhoea pose a risk of stunting.[31]. Research findings in Ethiopia show that children suffering from diarrhoea have a 6.3 times stunting risk. [32].

The WHO concept indicates a comprehensive review of articles on determinants of child stunting in Indonesia. From the literature review consistently, we found that maternal height, premature birth, LBW, birth length, low maternal education, infectious diseases, and family socioeconomic status are risk factors for stunting in Indonesia. [15][16].

Recent cross-sectional research shows that early weaning, father's height, consumption of raw water, and unclean surroundings have a risk of stunting. [33], while research in Madura shows that early introduction of complementary feeding poses a risk of stunting [33]. Stunting risk in children [34]. Efforts to combat stunting are carried out through experimental research using zinc supplements in children to improve height/length Z-scores [35][35], linear growth differences were found in stunted toddlers after being given zinc calcium [36].

We also found that community roles, access to healthcare, and quality healthcare services play a significant role in stunting in Indonesia. Besides, through academic research, Indonesia has developed the "Nutrition Improvement" policy, interpreted as the National Movement for the First 1000 Days of Life. Since nutrition issues have multifactorial variables, cross-sector involvement is necessary for implementation. Studies on the success of nutrition reduction policy implementation through various methods (systemic review, meta-analysis) show that global nutrition reduction policy implementation still needs to be improved. [37][38].

As a member state of the UN, Indonesia is committed to playing a role in reducing the prevalence of stunting. The issuance of Presidential Regulation No. 42/2013 is one of the SUN strategies involving cross-sectoral collaboration. This regulation is essential because stunting is related to poverty, low education, diseases, and low female productivity. [39][40]. Studies in Bangladesh show a correlation between poverty and malnutrition occurring in illiterate mothers, those low income, have many siblings, those with poor media access, those with poor sanitation, and those with poor health risk nutrition issues. [41]. However, differences in development between regions in Indonesia also affect the magnitude of disparities in stunting prevalence.

Study findings in Ghana show that poverty and regional characteristics are causes of differences in nutrition problems in toddlers. [42]. Therefore, serious attention is needed to address these issues and reduce stunting cases early, even during the first 1000 days of life, which is the golden period for preventing stunting growth. [43]. Low fetal growth during the first 1000 days has long-term impacts. If external factors (after birth) do not support it, stunting growth can be permanent, such as short adolescence. Research results show that those who are short or stunted at birth, biologically.

### **Conclusions and Future Directions**

Based on the identification results and several articles, it can be concluded that the consistent determinants of stunting in Indonesia are socioeconomic status (family income), maternal education, LBW, premature birth, inclusive breastfeeding, birth length, and macro and micro deficiencies. Additionally, community and societal factors significantly influence stunting. Further research is needed regarding

economic, political, social, and cultural variables, agriculture and food systems, water, and sanitation in stunting in Indonesia. It is essential to enhance productivity and social improvement.

### Conflict of Interest

The authors shall declare no conflict of interest if it is true.

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