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Determinant Factors of Stunting in Children Under Five Years Old: A Systematic Review

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Abstract

Introduction: Stunting is a child health issue that affects the entire world and requires prompt attention. Stunting is common in children under the age of five for a variety of reasons.

Objectives: . This study intends to examine the factors that contribute to stunting in children under the age of five.

Methods: The research strategy employs a systematic review methodology to find 40 pertinent papers by searching the electronic databases of ScienceDirect and PubMed between the dates of January 1, 1970, and December 15, 2022.

Results: According to an analysis of the included articles, a history of exclusive breastfeeding, vitamin A supplements, a varied diet, receipt of all required basic vaccinations, and a history of low birth weight (LBW) are determinant factors that affect the incidence of stunting in children under the age of five.

Conclusions: Stunting is, to variable degrees, correlated with a number of risk factors. Given that women play a crucial role in efforts to prevent and combat stunting, it is crucial to involve health professionals and family support in empowering mothers to increase certain knowledge and self-management skills in order to get ready for pregnancy and child development.

Keywords: Stunting; children under five; determining factors

1. Introduction

Stunting cannot detect changes in acute malnutrition and is a symptom of prior or chronic malnutrition. Height for age is the index used for children under 2 years old, whereas height for age is used for children beyond 2 years old. Stunting is defined as a z-score -2 SD deficiency in length or height for age [1]. Stunting causes physical and cognitive failure in children that is irreversible, spanning a lifetime and even influencing the following generation. Due to barriers to obtaining a healthy diet and necessary nutrition services during the COVID-19 pandemic, this figure may significantly rise. Therefore, before taking into account the complete population of children under five years old employed to track this indicator, a higher prevalence of stunting may be observed among children born during the first year of the pandemic. [2].

According to information from the Global Nutrition Report for 2021, the expected rise in stunting is quite worrisome. There are 149.2 million stunted children under the age of five in the world, which translates to one in every five kids. [3]. It is predicted that there will be an additional 3.4 million stunted children in 2022, based on the Food and Agriculture Organization of the United Nations' study from 2021. [4]. If the world is to meet the worldwide goal of lowering the number of children with stunting by 40% by 2025 and by 50% by 2030, more rigorous measures are required.[2].

From the womb onward, stunting is possible. The dietary status of expectant mothers will affect the fetus' growth even before pregnancy. Women who are undernourished throughout pregnancy run the risk of giving birth to children who are underweight at birth. Babies who are not properly nursed after birth run the risk of contracting a number of infectious diseases because of a diet deficient in nutrition. After the age of six months, children require a nutritional intake that may satisfy their requirements for calories, protein, carbs, and lipids, as well as micronutrients (acquired from regular meals). The significant frequency of stunting is attributed to socioeconomic factors, food security, the availability of clean water, and access to other basic service facilities. [5].

Short-term consequences of stunting include disruptions in the growth of the body's organs, mental and physical development, and metabolic diseases. Long-term negative effects include diminished cognitive function and academic performance, lowered immunity, which makes you more susceptible to illness, and a high risk of diabetes, obesity, heart and blood vessel disease, cancer, stroke, and old age disability. as well as low economic output due to uncompetitive work quality.[6].

To lessen its effects, it is crucial to examine the prevalence of stunting and its causes in children under the age of five. This evaluation of the literature may provide data that can be utilized by public health professionals, physicians, and health planners to determine the most effective strategies to decrease the prevalence of stunting in children and its determinants.

2. Objectives

In this study, the causes of stunting in children under the age of five will be investigated.

3. Methods

The research design explores the causes of stunting in children under the age of five using a systematic review technique and narrative synthesis. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) standards for drafting systematic review reports served as the foundation for this review. The reviewer searches numerous electronic databases for published journal articles as part of the systematic review process. Between January 1, 1970, and December 15, 2022, PubMed and ScienceDirect were two of the electronic databases used. "Stunting" and "determinants factor" were among the search terms' keywords. Figure 1 depicts the selection procedure for the studies that were reviewed. Data were taken from each study that met the following criteria for inclusion: 1) using measurements of stunting; 2) identifying the causes of stunting; 3) identifying stunting in children under five; 4) journals published in English; and 5) identifying at least one of the independent variables, such as: exclusive breastfeeding, low birth weight, vitamin A supplements, history of basic immunization, and dietary diversity. If a systematic review was utilized as the research methodology, the articles are omitted. Guidelines were utilized in this systematic review to evaluate the caliber of the literature in the chosen studies. To evaluate the possibility of bias in the chosen studies, the Critical Appraisal Skills Program (CASP) and quality assessment criteria were employed.

4. Results

The initial search using all keywords yielded 1107 article titles; 124 were removed due to duplication of titles and authors, leaving 983 for screening; 889 were then eliminated due to the relevance of the titles and abstracts; 94 were then subjected to full text checks, leaving 40 articles for this systematic review. Thus, the causes of stunting in kids under the age of five are determined. The articles' synopsis is shown in Table 1.

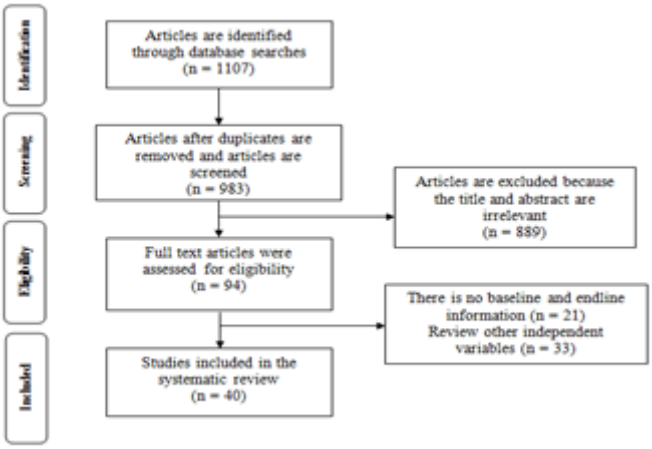

Figure 1. PRISMA Flow Diagram

Table 1. Article Synthesis

No.	Researcher, Publication, Research Title	Research Population	Research Methods	Research Variable	Result Research
1.	Journal of Nutrition and Metabolism (2021), Stunting and Associated Factors Among Under Five-Age Children in West Guji Zone, Oromia, Ethiopia, by Eyob Afework1, Selamawit Mengesha2, and Demelash Wachamo3.	Children aged 6-59 months	Community based cross-sectional study	Independent variable: complete basic immunization	According to this study, there is a connection between the prevalence of stunting in the West Guji Zone of Oromia, Ethiopia, and full basic immunisation (p-value = 0.009). The COR value was 1.60 (95% CI: 1.10–2.33), indicating that children who did not obtain all of their basic immunisations had a two-times higher risk of stunting than those who did.
2.	Stunting and Its Determinants Among Children Aged 6–59 Months in Northern Ethiopia: A Cross-Sectional Study, Shiferaw Abeway1, Bereket Gebremichael2, Rajalaksmi Murugan3, Maresha Assefa4, and Yohannes Mehretie Adinew5, Journal of Nutrition and Metabolism (2018)	Children aged 6-59 months	Community based cross-sectional study	Independent variables: history of low birth weight, and complete basic immunization	According to this study, there is no correlation between the prevalence of stunting in northern Ethiopia and receiving all recommended vaccinations (p-value = 0.73). In northern Ethiopia, a correlation between low birth weight and the prevalence of stunting was discovered (p-value = 0.01). The COR value is 4, which indicates that children with low birth weight have a 4 times higher likelihood of being stunted (95% CI: 1.65–10.01).
3.	Low Intake of Essential Amino Acids and Other Risk Factors of Stunting Among Under Five Children in Malang City, East Java, Indonesia, by Annisa Rizky Maulidiana1 and Endang Sutjiati2, Journal of Public Health Research (2021), Volume 10:2161.	Children aged 24-59 months	Case control study	Independent variable: history of exclusive breastfeeding	This study found that 23 (38%) of the 80 participants were stunted kids. The findings demonstrated a connection between the prevalence of stunting in Malang City, East Java, Indonesia, and exclusive breastfeeding (p-value = 0.022). The OR score is 5.34, indicating that children who are not exclusively breastfed are five times more likely than those who are to be at risk for stunting.
4.	Comparison of WHO Growth Standard and National Indonesian Growth Reference in Determining Prevalence of Underweight in Children Under Five: A Cross-Sectional Study From Musi Sub District, by	Children under five years old	Cross-sectional study	Independent variable: history of low birth weight	According to this study's findings (p-value = 0.045), stunting is more common in children under the age of five in Musi District when their birth weight is low. According to the COR value of 2.948 (95% CI: 1.025-8.478), there is a threefold increased risk of stunting in newborns who are underweight.

	Jeannie Flynn1, Firas Farisi Alkaff2, William Putera Sukmajaya3, and Sovia Salamah4,				
5.	The Co-occurence of Anemia and Stunting in Young Children, Maternal and Child Nutrition (2018), Lucas Gosdin1, Reynaldo Martorell2, Rosario M. Bartolini3, Rukhsan Mehta4, Sridhar Srikantiah5, and Melissa F. Young6	Children under five years old	Cross-sectional study	Independent variable: diatery diversity	According to this study, there is a connection between dietary variety and the prevalence of stunting in Peru's under-five population (p-value = 0.05). The OR value is 0.60 (95% CI: 0.41-0.88), which indicates that children with a diet that is less diverse (4 different food groups) have a 1-times greater likelihood of being at risk for stunting.
6.	Jorge Castro Bedrinana1, Doris Chirinos Peinado2, and Gina De La Cruz Calderon3, Public Health in Practice 2 (2021), Predictive Model of Stunting in the Central Andean Region of Peru Based on Socioeconomic and Agri-Food Determinants	Children under five years old	Cross-sectional study	Independent variable: history of low birth weight	According to this study, there is a connection between low birth weight and the prevalence of stunting in Peru's under-five population (p-value = 0.000). The correlation between spearmen is 0.210.
7.	Determinants of Stunting in Children Under Five Years in Dibate District of Ethiopia: A Case-Control Study, Dinaol Abdissa Fufa, Human Nutrition and Metabolism, 30 (2022).	Children aged 6-59 months	Case-control study	Independent variables: history of exclusive breastfeeding, and dietary diversity	According to this study, there was no correlation between the prevalence of stunting in Ethiopian children aged 6–59 months and a history of exclusive breastfeeding (p-value > 1.00). However, a link between dietary variety and the prevalence of stunting in Ethiopian children aged 6–59 months was discovered (p-value = < 0.01). The COR score is 9.73 (95% CI: 6.3–15.1), indicating that children who do not consume a variety of foods run a 10 times higher risk of stunting.
8.	Understanding the Geographical Burden of Stunting in India: A Regression-Decomposition Analysis of District-level Data from 2015–16, Purnima Menon1, Derek Headey2, Rasmi Avula3, and Phuong Hong Nguyen4	Children under five years old	Cross sectional study	Independent variables: complete basic immunization and vitamin A supplementation	This study found a correlation between the incidence of stunting in children under the age of five in India and the receipt of vitamin A supplements (p-value = < 0.001), with coefficient values of -0.26 (95% CI: -0.30, -0.22) and -0.24 (95% CI: 0.28–0.19).

9.	Nutrition Journal (2018) 17:14, Yohannes Adama Melaku1, Tiffany K. Gill2, Anne W. Taylor3, Robert Adams4, Zumin Shi5, and Amare Worku6. Associations of Childhood, Maternal, and Household Diaper Patterns with Child Stuntin in Ethiopia: Introducing a Reliable Alternative to Dietary Diversity Scores	Children under five years old	Cross sectional study	Independent variables: history of exclusive breastfeeding and dietary diversity	According to this study, there is a connection between a history of exclusive breastfeeding and a diverse diet and the prevalence of stunting in children under five in Ethiopia (p-values = 0.001 and 0.045, respectively).
10.	As reported in PLOS One (2018) by Kazi Istiaque Sanin, M. Munirul Islam, Mustafa Mahfuz, A. M. Shamsir Ahmed, Dinesh Modal, Rashidul Haque, and Tahmeed Ahmed, poor micronutrient adequacy between 12 and 24 months of age is not linked to stunting, according to the results of a cohort study conducted in a Bangladeshi slum.	Children aged 12-24 months	Cohort study	Independent variable: history of low birth weight	According to this study, low birth weight and the prevalence of stunting in Bangladesh's slums are related (p-value = < 0.000). The odds ratio (OR) is 3.03 (95% confidence interval [CI]: 1.69–5.44), which indicates that stunting is three times more likely in newborns with low birth weight.
11.	Nutrition Journal (2019) 11-18, "Predictors of Stunting with Particular Focus on Complementary Feeding Practices: A Cross-Sectional Study in the Northern Province of Rwanda," by Vestine Uwiringiyamana1, Marga C. Ocke2, Sherif Amer3, and Antonie Veldkamp4.	Children aged 5-30 months	Cross sectional study	Independent variables: history of exclusive breastfeeding and dietary diversity	In children aged 5 to 30 months in North Rwanda Province, this study found that there was no correlation between dietary variety and the prevalence of stunting (p-value = < 1.00). However, a correlation between the prevalence of stunting in children aged 5 to 30 months in North Rwanda Province and a history of exclusive breastfeeding was discovered (p-value = < 0.001).
12.	Gac Sanit Journal (2021): 35, Hasan Basri1, Veni Hadju2, Andi Zulkifli3, Aminuddin Syam4, Ansariadi5, Stang6, Rahayu Indriasari7, and Siti Helmiyati Stunted Children in Jeneponto District, Indonesia: Dietary Diversity, Diatery Patterns, and Diatery Intake	Children under five years old	Cross sectional study	Independent variable: vitamin A supplement	This study found no correlation between the frequency of stunting in children under the age of five in Jeneponto Regency, Indonesia, and vitamin A supplementation (p-value = 0.685).

13.	Children's Anemia and Stunting in Ghana: Correlates and Spatial Distribution, Population Health (2020), by Aaron Kobina Christian1, Caesar Agula2, and Philip-Neri Jayson-Quashiqah3.	Children under five years old	Cross sectional study	Independent variables: vitamin A supplementation and dietary diversity	According to this study, dietary diversification and vitamin A supplementation are related to the prevalence of stunting in children under five in Ghana (p-value = < 0.001).
14.	BMC Public Health (2018) 18:197, M. Munirul Islam1, Kazi Istiaque Sanin2, Mustafa Mahfuz3, A.M. Shamsir Ahmed4, Dinesh Mondal5, Rasidul Haque6, and Tahmeed Ahmed7 Results of a Prospective Cohort Study on Stunting Risk Factors Among Children Living in an Urban Slum in Bangladesh	Children aged 12-24 months	Cohort study	Independent variable: dietary diversity	According to this study, there is no correlation between dietary variety and the prevalence of stunting in Bangladeshi children between the ages of 12 and 24 months (p-value = 0.505).
15.	Determinants of Stunting in Children Under 5 Years in Madagascar, Hasina Rakotomanana1, Gail E. Gates2, Deana Hildebrand3, and Barbaea J. Stoecker4, Maternal and Child Nutrition (2017):13	Children under five years old	Cross sectional study	Independent variable: history of low birth weight	According to this study's findings (p-value = < 0.01), stunting is more common in children under the age of five in Madagascar when their birth weight is low. The AOR value is 1.56, with a 95% confidence interval of 1.17 to 2.06, indicating that children with low birth weight are two times more likely to experience stunting.
16.	Determinants of Stunting Among Children Aged 6-59 Months in Kindo Didaye Woreda, Wolaita Zone, Southern Ethiopia: An Unmatched Case-Control Study, Bancha Batiro1, Tsegaye Demissie2, Yoseph Halala3, and Antehun Alemayehu Anjulo4, Plos One (2017)	Children under five years old	Case control study	Independent variable: complete basic immunization	Stunting and complete basic immunisation were found to be related in this study (p-value = < 0.01). The AOR value was 6.38 (95% CI: 2.54–17.10), indicating that children who did not receive the full complement of basic immunisations had a six-times higher risk of stunting than those who did.
17.	Beyond Personal Factors: Multilevel Determinants of Childhood Stunting in Indonesia Tri Mulyaningsih1, Itismita Mohanty2, Vitri Widyaningsih3, Tesyafe Alemayehu	Children under five years old	Cross sectional study	Independent variable: history of low birth weight	According to this study, there is a connection between stunting and low birth weight (p-value = < 0.05). The AOR value is 2.29 (95% CI: 1.73-3.01), which indicates that children who are underweight at birth are twice as likely to experience stunting.

	Gebremedhin4, Riyana Miranti5, and Vincent Hadi Wiyono6, Plos One (2021).				
18.	Trends and Determinants of Stunting Among Children Under 5 Years: Evidence From the 1995, 2001, 2006, and 2011 Uganda Demographic and Health Surveys, Ying Ying Yang1, Gabriella Kaddu2, David Ngendahimana3, Hope Barkoukis4, Darcy Freedman5, Yovani AM Lubaale6, Ezekiel Mupere7, and Paul M. Bakaki8, Public Health Nutrition: 21 (16), 2915-2928	Children under five years old	Cross sectional study	Independent variable: history of low birth weight	Low birth weight and stunting are related, according to this study (p-value = < 0.001). The OR result is 1.59 (95% CI: 1.44–1.77), which indicates that children who are underweight at birth are twice as likely to experience stunting.
19.	Stunting at Birth and Associated Factors Among Newborns Delivered at the University of Gondar Comprehensive Specialized Referral Hospital, Almaz Tefera Gonete, Bogale Kassahun, Eskedar Getie Mekonnen, Wubet Worku Takele, and Plos One (2021),	Children aged 6-59 months	Cross sectional study	Independent variable: history of low birth weight	According to this study, there is a connection between stunting and low birth weight (p-value = < 0.00). The COR value is 2.84 (95% CI: 1.74–4.62), which indicates that stunting is three times as prevalent in newborns who are underweight.
20.	Social Determinants of Stunts in Rural Wardha, Central India, Pradeep R. Deshmukh1, Nirmalya Sinha2, and Amol R. Dongre3, Medical Journal Armed Forces India 69 (2013) 213-217	Children aged 0-36 months	Cross sectional study	Independent variable: vitamin A supplement	According to this study, there is a connection between vitamin A supplementation and the prevalence of stunting in Indian children between the ages of 0 and 36 months (p-value = < 0.05). Children who do not receive vitamin A supplements are twice as likely to be at risk of stunting, according to the OR value of 1.8 (95% CI: 1.2-2.7).
21.	Determinants of Stunting and Severe Stunting Among Underfives in Tanzania: Evidence From the 2010 Cross-Sectional Household Survey, Lulu Chirande1, Deborah Charwe2, Hadijah	Children aged 0-36 months	Cross sectional study	Independent variable: history of low birth weight	This study demonstrates that there is an association between low birth weight and stunting (p-value = < 0.001). The AOR value is 1.48 (95% CI: 1.19–1.84), which suggests that children with low birth weight are 1 times more likely to be at risk of stunting.

	Mbwana3, Rose Victor4, Sabas Kimboka5, Abukari Ibrahim Issaka6, Surinder K. Baines7, Michael J. Dibley8, and Kingsley Emwinyore Agho9				
22.	BMC Paediatrics (2017) 17:176, Sandra Nkurunziza1, Bruno Meessen2, Jean Pierre Van Geertruyden3, and Catherine Korachais4 Evidence from a National Cross-Sectional Household Survey, 2014: Determinants of Stunting and Severe Stunting Among Burundian Children Aged 6–23 Months	Children aged 6-23 months	Cross sectional study	Independent variable: history of low birth weight	Low birth weight and stunting are related, according to this study (p-value = <0.001). The AOR value is 2.9 (95% CI: 2.4–3.6), which indicates that stunting is three times as likely to occur in infants with low birth weight.
23.	BMC Public Health (2014) 14:800, Teshale Fikadu1, Sahilu Assegid2, and Lamessa Dube3. Stunting Risk Factors Among Children Between the Ages of 24 and 59 Months in South Ethiopia's Meskan District: A Case-Control Study	Children aged 24-59 months	Case control study	Variabel independen: riwayat Air Susu Ibu eksklusif	According to this study, there is a connection between a history of exclusive breastfeeding and the prevalence of stunting in Ethiopian infants between the ages of 24 and 59 months (p-value = 0.05). Children who are not exclusively breastfed have a three-times higher risk of stunting, according to the AOR value of 3.27 (95% CI: 1.21–8.82).
24.	The Importance of Public Health, Poverty Reduction Programmes, and Women's Empowerment in the Reduction of Child Stunting in Rural Areas of Moramanga and Morondava, Madagascar, by Chitale Remonja Rabaoarisoa1, Rado Rakotoarison2, Nivo Heritiana Rakotonirainy3, Reziky Tiandraza Mangahasimbola4, Alain Berthin Randrianarisoa5, and Ronan Jambou	Children aged 6-59 months	Case control study	Independent variable: history of low birth weight	According to this study, there is a connection between stunting and low birth weight (p-value = 0.004). The AOR value is 1.6 (95% CI: 1.1–2.1), meaning that children who are underweight at birth are twice as likely to experience stunting.
25.	Factors Associated With Stunting Among Children Aged 0 to 59 Months From	Children under five years old	Case control study	Independent variable: history	Low birth weight and stunting are related, according to this study (p-value = 0.001). A child's risk of

	the Central Region of Mozambique by Looida Maria Garcia Cruz1, Gloria Gonzalez Azpeitia2, Desiderio Reyes Suarez3, Alfredo Santana Rodriguez4, Juan Fransisco Loro Ferrer5, and Lluis Serra Majem6, Nutrients (2017) 9:491.			of low birth weight	stunting is 20 times higher if they have a low birth weight, according to the AOR value of 19.99 (95% CI: 5.80–68.85).
26.	BMC Paediatrics (2017) 17:210, Rima Rafiq El Kishawi1, Kah Leng Soo2, Yehia Awad Abed3, and Wan Abdul Manan Wan Muda4 Stunting in Palestinian Children Between the Ages of 2 and 5: Prevalence and Related Factors: A Cross-Sectional Study	Children aged 2-5 years	Cross sectional study	Independent variable: history of exclusive breastfeeding	According to this study, there is no connection between a history of exclusive breastfeeding and the prevalence of stunting in Palestinian children between the ages of 2 and 5 (p-value = 0.523).
27.	Developments in South Asian child stunting inequalities, Maternal and Child Nutrition (2018):14 Victor M. Aguayo, Mark McGoven, S. V. Subramanian, and Aditi Krishna	Children aged 6-23 months	Cross sectional study	Independent variable: dietary diversity	According to this study, there is a connection between dietary variety and the prevalence of stunting in South Asian children aged 6–23 months (p-value = 0.05). The OR value is 1.47 (95% CI: 1.28–1.69), indicating that children who do not consume a variety of foods are at an increased risk of stunting by a factor of 1.
28.	A Community-Based Cross-Sectional Study in Ethiopia on Stunting, Wasting, and Related Factors Among Children Aged 6–24 Months in the Dabat Health and Demographic Surveillance System Site, BMC Paediatrics (2017) 17:96 Terefe Derso 1, Amare Tariku 2, Gashaw Andargie Biks 3, and Molla Mesele Wassie 4	Children aged 6-24 months	Cross sectional study	Independent variable: dietary diversity	According to this study, there is no correlation between dietary diversity and the prevalence of stunting in Ethiopian children between the ages of 6 and 24 months (p-value = > 0.05).
29.	Kingsley E. Agho1, Novianti Rachmi2, Mu Li3, and Louise Alison Baur4, Plos One (2016), Children in Indonesia aged 2 to 5 who are stunted,	Children aged 2-5 years	Cross sectional study	Independent variable: history of low birth weight	According to this study, there is a connection between stunting and low birth weight (p-value = 0.05).

	underweight, or overweight: prevalence trends and risk factors				
30.	Maternal and Child Nutrition, 2017, by Julia Krasevec1, Xiaoyi An2, Richard Kumapley3, France Begin4, and Edward A. Frongillo 5. 13, Stunting Risk Among Infants and Young Children in Low and Middle Income Countries: Diet Quality	Children aged 6-23 months	Cross sectional study	Independent variable: dietary diversity	According to this study, there is a connection between the prevalence of stunting in children aged 6–23 months and dietary diversification (p-value = 0.001). The AOR value is 1.34 (95% CI: 1.22-1.46), indicating that children with non-diverse dietary habits are at an increased risk of stunting by a factor of 1.
31.	Binod Shrestha, Swetha Manohar, Sumanta Neupane, Rolf D. W. Klemm, and Keith P. West Jr. are among the authors. Individual, household, and community-level risk factors of stunting in children younger than 5 years: Findings from a National Surveillance System in Nepal, Maternal and Child Nutrition (2018): 14.	Children under five years old	Cross sectional study	Independent variables: dietary diversity and vitamin A supplements	According to this study, dietary diversification and vitamin A supplementation are associated with a lower incidence of stunting in children under the age of five in Nepal (p-values = 0.01, 0.01, and 0.001). Dietary diversity had an OR of 0.74 (95% CI: 0.59–0.92), while vitamin A supplementation had an OR of 0.65 (95% CI: 0.51-0.82). Accordingly, children who have different dietary habits are 1 time more likely to have stunting than children who do, and children who do not receive vitamin A supplements are 1 time more likely to experience stunting than those who do.
32.	Children's stunting in Ethiopia: Household, Dietary, and Healthcare Factors, by Abebe Ayelign and Taddese Zerfu, Heliyon 7 (2021).	Children under five years old	Cross sectional study	Independent variable: history of low birth weight	This study found a connection between dietary variety and vitamin A supplements and the prevalence of stunting in children under the age of five in Nepal (p-value = 0.005). It also found a link between low birth weight and stunting.
33.	Maternal and Child Nutrition (2019): 15, by Sumonkanti Das and Kakoli Rani Bhowmilk. For The Determination Of The Risk Factors Of Childhood Stunting In Bangladesh: On The Selection Of An Appropriate Logistic Model	Children under five years old	Cross sectional study	Independent variable: history of low birth weight	According to this study, low birth weight and the likelihood of stunting are related (p-value = 0.00).

34.	Assessing Comorbidity and Correlates of Wasting and Stunting Among Children in Somalia Using Cross-Sectional Household Surveys: 2007 to 2010 by Damaris K. Kinyoki1, Ngianga Bakwin Kandala2, Samuel O. Manda3, Elias T. Krainski4, Geir Ame Fugistad5, Grainne M. Moloney6, James A. Berkley7, and Abdisalan M. Noor8	Children aged 6-59 months	Cross sectional study	Independent variable: vitamin A supplement	This study reveals that there is no relationship between vitamin A supplementation and the incidence of stunting in children aged 6-59 months in Somalia (p-value = <0.05)
35.	Italian Journal of Pediatrics 43:112, Amare Tariku1, Gashaw Andargie Biks2, Terefe Derso3, Molla Mesele Wassie4, and Solomon Mekonnen Abebe5. Stunting and Its Contributing Factors Among Ethiopian Children Aged 6–59 Months	Children aged 6-59 months	Cross sectional study	Independent variable: dietary diversity	This study reveals that there is no relationship between dietary diversity and the incidence of stunting in children aged 6-59 months in Ethiopia (p-value = > 0.05).
36.	Maternal and Child Nutrition: Determinants of Stunting and Poor Linear Growth in Children Under 2 Years of Age in India: An In-Depth Analysis of Maharashtra's Comprehensive Nutrition Survey, by Victor M. Aguayo1, Rajilakhsmi Nair2, Nina Badgaiyan3, and Vandana Krishna4.	Children aged 0-23 months	Cross sectional study	Independent variables: history of low birth weight, and complete basic immunization	This study revealed that there was a relationship between a history of low birth weight and complete basic immunization with the incidence of stunting in India (p-value = 0.000).
37.	Stunting is Characterized by Chronic Inflammation in Zimbabwean Infants, Andrew J. Prendergas1, Sandra Rukobo2, Bernard Chasekw3, Kuda Mutasa4, Robert Ntozini5, Mduduzi N. N. Mbuya6, Andrew Jones7, and Lawrence H. Moulton8, Plos One (2014)	Children under five years old	Case control study	Independent variables: history of low birth weight and exclusive breast milk	This study revealed that there was a relationship between a history of low birth weight and exclusive breastfeeding with the incidence of stunting (p-value = 0.002; and 0.024).

38.	Factors Associated With Stunting Among Children Aged 6-59 Months in District, Sidama Region, South Ethiopia: An Unmatched Case-Control Study, Temesgen Tafesse1, Amanuel Yoseph2, Kaleb Mayiso3, and Taye Garl4	Children aged 6-59 months	Case control study	Independent variable: history of exclusive breastfeeding	This study reveals that there is a relationship between a history of exclusive breastfeeding and the incidence of stunting (p-value = <0.05). The AOR value is 2.07 (95% CI: 1.06-4.01), meaning that children who are not exclusively breastfed have a 2 times greater chance of stunting compared to children who receive exclusive breastfeeding.
39.	Risk Factors of Stunting and Wasting Among Children Aged 6–59 Months in Household Food Insecurity in Jima Geneti District, Western Oromia, Ethiopia: An Observational Study, Tamiru Yazew, Journal of Nutrition and Metabolism (2022).	Children aged 6-59 months	Cross sectional study	Independent variable: dietary diversity	This study reveals that there is a relationship between dietary diversity and the incidence of stunting in Ethiopia (p-value = <0.05). The AOR value is 4.7 (95% CI: 2.5-8.83), meaning that the risk of a child stunting is 5 times greater in children who have non-diverse consumption patterns
40.	Samuel Powers, Agnes Binagwaho, Alphonse Rukundo, and Kateri B. Donahoe, BMC Public Health (2020) 20:83, Mawuena Agbonytor4, Fidel Ngabo5, Corine Karema6, Kristin Woody Scoot7, and Mary C. Smith Fawzi8 Trends in Childhood Stunting Burden and Risk Factors in Rwanda from 2000 to 2015: Policy and Program Implications	Children under five years old	Cross sectional study	Independent variable: history of low birth weight	This study revealed that there is a relationship between a history of low birth weight and the incidence of stunting in children under five years of age in Rwanda (p-value = <0.05). OR value of 1.77 (95% CI: 1.23-2.56) which means that children with low birth weight are 2 times more likely to be at risk of stunting

OR: Odds Ratio, CI: Confidence Interval, COR: Crude Odds Ratio, AOR: Adjusted Odds Ratio, LBW: Low Birth Weight

Based on the journals that have been reviewed, several factors cause stunting in children under five years old in several countries, that is:

1. Exclusive Breastfeeding

Eight journal articles are examined in this review of the literature because they address the connection between a history of exclusive breastfeeding and the prevalence of stunting in early infants in various countries. Six of the articles came to the conclusion that the two factors had a strong correlation. Children who breastfeed intermittently (less than six months) are more likely to experience stunting than those who exclusively breastfeed for six months. The AOR value is 3.27 (95% CI: 1.21–8.82), which shows that children who are not exclusively breastfed have a three times higher risk of stunting than infants who are [7]. The odds ratio (AOR) for stunting is 2.07, with a 95%

confidence interval (CI) of 1.07 to 4,01, indicating that infants who take breast milk solely outside of the approved guidelines are 2.07 times more likely to do so than infants who do so during the first six months [8]. Through non-exclusive nursing, infants who live in dirty, unsanitary settings may catch feco-oral bacteria [9]. For healthy growth and development, children require a balanced diet with plenty of nutrients. The baby's ability to eat, however, depends on how well its developing digestive system is functioning. The only food that is suitable for a newborn's digestive system and meets all of its nutritional needs during the first few months of life is breast milk. When a child is not exclusively breastfed, there is a chance that they won't get enough nutrients for healthy growth and development, which will hinder their growth [10].

Exclusive breastfeeding during the first six months of life is practised by 66% of children who are not stunted and 31% of children who are stunted. This demonstrates the low rate of exclusive breastfeeding for children who are stunted. In the first six months of a child's existence, exclusive breastfeeding is known to supply all the nutrients necessary for their growth and immunity, preventing stunting. In most malnourished children, breast milk has been demonstrated to enhance linear growth. In this study, moms acknowledged that they had discontinued exclusively breastfeeding because their kids wanted to eat, the milk wasn't smooth, they were working too much, and other reasons [11]. Despite the fact that ASI's anti-infection properties can influence alterations in stunting status in children under the age of five, This demonstrates the requirement for ongoing initiatives to inform carers of the significance of exclusive breastfeeding during the first six months of life [12].

The incidence of stunting in children under the age of five in Ethiopia and Palestine was not significantly correlated with exclusive breastfeeding in the other two research studies. This is evident from the p value in each article, namely the p value > 0.05. This is due to the fact that other, more predominately influencing factors, such as household food variety, mother's height, family economic situation, and others, might affect the occurrence of stunting [13] [14].

The researchers came to the conclusion that exclusive breastfeeding might be a risk factor for stunting in children under the age of five based on the findings of this systematic review. This is due to the fact that breast milk provides a very complete nutritional profile, is easily assimilated by infants, and also contains antibodies and immunoglobins that can lower the risk factors for stunting in children under the age of five by reducing the occurrence of infectious diseases.

1.1 Vitamin A Supplements

The association between vitamin A supplementation and the prevalence of stunting in children under five in various countries was examined in six journal publications as part of this evaluation of the literature. Four of the articles came to the conclusion that there was a substantial association between the two variables. A study done in India gathered information on how well children between the ages of 6 months and 59 months received vitamin A over the previous six months. The study's findings showed a strong correlation between vitamin A supplementation and stunting, with a coefficient of -0.24 (95% CI: -0.28, -0.19) and a p value of 0.001 [15]. These findings are consistent with research from Ghana, Nepal, and India, which found that children who had not received vitamin A supplements in the previous six months had a higher risk of stunting than those who had [16], [17], [18].

As vitamin A supplementation lowers the risk of morbidity and death from infectious diseases, improving the status of vitamin A supplements in children is one of the most tested child survival strategies. Stunting risk is significantly increased by frequent episodes of contagious illnesses, including diarrhoea and respiratory infections. This improved immunity can help youngsters who receive enough vitamin A supplements lower the incidence of bouts of infectious disorders [19].

Vitamin A deficiency can result in osteoblasts producing less bone matrix, which interferes with remodelling and disrupts the process of bone formation. Growth that is later stunted comes from the disruption of bone formation [20]. The WHO states that vitamin A is crucial for preventing paediatric infections, and clinical trials have shown that vitamin A supplements can lessen the severity of respiratory infections and the risk of measles-related deaths in young patients. Additionally, vitamin A supplementation can lower the prevalence of infectious disorders in kids, particularly acute respiratory infections and diarrhoea, which commonly affect kids and increase the risk of stunting [21].

The result of two of the research articles included in this review, however, is that there is no significant correlation between the incidence of stunting in children under the age of five in Indonesia and Somalia and vitamin A supplementation. This is evident from the p values discovered in each article, which are greater than 0.05. This study came to the conclusion that the distribution of variable data among studies and changes in target population coverage could account for the variations in results [22] [23].

From the results of this systematic review, the researchers concluded that the fulfillment of micronutrients such as vitamin A supplements is very important, although the amount needed is not much, a lack of adequacy of micronutrients can occur due to low intake of food sources of micronutrients in the daily consumption of children. Increased intake of vitamin A is more needed from balanced and diverse food sources, such as fruit and vegetables that are rich in vitamins. Usually, orange and red fruits and vegetables contain lots of vitamin A. Apart from that, you can also get them through side dishes such as fish, eggs and shrimp.

The findings of this systematic review led the researchers to the conclusion that, despite the fact that the amount required for micronutrients, such as vitamin A supplements, is small, a lack of adequacy can result from children's diets that are deficient in these nutrients. More balanced and varied food sources, such as vitamin-rich fruits and vegetables, are required for increased vitamin A intake. Fruits and vegetables that are orange or red typically have high vitamin A content. In addition, you can consume them by eating side dishes like fish, eggs, and prawns.

1.2 Dietary Diversity

Twelve journal papers about the connection between dietary variety and the prevalence of stunting in kids under five in various nations are examined in this review of the literature. In nine of the articles, it was stated that there was a substantial correlation between the two factors.

The 11 research publications under consideration used information from the 2006 Food and Nutrition Technical Assistance (FANTA) standard questionnaire for children to create the majority of the dietary variety data. by recalling what they fed their child in the previous 24 hours during the trial. The FANTA 2006 scale employs a cutoff of four food groups to determine if a child's dietary diversity intake is sufficient.

According to the findings of a study conducted in Ethiopia, the majority of children who were stunted did not eat a variety of meals every day (55.7%) [12]. In several logistic regression analyses, dietary diversification had a substantial negative correlation with stunting (p-value 0.005). Based on this study, stunting was 10.4 times more likely to occur in research respondents who were exposed to insufficient family food diversity during data collection (AOR = 10.37, 95% CI: 5.39–19.94). These findings are consistent with research from Peru and Ghana, where it was found that Peruvian children who had a minimum amount of dietary diversity (4 different food groups) experienced less stunting [13] [24] [16]. With statistically significant differences even between the food groups of five and four, children who ingested foods from five or more food groups were less likely to be stunted than those who ate fewer food categories [25].

The recommended time to stop breastfeeding is between the ages of 6 and 24 months. After that point, complementary foods should be offered to help meet any remaining nutritional needs. An earlier study's findings on infants aged 6 to 23 months showed a strong relationship between the risk of stunting and the level of diversity in scores for complementary feeding. The risk of stunting in children can be decreased by increasing the variety of foods consumed each day [26].

For everyone to be healthy and fulfil their fundamental nutritional needs, a range of foods is necessary. A varied diet can offer sufficient energy and the necessary vitamins. A balanced diet rich in a range of foods is particularly important because the majority of the micronutrients we require are found in our daily diet. because kids from households with a limited variety of foods are more likely than their peers to have stunted growth. Dietary diversity is a crucial factor in determining the nutritional quality of a child's diet, as eating a greater variety of foods and food groups is linked to higher dietary nutritional adequacy [27].

In the meantime, three other studies found no connection between dietary variety and the prevalence of stunting in children under five in Ethiopia, Bangladesh, or Rwanda. This is evident from the p value in each article, namely the p value > 0.05. Given that this study was a longitudinal prospective study that was conducted in several contexts, differences in findings between this study and others may be due to differing study designs. Additionally, socio-cultural factors that control food availability, access, and utilisation have an impact on eating habits. Based on the findings of this systematic review, the researchers came to the conclusion that healthy food choices

offer all the nutrients required to maintain regular bodily processes. Poor eating choices can result in crucial nutritional deficits, and these nutrients can only be acquired through food. Food quality can be improved by consuming items from four or more food groups, which will boost nutrient intake to meet daily nutritional demands and lower the risk of stunting.

1.3 Complete Basic Immunization

The incidence of stunting in children under the age of five in various nations is examined in this literature review through an analysis of five journal publications. Four of the articles came to the conclusion that there was a substantial association between the two variables.

According to a study done in India, insufficient basic immunisation has a correlation with the incidence of stunting in children under the age of five, with a coefficient value of -0.26 (95% CI: -0.30, -0.22) and a value of p = 0.001 [15]. These findings are consistent with a study from the West Guji Zone, Oromia, Ethiopia, which found that only 45 (24.5%) of the stunting group's children had gotten a full course of basic immunisation, compared to 199 (34.1%) who had not. Stunting and insufficient basic immunisation are significantly correlated, according to the results of the chi square analysis test that was performed [28]. When compared to children who receive complete basic immunisation, those who do not are 6.38 times more likely to suffer from malnutrition. These results are in line with research done in Ethiopia's Gimbi and Machakel Woreda areas. Children who are not immunised could contract infectious diseases like measles, pneumonia, and diarrhoea. Thus, it is quite likely that these kids experienced malnutrition [29].

Children's vaccinations are crucial because they can strengthen their immune systems and protect them from illnesses like hepatitis B, diphtheria, pertussis, tetanus, pulmonary TB, measles, and rubella. Children without immunisations have weaker immune systems than immunised children. Therefore, the likelihood of getting sick will increase. When a child is ill, their hunger decreases, which makes it harder for the body to absorb nutrients in order to minimise the child's weight. Long-term illness increases the likelihood of a child developing stunted growth. Therefore, parents must give their kids the full complement of basic immunisations in order to lower the risk of illness and prevent the child from contributing to stunting [30].

This review does, however, include one study that found, with a p value of 0.73, that complete basic immunisation had no association with stunting in children aged 6–59 months in Northern Ethiopia. This is due to the fact that there are still a number of additional factors that can contribute to stunting, even after the child has received all of the recommended vaccinations. In this study, low birth weight, supplementary foods for breast milk, the mother's education, birth spacing, and other factors all contributed to stunting [31].

According to the findings of this systematic analysis, children under the age of five must receive all recommended immunisations in order to preserve immunity until adulthood. This is due to the fact that full immunisation for children under the age of five might strengthen their immune systems. Conversely, young children who are not fully immunised run the risk of contracting infectious diseases, going without food, and having their ability to absorb nutrients compromised, all of which will increase their nutritional requirements as they get older. In the first two years of life, there is a particularly significant demand for macro and micronutrients to sustain the period of rapid growth.

1.4 Low Birth Weight

LBW history and the prevalence of stunting in children under five years old in various nations were examined in seventeen journal papers for this review of the literature. All of the research came to the same conclusion: there was a substantial association between these two variables.

According to research conducted in Northern Ethiopia, the stunting group consisted of 163 (75.7%) infants born under 2500 grammes, 48 (22.4%) children born between 2500 and 4000 grammes, and 4 (1.9%) children born beyond 4000 grammes. The results of the chi-squared analysis test yielded a value of p = 0.01, indicating a significant correlation between birth weight and the prevalence of stunting [31]. These findings are consistent with a study conducted in Bangladesh, which found that body weight is the primary factor influencing future growth status in infancy [32]. Another study done in Peru similarly discovered that children with and without stunting had significantly different birth weights [33]. According to research conducted in the Musi Sub District, the COR value is 2.94 (95% CI: 1.025-8.478), which indicates that children with low birth weight have a three

times higher risk of stunting than those with normal birth weight. [34]. Research in the Musi Sub District obtained a COR value of 2.94 (95% CI: 1.025-8.478), meaning that children with low birth weight have a 3 times greater chance of being at risk of stunting compared to children with normal birth weight [35].

Intrauterine growth retardation, which is characterised by slower growth and development than babies who are born normally, has affected children with low birth weight since birth and will continue until the next age after birth. These children frequently fail to catch up with the growth rate that should be achieved at this age. Growth retardation is linked to brain maturity, and before 20 weeks of pregnancy, there are obstacles to brain growth, like somatic changes [36] [37].

Low maternal weight gain during pregnancy, drug usage, inadequate food distribution through the placenta, gestational hypertension, anaemia throughout pregnancy, and other factors are linked to retarded foetal growth and preterm birth. Future body size can be strongly predicted by birth weight. Most babies with intrauterine growth retardation (IUGR) miss their developmental spurt and are unable to catch up and develop normally like other kids [38].

Pregnant women's nutritional demands must be satisfied in order to avoid low birth weight babies. Women who are pregnant need to consume enough carbs, proteins, fats, vitamins, and minerals. Pregnant women must also perform routine prenatal exams so that any issues or health issues can be treated right away for both the mother and the foetus. It will be determined whether the weight gain of the mother and foetus has occurred as anticipated during the pregnancy assessment. If the mother's weight marginally rises or even falls, it means that her nutritional intake needs to be increased. Foetal weight increase and maternal weight are tightly connected. Pregnant women should avoid using medicines to avoid harming the foetus, pay attention to food safety and environmental factors, take iron supplements if they are anaemic, get enough rest, and eat plenty of red meat and green vegetables to meet their iron needs [30].

The researchers came to the conclusion that children with low birth weight had a disproportionately higher prevalence of stunting based on the findings of this systematic study. The size of the unborn child during the intrauterine stage can be influenced by the mother's health and nutritional state before and during pregnancy, and small infants are more likely to have recurrent infections, which impair nutrient absorption.

5. Discussion

Based on the results of the literature review conducted, it can be concluded that the factors that consistently influence the occurrence of stunting in children under five years old in various countries are a history of exclusive breastfeeding, vitamin A supplements, complete basic immunization, history of low birth weight babies, and food diversity. Vitamin A factor can be found in six articles, exclusive breastfeeding factor can be found in eight articles, complete basic immunization factor can be found in five articles, food diversity factor can be found in twelve articles and low birth weight factor can be found in seventeen articles out of the thirty-nine articles reviewed.

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