Research Article

Determinants and Prevalence of Stunting Among Children Under the Age of Five in Pakistan

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Abstract

Background: Stunting is a serious problem related to public health mostly affecting children under five years of age in various middle and low-income countries globally. It is a situation in which the growth and advancement of the human body is reduced.

Objective: This study is purposed to figure out the key factors of stunting and the prevalence of stunting among children under the age of five in Pakistan.

Methods: A comprehensive search on key databases like PubMed, Google Scholar, and ScienceDirect was made for relevant articles published between 2005 to 2022. For data reporting and analysis PRISMA checklist 2020 was used and a sum of 13 articles describing the determinants and prevalence of stunting in different rural and urban communities of Pakistan were selected for this systematic review.

Results: The prevalence of stunting among children under the age of five ranges from 18.58% to 61%, with a pooled prevalence of 39.26%. 12 out of 13 studies mentioned the mother's lack of education (prevalence range:16.6%-98.3%), 10 studies touched upon lower socioeconomic status (prevalence range: 37%-77.8%),8 studies mentioned residence in rural areas (prevalence range: 40.7%-79%), 5 studies showed unsanitary conditions (prevalence range:10.4%-77%), 6 studies mentioned overcrowded families (prevalence range: 26%-64.1%) are the main determinants of stunting among children under the age of five in Pakistan. Only one article brought up that 33.9% of stunted children were underweight at birth and 39.1% children stunted children started weaning before the age of 6 months.

Conclusion: The most recurrent factor was the mother's lack of education, followed by lower socioeconomic status, then residence in rural areas, then overcrowded families, followed by unsanitary conditions and lastly underweight children at birth and weaning age of less than 6 months. The overall pooled prevalence of stunting among children under the age of five in Pakistan is 39.26%.

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Introduction

Stunting is a significant public health concern affecting millions of children worldwide, particularly those under the age of 5 years. It is the manifestation of chronic malnutrition along with wasting, underweight, and obesity.[1] Stunting is a condition in which the growth and development of the body are impaired. It is measured by comparing a child's height to the World Health Organization (WHO) standards. Children under five years of age who fall below two standard deviations from the median height-for-age are considered stunted.[2] Stunted growth and malnutrition during early childhood can have long-term effects on health and development, increasing the risk of chronic diseases such as diabetes, cardiovascular disease, and obesity in adulthood.[3]

The determinants of stunting among children under five years of age are complex and multi-factorial. Various factors, including biological, environmental, and socio-economic factors, contribute to stunting.[4] Some of the key determinants include mothers' illiteracy, poor socioeconomic status, and residence in rural areas. Other factors include infectious

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diseases, such as diarrhoea and pneumonia, poor sanitation and hygiene, inadequate access to clean water, and overcrowded families. Stunting and other malnutrition types are concentrated in underdeveloped nations, especially in South Asia and Africa.[5]

According to UNICEF, 22% of under-5 children were found to be stunted globally in the year 2020, while for the same year, 38% of children under-5 were reported to be stunted in Pakistan. Rural areas suffer more from stunting (43.2%) as compared to urban areas (34.8%) and there is a higher prevalence of stunting among boys (50.3%) than in girls.[6] Regarding the determinants, it was observed that with the increase in the age of the child, stunting increased (66.3% above 24 months of age). Among the cases, 60% of mothers were under the age of 21, 97.8% were educated less than 8th grade and 92.3% were housewives. Stunting is strongly co-related with shorter breastfeeding duration, low monthly income, and families with five or more members (73.1%). Some other factors associated with stunting include a child's age between 12-24 months (38.9%), birth interval under two years (66.7%), and onset of complementary food before 6 months (74.1%).[7]

In 2011, the prevalence of stunting was 33.5% in Punjab which reduced to 31.7% in 20228. Even though child stunting has decreased over the years, the reduction rate is still very low at an average rate of 0.5%. Ineffectual interventions are a cause of it. Such programs only target one problem at a time and don't employ a multi-scale approach to treat the various determinants of stunting.[9]

Stunting in children is caused by a variety of variables. The majority of earlier research on childhood stunting in Pakistan was done in regional, community and hospital settings. Only a few studies that provided data at the national level were either limited to socio-demographic determinants or children under the age of two. Our study will give the burden of this possible health issue along with factors contributing to it which will help in planning preventive strategies/ interventions to address this growing issue among children less than 5 years of age in Pakistan.

Methods

We conducted a comprehensive review of the literature to find pertinent studies on the determinants and prevalence of stunting among children under the age of five in Pakistan while adhering to the recommendations of PRISMA (also known as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses) for a broad literature review.

We performed a comprehensive search on three key databases PubMed, Google Scholar and ScienceDirect and articles between the timeframe of 2005 to 2022 were added to the Zotero library. In the databases, our search string including Boolean operators was "Determinants" OR "Factors" OR "Predictors" AND "Prevalence" OR "Incidence "AND "Stunting" AND "Children under five years of age" AND "Pakistan"; were used by the authors. The keywords and database-specific headings (MeSH) used were Malnutrition, Child Development, Growth Disorders, Stunting, and Prevalence. PRISMA 2020 flow diagram and Forest Plot of reported studies are shown in Figures 1 and 2 respectively.

The inclusion criteria for the systematic review included studies conducted in Pakistan. Studies that were cross-sectional, cohort and case-control, that reported determinants and prevalence of stunting among children under five years of age and those that used WHO or CDC growth standards to measure stunting were added to the library. Studies including children who are hospitalized or have chronic diseases or disabilities, irrelevant studies, studies with small sample sizes and unclear methodology and those that did not meet the inclusion criteria were not included.

After the removal of duplicate articles, all six authors independently screened the titles and abstracts of the retrieved articles during the first phase of screening. In the second phase, full-text screening was done and a total of 13 arcticles were finalized by the authors that are included in the systematic review. Using the PRISMA guidelines 2020(checklist), each author collected the data from finalized articles. The first author was there to resolve any discrepancies during this process.

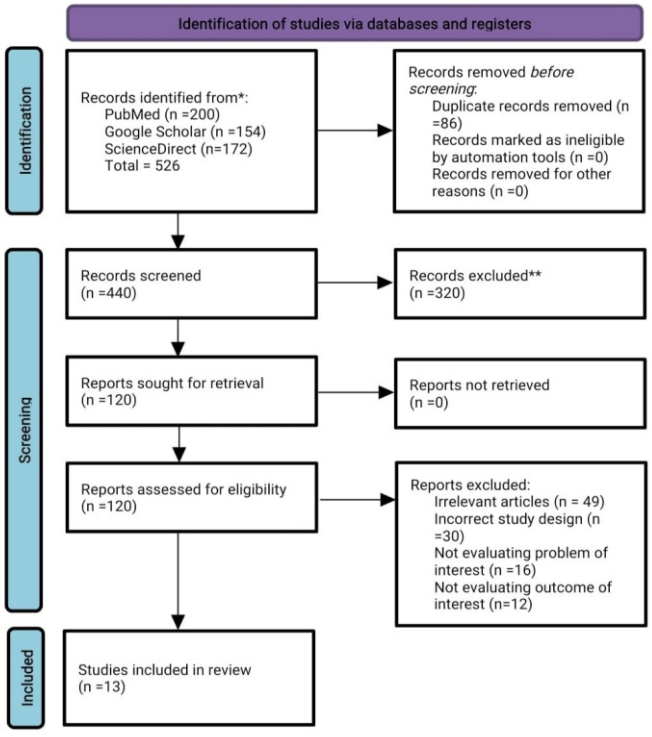

Figure 1: *PRISMA 2020 Flow Diagram showing selection*

of studies.

The information extracted by each author from the final 13 articles included the author's name, year of publication, study design and area, sample size, mother's education, child's socioeconomic status, residence, access to improved water and sanitation facilities, overcrowded families, birth weight and weaning age. Microsoft Excel was used for data extraction and data synthesis.

Results

A total of 526 articles were found related to our title. After 1st phase 120 articles were obtained by removing duplicates and screening based on their titles and abstracts. In the next phase, the full text of these 120 articles was evaluated more deeply and after further screening 13 articles were selected that met the inclusion criteria.

All of the studies included in this systematic review are from Pakistan's rural and urban communities and were published between 2005 to 2022 (last 17 years). We obtained a minimum sample size of 304 and a maximum sample size of 12708 children under five years of age. Almost all studies are cross-sectional. Our first variable is Mother's Education which is divided into 4 categories: illiterate, primary education, secondary education, and higher education. The second variable which is Socioeconomic status is divided into 3 categories: lower, middle, and upper class. Our third determinant, Residence is divided into rural and urban categories. The next two determinants are Improved Water and Sanitation facilities and overcrowding in families. Our sixth determinant, Birth Weight is divided into normal and underweight categories. Our last determinant is the Age of Weaning (<6 months or >6 months). The range of stunting prevalence is from 18.58% to 61%.

The pooled prevalence of stunting in children under five years of age is 39.26%. In 12 out of 13 studies, the prevalence of illiterate mothers ranges from 16.6% to 98.3%, the preva-

Table 1: *Characteristics of the studies included in the systematic review*

Sr#	Author	Year	Area	Sample Size	Study Design	Determinant 1			
						Mother's Education			
						Illiterate	Primary	Secondary	Higher
1	Khan et al.[4]	2019	Pakistan	3071	C/S	52.30%, n=1606	16.20%, n=497	20.40%, n=626	11.10%, n=342
2	Ahmad et al.[6]	2020	Multan, Pakistan	2497	Empirical Analysis	51.78%, n=1293	19.82%, n=495	19.66%, n=491	8.73%, n=218
3	B.G. Chauhan et al.[10]	2020	Pakistan	3071	C/S	52.2% n=1606	16.20% n=497	20.40% n=626	11.10% n=342
4	S.S. Ali et al.[11]	2005	District Malir, Karachi.	400	C/S	80%, n=319	10%, n=41	9%, n=37	1%, n=3
5	S. Ahsan et al.1[2]	2014	four villages of Tharparkar, Sindh, Pakistan	304	C/S	98.3%, n=115	1.7%, n=2	0	0
6	Q. Saeed et al.[14]	2017	District Malir of Karachi, Pakistan	322	C/S	16.6% n=54	16.3% n=53	67.1% n=218	----
7	Siddiqa et al.[8]	2022	Pakistan	12708	C/S	51.5%, n=2175	13.7%, n=579	34.8%, n=1472	----
8	Haq et al.[14]	2021	KPK,Pakistan	656	C/S	56.7%, n=372	43.3%, n=284	----	----
9	Khaliq et al.[15]	2021	Pakistan	6168	Demographic Health Survey	52.2% n=3223	14.6% n=899	33% n=2046	----
10	B. Syeda et al.[16]	2021	Pakistan	1200 mother-child pair	C/S	54.8% n=587	18.1% n=194	----	27.5% n=295
11	Mahmood et al.[17]	2021	Sindh, Pakistan	7781 children <5 years	C/S	36% n=4428	25% n=1149	30% n=1037	9% n=249
12	Farid-ul-Hasnain & Sophie[18]	2010	Sindh, Pakistan	800	C/S	----	----	----	----
13	Nazli Javid & Christy Pu[19]	2020	Pakistan	3883	C/S	55.2% n=977	46.3% n=240	30.6% n=206	28.5% n=112

Sr#	Author	Year	Determinant 2			Determinant 3		Determinant 4	
			Socioeconomic Status			Residence		Improved water and Sanitation	
			Lower Class	Middle Class	Upper Class	Rural	Urban	Yes	No
1	Khan et al.[4]	2019	40.60%, n=1247	39.40%, n=1212	19.90%, n=612	43.30%, n=1330	56.70%, n=1741	----	----
2	Ahmad et al.[6]	2020	43.25%, n=1080	41.33%, n=1032	15.42%, n=385	42.13%, n=1052	57.87%, n=1445	water 45.77%, n=1143 Sanitation 78.41%, n=1958	water 54.23%, n=1354 Sanitation 21.59, n=539
3	B.G. Chauhan et al.[10]	2020	40.60% n=1247	18.03% n=554	41.35% n=1270	78% n= (1741)	66% n= (1330)	----	----
4	S.S. Ali et al.[11]	2005	----	----	----	----	----	----	----
5	S. Ahsan et al.[12]	2014	----	----	----	----	----	----	----
6	Q. Saeed et al.[13]	2017	77.8% n=253	----	22.2% n=72	----	----	----	----
7	Siddiqa et al.[8]	2022	46%, n=1956	19%, n=805	34.7%, n=1456	54.4%, n=2300	45.6%, n=1926	----	----
8	Haq et al.[14]	2021	56.7%, n=372	43.3%, n=284	----	----	----	water81.7% n=536	water18.3%, n=120
9	Khaliq et al.[15]	2021	42.6% n=2628	18.2% n=1674	40.1% n=2366	55% n=3395	45% n=2733	water89.6%, n=5524	water10.4%, n=644
10	B. Syeda et al.[16]	2021	42.6% n=456	41.80% n=449	15.6% n=167	70.5% n=756	29.5% n=316	42.8% n=458	57.3% n=614
11	Mahmood et al.[17]	2021	37% n=4155	25% n=1218	17% n=1491	79% n=6222	21% n=1620	23% n=4185	77% n=13
12	Farid-ul-Hasnain & Sophie[18]	2010	----	----	----	----	----	----	----
13	Nazli Javid & Christy Pu[19]	2020	62.1% n=427	46.2% n=286	27.0% n=184	40.7% n=598	49.8% n=937	----	----

Sr #	Author	Year	Determinant 5		Determinant 6		Determinant 7		Stunting Prevalence
			Overcrowded Families		Birth Weight		Weaning Age		
			Yes	No	Normal	Under-weight	≤6 months	>6 months	
1	Khan et al.[4]	2019	----	----	----	----	----	----	44.40%, n=1363
2	Ahmad et al.[6]	2020	60.51% n=1511	39.49% n=986	----	----	----	----	18.58%, n=464
3	B.G. Chauhan et al.[10]	2020	----	----	----	----	----	----	30.51%, n=937
4	S.S. Ali et al.[11]	2005	----	----	----	----	----	----	39%, n=156
5	S. Ahsan et al.[12]	2014	64.1%,n=75	35.9%,n=42	----	----	----	----	38.5%, n=117
6	Q. Saeed et al.[13]	2017	40.3%, n=131	59.7%, n=197	----	----	----	----	27.30%
7	Siddiqa et al.[8]	2022	----	----	----	----	----	----	31.70%
8	Haq et al.[14]	2021	43%, n=282	57%, n=374	----	----	----	----	50.50%
9	Khaliq et al.[15]	2021	57.5% n=3546	42.5% n=2622	----	----	----	----	44%
10	B. Syeda et al.[16]	2021	----	----	----	----	----	----	40%
11	Mahmood et al.[17]	2021	26% n=2339	74% n=2168	----	----	----	----	40%
12	Farid-ul-Hasnain & Sophie[18]	2010	----	----	66.1% n=261	33.9% n=134	39.1% n=167	60.9% n=260	61%
13	Nazli Javid & Christy Pu[19]	2020	----	----	----	----	----	----	45%

lence of mothers having primary education is 1.7%-46.3%, the prevalence of mothers with secondary education is 9% -67.1% and the mothers with higher education have the prevalence that ranges from 1% to 28.5%.

10 out of 13 studies show the socioeconomic status of the stunted children, according to which 37% to77.8% of stunted children belonged to the lower class, 18.03% to 46.2% children belonged to the middle class and only 15.42% to 41.35% children belonged to the upper class. 8 out of 13 studies mentioned the residential status of stunted children which shows that the overall prevalence of children living in rural areas ranges from 40.7% to 79% while the percentage prevalence of children living in urban areas is 21%-66%.

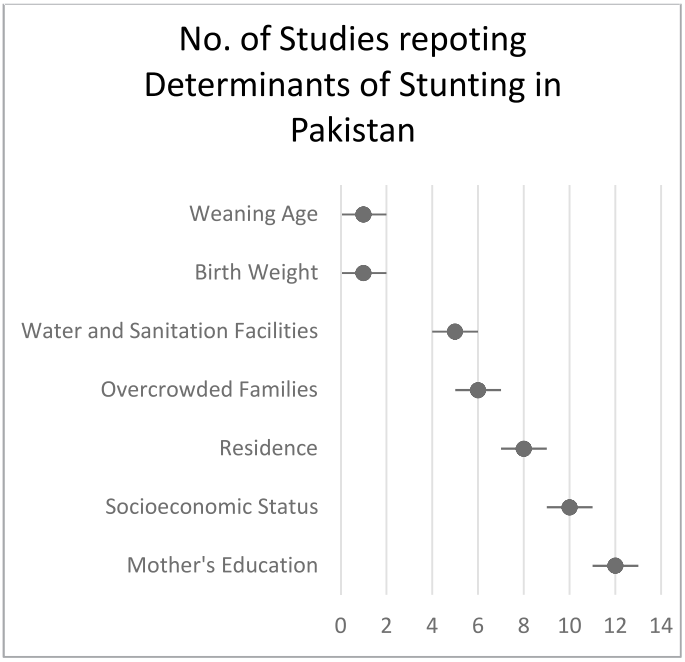

Figure 2: *Forest Plot of the reported studies*

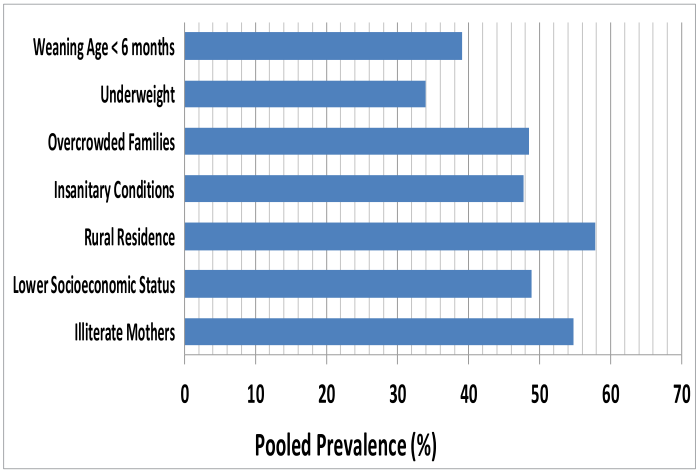

Figure 3: *Bar graph of the pooled prevalence of the key determinants of stunting in Pakistan*

A total 5 studies mentioned that 10.4% to 77% of children were exposed to unsatisfactory water and sanitation facilities, 6 out of 13 studies showed that the prevalence of children living in the family of more than five people (overcrowded families) is 26% to 64.1% and only 1 article shed light on the relation of stunting with birth weight and weaning age of children. It mentioned that 33.9% of stunted children under five years of age were underweight at birth and 39.1% of children started weaning before 6 months. Figure 3 shows the pooled prevalence of the key determinants causing stunting among children under the age of five.

Discussion

This systematic review aims to analyze the determinants and prevalence of stunting in children under the age of 5 in Pakistan. Stunting is a critical public health issue; understanding its determinants is essential for developing effective interventions. Our review synthesized data from multiple studies conducted in various regions of Pakistan, providing a holistic perspective on this problem.

The analysis of the included studies has revealed several significant determinants of childhood stunting. These determinants can be broadly categorized into socioeconomic, maternal, environmental, and infant-related factors which cause low birth weight in children. Low socioeconomic status, lack of proper water sanitation, residency in rural areas, and illiterate mothers were the significant risk factors associated with stunting.[21]

The prevalence of stunting in Pakistan is (39.26%) which is comparable to that of underdeveloped countries like Eastern Africa (43.9%) and Central Africa (36.5%)[22]. Factors associated with stunting in these areas are very similar and include poor water sanitation, underweight mothers, and lack of complementary feeding[23]. In Bangladesh, the prevalence of stunting is 18%[24]. Similar factors were associated with the increased rate like Mothers' education and age, breastfeeding, and birth weight. Some additional factors were also considered like the sex of the child (more in females), birth order (increase with ascending birth order) and religion (more in Muslims).

Other studies conducted in Pakistan also found Delayed weaning, drinking only cow milk, large family size, twin babies, working mothers, and unemployed fathers as risk factors for severe malnutrition[25]. Underweight children were having only 1 or 2 meals per day while sleeping for more than 10 hours.[26]

Global Prevalence of stunting (19.8%), especially that of developed countries (6.0%) was much lower than Pakistan. The reasons for this include better socioeconomic conditions, high literacy rates, and special care for maternal and child

health and nutrition in these countries.

Heterogeneity In stunting prevalence between Pakistan and other developed countries is because Pakistan has a higher prevalence of poverty and income inequality compared to developed countries. Lower-income households often lack access to nutritious foods and healthcare services, contributing to stunting. Developed countries generally have better access to diverse and nutrient-rich foods.[27] In contrast, Pakistan may face challenges in ensuring a varied and balanced diet for its population, particularly in rural and marginalized areas. Food security is more stable in developed countries, reducing the risk of chronic malnutrition.

Maternal education is another major determinant of stunning under age 5 in Pakistan. Maternal education levels are generally higher in developed countries, leading to better awareness of proper nutrition and childcare practices. Developed countries often have well-established public health awareness programs targeting maternal and child health. Moreover, Access to clean water and sanitation facilities is often better in developed countries, reducing the risk of waterborne illnesses that can contribute to stunting. Improved hygiene practices also play a role in reducing infections that affect child growth.

The importance of this systematic review lies in its comprehensive analysis of a diverse range of studies conducted in Pakistan. Nevertheless, there are limitations to consider. Some studies lacked detailed information on specific determinants, and there may be additional factors influencing stunting that were not explored in the reviewed literature.

Public health practitioners and policymakers in Pakistan can get significant help from the findings of this systematic review. Their primary goal should be reducing stunting rates, improving access to nutritious food, especially for vulnerable populations and strengthening healthcare infrastructure and services for mothers and children. To reduce stunting we should improve access to clean water and sanitation facilities, reduce the risk of infections and raise awareness about the importance of proper nutrition, breastfeeding, and healthcare.

To achieve these goals public health practitioners should make proper budget allocations and investments in training healthcare workers and community health volunteers. They should collaborate with media and community leaders to disseminate information on nutrition and healthcare practices and should ensure coordination among various government departments, NGOs, and international organizations working on child nutrition and health. They should involve communities in the design and implementation of programs, to ensure they meet local needs, and should collaborate with international organizations for technical support and funding assistance.

Reducing stunting in children under 5 is a complex challenge that requires a sustained effort from multiple stakeholders. This policy, if implemented effectively, can lead to significant improvements in child nutrition and overall health in Pakistan.

Conclusion

In this systemic review, the prevalence of stunting among children under the age of five ranges from 18.58% to 61%, with a pooled prevalence of 39.26%.

The strongest predictor of stunting was illiteracy of mothers which was followed by the poor socioeconomic status of the children. This was followed by the residence of children in rural areas, then living in overcrowded families, exposure to unsanitary conditions, weaning age of less than six months and lastly low birth weight.

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Authors' Contribution

All the authors contributed equally in accordance with ICMJE guidelines.

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