



Factors Associated with Stunting Among Under-Five Children: A Cross-Sectional Study.

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Abstract: Background: Stunting remains one of the most significant public health challenges affecting children under five years of age, particularly in low- and middle-income countries. Chronic undernutrition during early childhood adversely affects physical growth, cognitive development, educational performance, and long-term health outcomes. Identification of modifiable risk factors associated with stunting is essential for designing effective preventive interventions. **Objective:** To determine the prevalence of stunting and identify factors associated with stunting among children under five years of age presenting to District Headquarters Hospital Toba Tek Singh. **Methods:** A hospital-based cross-sectional study was conducted at District Headquarters Hospital Toba Tek Singh between January and June 2025. A total of 420 mother-child pairs were enrolled using a non-probability consecutive sampling technique. Data regarding socio-demographic characteristics, maternal education, feeding practices, birth history, immunization status, household sanitation, and recent illness episodes were collected using a structured questionnaire. Anthropometric measurements were obtained according to World Health Organization (WHO) guidelines. Stunting was defined as height-for-age Z-score below -2 standard deviations. Data were analyzed using SPSS version 26. Multivariable logistic regression analysis was performed to identify independent predictors of stunting, with p -value < 0.05 considered statistically significant. **Results:** The overall prevalence of stunting among under-five children was 31.4%. Higher odds of stunting were significantly associated with low maternal education (AOR: 2.18; 95% CI: 1.34–3.55), low household income (AOR: 1.89; 95% CI: 1.12–3.17), incomplete immunization (AOR: 1.76; 95% CI: 1.01–3.05), recurrent diarrheal episodes (AOR: 2.41; 95% CI: 1.45–4.02), lack of exclusive breastfeeding during the first six months (AOR: 2.07; 95% CI: 1.26–3.39), and poor sanitation practices (AOR: 1.94; 95% CI: 1.15–3.28). Children born with low birth weight were also at increased risk of stunting (AOR: 2.53; 95% CI: 1.47–4.36). **Conclusion:** Stunting among under-five children remains highly prevalent and is strongly associated with socioeconomic, maternal, nutritional, and environmental factors. Strengthening maternal education, promoting exclusive breastfeeding, improving sanitation, and enhancing childhood immunization coverage may substantially reduce the burden of stunting. Integrated community-based nutritional interventions are recommended to improve child growth outcomes.

Keywords: Stunting, under-five children, malnutrition, growth retardation, breastfeeding, public health, Pakistan.

INTRODUCTION

Stunting is one of the most serious public health and nutritional problems affecting children under five years of age worldwide. According to the World Health Organization (WHO), stunting is defined as impaired linear growth characterized by a height-for-age Z-score below minus two standard deviations from the WHO Child Growth Standards median. It represents chronic undernutrition resulting from prolonged inadequate nutrient intake, repeated infections, and unfavorable socioeconomic conditions.¹ Stunting during early childhood has irreversible consequences on physical growth, cognitive development, school performance, immunity, and future economic productivity.²

Globally, childhood malnutrition continues to impose a substantial burden on healthcare systems, particularly in low- and middle-income countries. Recent estimates from UNICEF, WHO, and the World Bank revealed that approximately 150 million children under five years of age were stunted in 2024, with South Asia carrying a disproportionately high burden.³ Persistent nutritional deprivation during the first 1,000 days of life significantly increases the risk of morbidity, mortality, poor neurodevelopmental outcomes, and chronic diseases later in life.⁴

The etiology of stunting is multifactorial and includes inadequate breastfeeding practices, recurrent diarrheal illnesses, poor maternal nutrition, food insecurity, low parental education, poverty, inadequate sanitation, and limited healthcare accessibility.⁵ Maternal factors such as low educational status, inadequate antenatal care, and low birth weight have also been identified as important contributors to childhood growth failure.⁶ Environmental factors including unsafe drinking water and poor hygienic practices further increase susceptibility to recurrent infections and malnutrition among children.⁷

Pakistan remains among the countries with the highest prevalence of childhood stunting in South Asia. Rapid population growth, socioeconomic disparities, limited maternal awareness, and insufficient nutritional interventions continue to contribute to poor child health indicators across the country. National nutritional surveys have highlighted that a considerable proportion of Pakistani children suffer from chronic malnutrition, particularly in underserved rural and semi-urban communities.⁸ Despite ongoing public health initiatives, the burden of stunting remains alarmingly high and requires region-specific evidence to guide effective intervention strategies.

District Headquarters Hospital Toba Tek Singh serves a large pediatric population from both urban and rural areas where nutritional deficiencies and poverty-

related health conditions are common. However, limited local data are available regarding the determinants of stunting among under-five children attending this healthcare facility. Understanding the associated factors may assist healthcare providers and policymakers in designing targeted nutritional and preventive healthcare programs to reduce the burden of chronic malnutrition in the region.

Therefore, the present study aimed to determine the prevalence of stunting and identify factors associated with stunting among under-five children presenting to District Headquarters Hospital Toba Tek Singh.

Materials and Methods

Study Design and Setting

A hospital-based cross-sectional study was conducted at District Headquarters Hospital Toba Tek Singh. The study was carried out over a period of six months (January to June 2025). The hospital serves as a major secondary care center catering to both urban and rural populations of the district.

Study Population

The study population included children under five years of age attending the pediatric outpatient department and/or admitted in the pediatric unit along with their mothers or primary caregivers.

Sample Size and Sampling Technique

A total of 420 mother-child pairs were included in the study. The sample size was calculated using standard epidemiological formulas considering expected prevalence of stunting, confidence level, and margin of error. Non-probability consecutive sampling technique was used to recruit eligible participants until the required sample size was achieved.

Inclusion Criteria

- Children aged 6–59 months attending the pediatric outpatient department or admitted in pediatric ward
- Permanent residents of the catchment area of Toba Tek Singh district
- Mothers or primary caregivers willing to provide informed consent
- Children with complete anthropometric and clinical data available

Exclusion Criteria

- Children with known congenital anomalies or genetic disorders affecting growth (e.g., Down syndrome)
- Children with chronic systemic illnesses such as

congenital heart disease, chronic kidney disease, or malignancies

- Critically ill children requiring emergency resuscitation at the time of data collection
- Caregivers who refused or were unable to provide complete information

Data Collection Procedure

Data were collected using a structured, pre-tested questionnaire through face-to-face interviews with mothers or caregivers. The questionnaire included socio-demographic information (age, gender, parental education, and household income), maternal and child health history, breastfeeding practices, immunization status, sanitation conditions, and recent episodes of illness such as diarrhea or respiratory infections.

Anthropometric Assessment

Children's height/length was measured using a standardized measuring board according to World Health Organization (WHO) guidelines. Weight was recorded using a calibrated digital weighing scale. Height-for-age Z-scores were calculated using WHO Anthro software. Stunting was defined as height-for-

age Z-score less than -2 standard deviations below the WHO reference median.

Data Analysis

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were used to summarize frequencies and percentages. Inferential analysis was performed using chi-square test and multivariable logistic regression to identify factors associated with stunting. Adjusted odds ratios (AOR) with 95% confidence intervals were calculated, and a p-value of <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the institutional review board of the concerned institution. Written informed consent was taken from all participating mothers or caregivers. Confidentiality and anonymity of participants were strictly maintained throughout the study

Results

Sociodemographic Characteristics of Study Participants

A total of 420 under-five children with their mothers were included in the study. The mean age of children was 28.6 ± 14.2 months. Slight male predominance was observed (52.4%). Most mothers had primary or no formal education, and a majority belonged to low socioeconomic households.

Table 1: Sociodemographic characteristics of study participants (n = 420)

Variable	Category	Frequency (n)	Percentage (%)
Child gender	Male	220	52.4
	Female	200	47.6
Age group	6–23 months	150	35.7
	24–59 months	270	64.3
Maternal education	No formal education	120	28.6
	Primary	124	29.5
	Secondary or above	176	41.9
Socioeconomic status	Low	260	61.9
	Middle/High	160	38.1

Prevalence of Stunting

The overall prevalence of stunting among under-five children was 31.4% (132/420). Among stunted children, 19.3% had moderate stunting while 12.1% had severe stunting.

Table 2: Prevalence of stunting

Nutritional status	Frequency (n)	Percentage (%)
Normal height-for-age	288	68.6
Stunted (Total)	132	31.4
• Moderate stunting	81	19.3
• Severe stunting	51	12.1

Feeding and Health-Related Characteristics

Table 3: Feeding practices and health history (n = 420)

Variable	Category	Frequency (n)	Percentage (%)
Exclusive breastfeeding	Yes	240	57.1
	No	180	42.9
Immunization status	Complete	300	71.4
	Incomplete	120	28.6
Recurrent diarrhea	Yes	160	38.1
	No	260	61.9
Sanitation status	Adequate	190	45.2
	Poor	230	54.8

Factors Associated with Stunting

Multivariable logistic regression analysis identified several independent predictors of stunting.

Table 4: Multivariable logistic regression for factors associated with stunting

Factor	Category	AOR	95% CI	p-value
Maternal education	Low vs high	2.18	1.34–3.55	0.002
Low household income	Yes vs no	1.89	1.12–3.17	0.017
Incomplete immunization	Yes vs no	1.76	1.01–3.05	0.043
Recurrent diarrhea	Yes vs no	2.41	1.45–4.02	<0.001
Non-exclusive breastfeeding	Yes vs no	2.07	1.26–3.39	0.004
Poor sanitation	Yes vs no	1.94	1.15–3.28	0.013
Low birth weight	Yes vs no	2.53	1.47–4.36	<0.001

Summary of Key Findings

- Stunting prevalence: 31.4%
- Strongest predictor: Low birth weight (AOR 2.53)
- Major modifiable factors: breastfeeding, sanitation, infections, immunization
- Socioeconomic and maternal education factors significantly contributed

DISCUSSION

The present study was conducted to determine the prevalence of stunting and identify its associated factors among under-five children attending District Headquarters Hospital Toba Tek Singh. The findings demonstrated a high prevalence of stunting (31.4%), indicating that chronic undernutrition remains a significant public health problem in this region. This level of stunting reflects ongoing nutritional, socioeconomic, and environmental challenges affecting child health outcomes in Pakistan and other low- and middle-income countries.¹

The prevalence observed in this study is comparable to estimates reported in South Asia, where stunting rates remain persistently high despite ongoing nutritional interventions. According to global estimates, approximately one in four children under five years is affected by stunting worldwide, with the highest burden concentrated in South Asia and Sub-Saharan Africa.² The similarity between our findings and regional data suggests that structural determinants such as poverty, food insecurity, and inadequate maternal and child health services continue to play a central role in childhood growth failure.

Maternal education was found to be significantly associated with stunting in the present study. Children of less educated mothers had higher odds of being stunted, which may be explained by limited awareness regarding appropriate infant and young child feeding practices, hygiene, and healthcare utilization. Educated mothers are more likely to adopt exclusive breastfeeding, timely complementary feeding, and better preventive healthcare practices, which collectively improve child growth outcomes.³ Similar findings have been reported in multiple studies where maternal education consistently emerged as a strong predictor of child nutritional status.⁴

Socioeconomic status was another important determinant identified in this study. Children from low-income households were significantly more likely to be stunted. Poverty contributes to food insecurity, poor dietary diversity, and reduced access to healthcare services, all of which directly affect child growth.⁵ These findings are consistent with global evidence showing that household wealth is one of the strongest predictors of child malnutrition in developing countries.²

Health-related factors such as recurrent diarrheal episodes and incomplete immunization were also significantly associated with stunting. Recurrent

infections increase metabolic demands, reduce appetite, and impair nutrient absorption, leading to growth faltering. Inadequate immunization further predisposes children to preventable infectious diseases, which indirectly contribute to undernutrition.⁶ Poor sanitation practices observed in this study likely contributed to repeated exposure to enteric pathogens, supporting the concept of environmental enteric dysfunction as a key underlying mechanism of stunting.⁷

Non-exclusive breastfeeding was another significant predictor of stunting in this study. Exclusive breastfeeding during the first six months of life provides optimal nutrition, immune protection, and reduced risk of infections. Failure to practice exclusive breastfeeding increases the risk of diarrheal diseases and inadequate nutrient intake, ultimately leading to impaired linear growth.⁸ This finding aligns with WHO recommendations emphasizing exclusive breastfeeding as a critical intervention for preventing malnutrition in early childhood.

Low birth weight was strongly associated with stunting, highlighting the importance of maternal nutrition and antenatal care. Intrauterine growth restriction often results in persistent postnatal growth deficits, increasing the risk of chronic malnutrition in early childhood.⁹ This underscores the intergenerational cycle of malnutrition, where maternal undernutrition contributes to poor child health outcomes.

CONCLUSION

Stunting remains a major public health problem among under-five children attending District Headquarters Hospital Toba Tek Singh, with an overall prevalence of 31.4% observed in the present study. The findings highlight that stunting is a multifactorial condition strongly influenced by maternal education, household socioeconomic status, infant feeding practices, immunization status, recurrent infections, sanitation conditions, and low birth weight.

The results emphasize that both preventable health-related factors and broader social determinants of health contribute significantly to chronic undernutrition in early childhood. These findings suggest that improving child nutritional outcomes requires a comprehensive and integrated approach rather than isolated interventions.

Strengthening maternal and caregiver education, promoting exclusive breastfeeding, improving immunization coverage, enhancing water, sanitation and hygiene (WASH) facilities, and ensuring early nutritional support for low-birth-weight infants are key strategies that can substantially reduce the burden of stunting in this population.

Overall, the study underscores the urgent need for coordinated public health action at community and primary healthcare levels to address the underlying

determinants of stunting and improve long-term child health and development outcomes in the region

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Strengthening maternal education programs focusing on infant and young child feeding practices.
2. Promotion of exclusive breastfeeding for the first six months through community health workers and antenatal counseling.
3. Improvement of routine immunization coverage to reduce infection-related growth impairment.
4. Implementation of community-based nutrition programs targeting low-income households.
5. Improvement of water, sanitation, and hygiene (WASH) facilities to reduce recurrent infections.
6. Early identification and nutritional support for low-birth-weight infant.

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