

A Comparative Study: Growth and Developmental Trajectories of Preterm and Term Infants

Disha Vaja

dishakv@bhaikakauniv.edu.in

Bhaikaka University

Dhruti Patel

Bhaikaka University

Drashti Gor

Bhaikaka University

Himani Tailor

Bhaikaka University

Prachi Parmar

Bhaikaka University

Shreya Parmar

Bhaikaka University

Sneh Chauhan

Bhaikaka University

Research Article

Keywords: Preterm infant, Term infant, Infant growth, Child development, Developmental milestones, Anthropometry, Developmental delay, Infancy, India

Posted Date: October 12th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10888215/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.
[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Preterm birth is a major contributing factor of compromised growth and development during infancy, yet community-based comparative evidence from Indian district settings remains limited. This study compared the growth and developmental status of preterm and term infants aged 0–12 months in selected hospitals and Anganwadi centers of Anand district, Gujarat, India, and examined factors associated with developmental outcome.

Methods

A cross-sectional comparative (non-equivalent group) design was used. A total of 100 infants aged 0–12 months (67 term and 33 preterm) were enrolled from selected hospitals and Anganwadi centres using non-probability convenient sampling. Data were collected using a self-structured tool comprising demographic and perinatal variables, anthropometric measurements (length, weight, mid-upper arm circumference [MUAC], chest circumference, head circumference and abdominal girth), and a self-structured developmental screening questionnaire assessing gross motor, fine motor, language and play domains (20-point scale). Growth and developmental scores were compared between groups using the independent t-test. Categorical developmental status was compared using the chi-square test, and multivariable linear regression was used to identify factors independently associated with total developmental score.

Result

Preterm infants had a lower growth and development score than the term infants. Statistically significant difference were observed in MUAC ($p = 0.001$), abdominal girth ($p = 0.029$) and total developmental score ($p = 0.002$). Neonatal complication ($p = 0.041$) and immunization status ($p = 0.015$) were significantly associated with developmental outcomes, while gestational age and age of the child were identified as significant predictors of the developmental scores. Overall, findings indicate that term infants had a better growth and development than preterm infants.

Conclusions

Preterm infants in this district population showed measurable deficits in physical growth and developmental attainment compared with term infants during the first year of life, and gestational age at birth remained an independent predictor of developmental score after adjustment for other perinatal factors. These findings support routine, structured growth and developmental screening for preterm infants at the community level, with timely referral pathways for those identified with delay.

BACKGROUND

Childhood, and particularly the first year of life, is a foundational period during which rapid and interdependent changes occur across physical, neurological, cognitive and socio-emotional domains [1, 2]. Growth refers to quantitative physical change increases in weight, length and head circumference while development refers to the progressive, qualitative acquisition of functional abilities in motor, language, cognitive and social domains [3]. Because growth and development occur simultaneously during infancy and are highly sensitive to nutrition, caregiving practices and the health services an infant receives, this period represents both a window of opportunity and a period of vulnerability [4].

Developmental milestones such as head control, rolling, sitting, crawling, first words and social smiling mark the transition from simple to complex skills and provide a practical, age-referenced framework for monitoring a child's progress [5, 6]. Motor development in particular reflects the maturation of the nervous and musculoskeletal systems and, because it facilitates environmental exploration, is closely linked to cognitive and social development in turn [4, 7].

Preterm birth delivery before 37 completed weeks of gestation remains a leading global determinant of impaired postnatal growth and neurodevelopmental outcome [8]. India contributes disproportionately to this burden, accounting for an estimated 3 million preterm births annually, with preterm birth affecting approximately 13% of live births nationally [9]; in Gujarat, the state preterm birth rate was reported at 10.41% for 2024–25. Despite advances in neonatal care and improved survival, many preterm infants continue to face growth faltering and developmental delay that can go undetected without systematic monitoring during infancy [4].

Although international literature has extensively documented growth and developmental differences between preterm and term infants, community-based comparative evidence from Indian district-level settings where urban and rural populations and hospital- and Anganwadi-based care, coexist remains limited. Locally generated evidence is needed because socio-economic status, maternal health, nutritional practice, health-care access and parental awareness vary substantially across Indian districts and are likely to shape both growth and developmental trajectories [10]. Early identification of growth failure and developmental delay allows timely intervention and has been shown to improve long-term outcome, particularly among high-risk infants such as those born preterm [4]; however, routine developmental surveillance is not consistently implemented at the community level, and parental awareness of developmental warning signs is often limited. Nurses, as frontline providers of maternal and child health services, are well placed to undertake growth monitoring, parental education and early referral.

We therefore conducted a comparative study of preterm and term infants aged 0–12 months in selected hospitals and Anganwadi centres of Anand district, Gujarat, to (i) assess and compare growth and developmental status between the two groups and (ii) examine the association between developmental outcome and selected demographic and perinatal characteristics. We hypothesized that developmental

screening scores would differ between preterm and term infants during the first year of life, and that growth and developmental scores would show a significant association with gestational age at birth.

Methods

Study design and setting

We conducted a cross-sectional, comparative (non-equivalent group) study to assess and compare growth and developmental status between preterm and term infants at a single point in time. A quantitative descriptive approach was used because it allowed objective measurement of growth parameters and developmental status and direct comparison between groups. This design was considered appropriate, cost-effective and feasible for identifying between-group differences without requiring long-term follow-up.

The study was conducted at selected hospitals and Anganwadi centers of Anand district, Gujarat, India, comprising Shree Krishna Hospital, Karamsad; Krishna Child Hospital, Petlad; Killol Children's Hospital, Anand; Aparaj Children's Hospital, Anand; and the Anganwadi centres of Kasor and Sandesar.

Participants and sampling

The target population comprised infants aged 0–12 months. The accessible population consisted of term and preterm infants registered at the participating Anganwadi centres or admitted to the participating paediatric hospitals who met the eligibility criteria. Eligible infants were enrolled using non-probability convenience sampling, in which infants present at the time of data collection and whose parents were willing to participate were selected consecutively until the required sample size was reached.

Inclusion criteria: (i) preterm infants with a gestational age of 24 to 36 weeks; (ii) term infants with a gestational age of 37 to 42 weeks; (iii) infants whose parents were willing to participate and were available at the time of data collection.

Exclusion criteria: infants with severe congenital malformations or genetic/metabolic disease diagnosed at birth.

Sample size

The minimum required sample size was estimated using the standard formula for comparison of means between two independent groups:

$$n = 2(Z_{\alpha/2} + Z_{\beta})^2 / d^2$$

Where $Z_{\alpha/2} = 1.96$ (95% confidence level), $Z_{\beta} = 0.84$ (80% power) and $d = 0.5$ (assumed effect size). This yielded a required sample of approximately 63 infants per group ($n = 2 \times 2.8^2 / 0.25 \approx 62.7$). Considering feasibility, time constraints and the availability of eligible infants during the data-collection period, a total sample of 100 infants was recruited, comprising 67 term infants and 33 preterm infants.

Study variables

The independent variable was gestational age at birth (preterm VS term). Dependent variables were growth (weight, length, head circumference, chest circumference, MUAC and abdominal girth) and developments (gross motor, fine motor, language and play domains, and total developmental score). Demographic covariates included infant age, gender, date of birth, place and mode of birth, NICU admission, neonatal complications and immunization status.

Data-collection tool

Data were collected using a structured, investigator-developed tool comprising three sections. Section 1 recorded demographic variables (age, gender, Date of birth, gestational age at birth, place of birth, type and mode of birth, NICU admission, neonatal complications and immunization status). Section 2 recorded anthropometric measurements (length, weight, MUAC, chest circumference, head circumference and abdominal girth), obtained using standard anthropometric procedures. Section 3 was a self-structured developmental screening questionnaire assessing gross motor, fine motor, language and play domains, with five closed-ended items per domain (20 items in total, one point per item, maximum score 20). Total scores were categorized as normal development (15–20), mild developmental delay (9–14), moderate developmental delay (5–8) or severe developmental delay (0–4).

Content validity of the tool was established through review by 10 nursing experts and 2 paediatric consultants, and the tool was revised according to their recommendations before finalization. A pilot study was conducted in 10 infants aged 0–12 months at two of the participating hospitals to assess feasibility of the procedure, tool administration time (approximately 20–25 minutes per participant) and the planned analysis strategy; no changes to the study design were required following the pilot. Reliability testing was undertaken with participants from the main study, given the limited age-range variability available during the pilot phase.

Data-collection procedure

Following approval from the Institutional Ethics Committee and permission from the participating hospitals and Anganwadi, eligible infants were identified against the inclusion and exclusion criteria. Written informed consent was obtained from each infant's parent after the purpose, procedures, benefits and risks of the study had been explained. Demographic data, anthropometric measurements and the

developmental questionnaire were then administered by the investigator in a single sitting under standard conditions. All collected data were coded, tabulated and entered for analysis.

Statistical analysis

Data were analyzed using descriptive and inferential statistics. Demographic variables were summarized as frequencies and percentages. Growth and developmental scores were summarised as means and standard deviations and compared between preterm and term groups using the independent-samples t-test, with mean differences and 95% confidence intervals reported. Developmental category (normal, mild delay, moderate delay) was compared between groups, and its association with demographic variables was examined, using the chi-square test. Multivariable linear regression was used to identify factors independently associated with total developmental score after adjustment for gestational age at birth, mode of delivery, gender, chronological age, NICU admission, neonatal complications and immunisation status. A two-sided p-value < 0.05 was considered statistically significant throughout.

Results

Demographic characteristics

A total of 100 infants were enrolled, comprising 33 preterm and 67 term infants. Among preterm infants, 54.5% were male and 45.5% were female, compared with 44.8% male and 55.2% female among term infants. A larger proportion of preterm infants were delivered by lower segment caesarean section (LSCS) (54.5%) than term infants (34.3%), among whom 65.7% were delivered vaginally. NICU admission was substantially more frequent among preterm infants (69.7%) than term infants (13.4%), as were neonatal complications (69.7% VS 7.5%). All preterm infants (100%) had received age-appropriate immunization, compared with 94.0% of term infants (Table 1).

Table 1
Frequency and percentage distribution of socio-demographic and perinatal variables of preterm and term infants (n = 100)

Demographic variable	Preterm		Term	
	Frequency	Percentage	Frequency	Percentage
Sex				
Female	15	45.50%	37	55.20%
Male	18	54.50%	30	44.80%
Type of birth				
Normal vaginal delivery	15	45.50%	44	65.70%
LSCS	18	54.50%	23	34.30%
NICU admission				
Yes	23	69.70%	9	13.40%
No	10	30.30%	58	86.60%
Neonatal complications				
Yes	23	69.70%	5	7.50%
No	10	30.30%	62	92.50%
Immunization status				
Yes	33	100.00%	63	94.00%
No	0	0.00%	4	6.00%

LSCS, lower segment caesarean section; NICU, neonatal intensive care unit.

Growth parameters

Preterm infants had lower mean values than term infants across all six anthropometric measures. The between-group difference reached statistical significance for MUAC (11.65 vs 13.00 cm; mean difference – 1.35, 95% CI – 2.12 to – 0.58; $t(98) = -3.47$; $p = 0.001$) and abdominal girth (35.54 vs 38.14 cm; mean difference – 2.60, 95% CI – 4.93 to – 0.28; $t(98) = -2.22$; $p = 0.029$). Differences in length, weight, chest circumference and head circumference did not reach statistical significance (all $p > 0.05$) (Table 2).

Table 2

Independent-samples t-test comparison of growth parameters between preterm and term infants

Outcome score	Overall (n = 100) Mean (SD)	Preterm (n = 33) Mean (SD)	Term (n = 67) Mean (SD)	Mean difference (95% CI)	t (df)	p value
Length (cm)	59.62 (9.75)	58.12 (8.98)	60.36 (10.09)	-2.24 (-6.35 to 1.87)	-1.08 (98)	0.283 NS
Weight (kg)	5.57 (1.97)	5.13 (2.06)	5.79 (1.90)	-0.66 (-1.48 to 0.17)	-1.58 (98)	0.118 NS
Mid-upper arm circumference (cm)	12.56 (1.92)	11.65 (1.92)	13.00 (1.77)	-1.35 (-2.12 to -0.58)	-3.47 (98)	0.001 S
Chest circumference (cm)	38.46 (5.73)	37.83 (4.65)	38.77 (6.20)	-0.94 (-3.36 to 1.48)	-0.77 (98)	0.444 NS
Head circumference (cm)	39.65 (5.53)	38.42 (5.94)	40.26 (5.26)	-1.84 (-4.16 to 0.48)	-1.57 (98)	0.119 NS
Abdominal girth (cm)	37.28 (5.63)	35.54 (5.67)	38.14 (5.44)	-2.60 (-4.93 to -0.28)	-2.22 (98)	0.029 S

SD, standard deviation; CI, confidence interval. Values in bold indicate $p < 0.05$.

Developmental outcomes

Preterm infants scored significantly lower than term infants across all four developmental domains and on total developmental score. (Graph 1) Mean gross motor score was 2.94 (SD 0.83) among preterm infants versus 3.66 (SD 1.19) among term infants (mean difference - 0.72, 95% CI - 1.17 to - 0.26; $t(98) = -3.11$; $p = 0.002$). Similar reductions were observed for fine motor (3.00 vs 3.51; $p = 0.037$), language (3.03 vs 3.51; $p = 0.033$) and play (3.18 vs 3.73; $p = 0.013$) scores, and for total developmental score (12.15 vs 14.40; mean difference - 2.25, 95% CI - 3.65 to - 0.85; $t(98) = -3.19$; $p = 0.002$). (Table 3)

Table 3

Independent-samples t-test comparison of developmental outcomes between preterm and term infants

Developmental Domains	Overall (N = 100) Mean (SD)	Preterm (n = 33) Mean (SD)	Term (n = 67) Mean (SD)	Mean difference (95% CI)	t (df)	p value
Gross motor score	3.42 (1.13)	2.94 (0.83)	3.66 (1.19)	-0.72 (-1.17 to -0.26)	-3.114 (98)	0.002
Fine motor score	3.34 (1.15)	3.00 (0.90)	3.51 (1.22)	-0.51 (-0.98 to -0.03)	-2.115 (98)	0.037
Language score	3.35 (1.06)	3.03 (0.95)	3.51 (1.08)	-0.48 (-0.92 to -0.04)	-2.160 (98)	0.033
Play score	3.55 (1.05)	3.18 (0.98)	3.73 (1.04)	-0.55 (-0.98 to -0.12)	-2.532 (98)	0.013
Total score	13.66 (3.47)	12.15 (2.08)	14.40 (3.77)	-2.25 (-3.65 to -0.85)	-3.192 (98)	0.002

SD, standard deviation; CI, confidence interval. Values in bold indicate $p < 0.05$.

Graph 1: Total developmental score across groups

When developmental status was classified by category, the distribution differed significantly between groups ($\chi^2(2) = 13.32$; $p = 0.001$). Normal development was recorded in 43.3% of term infants but only 12.1% of preterm infants, whereas mild developmental delay was recorded in 87.9% of preterm infants compared with 50.7% of term infants. Moderate developmental delay was observed only among term infants (6.0%; 4/67), and no infant in either group met criteria for severe developmental delay (Table 4).

Table 4

Distribution of developmental category among preterm and term infants

Developmental category	Overall (N = 100)	Preterm (n = 33)	Term (n = 67)	χ^2 (df)	p value
Moderate delay	4 (4.0)	0 (0.0)	4 (6.0)	13.316 (2)	0.001
Mild delay	63 (63.0)	29 (87.9)	34 (50.7)		
Normal development	33 (33.0)	4 (12.1)	29 (43.3)		

χ^2 , Pearson chi-square test; df, degrees of freedom. No infant in either group scored in the severe delay category.

Association between developmental category and demographic/perinatal characteristics

Developmental category was not significantly associated with gender ($\chi^2 = 2.73$, $p = 0.256$), NICU admission ($\chi^2 = 2.93$, $p = 0.231$), or type of birth ($\chi^2 = 5.72$, $p = 0.057$), although a higher proportion of infants delivered vaginally were classified as having normal development compared with those delivered by LSCS. Developmental category was significantly associated with neonatal complications ($\chi^2 = 6.41$, $p = 0.041$); infants with a history of neonatal complications were less frequently classified as having normal development than those without. Developmental category was also significantly associated with immunization status ($\chi^2 = 8.46$, $p = 0.015$) (Table 5).

Table 5
Association between developmental category and selected demographic and perinatal characteristics (n = 100)

Variable	Moderate	Mild	Normal	F	χ^2	df	p value
Gender							
Female	3	29	20	52	2.726	2	0.256
Male	1	34	13	48			
Type of birth							
LSCS	2	31	8	41	5.719	2	0.057
Normal vaginal birth	2	32	25	59			
NICU admission							
No	3	39	26	68	2.931	2	0.231
Yes	1	24	7	32			
Neonatal complication							
No	3	40	29	72	6.407	2	0.041*
Yes	1	23	4	28			
Immunization status							
No	0	0	4	4	8.46	2	0.015*
Yes	4	63	29	96			

χ^2 , Pearson chi-square test. A p-value < 0.05 was considered statistically significant. LSCS, lower segment caesarean section; NICU, neonatal intensive care unit.

Multivariable predictors of developmental score

Multivariable linear regression, adjusted for gestational age at birth, type of birth, gender, age of child, NICU admission, neonatal complications and immunization status, identified two independent predictors of total developmental score. Age of the child was positively associated with developmental score, with

each additional month of age associated with a 0.32-point increase in total score ($\beta = 0.32$, SE = 0.09; 95% CI 0.13–0.50; $p = 0.001$). Term gestational status was also independently associated with a higher developmental score: relative to preterm infants, term infants scored 1.88 points higher on average ($\beta = 1.88$, SE = 0.88; 95% CI 0.13–3.64; $p = 0.036$). No independent association was observed for mode of delivery, gender, NICU admission, neonatal complications or immunization status after adjustment (all $p > 0.05$). The model explained 24.6% of the variance in developmental score (adjusted $R^2 = 18.8\%$) (Table 6) (Graph 2)

Table 6
Multivariable linear regression analysis of factors associated with total developmental score

Predictor variable	Regression coefficient (β)	Standard Error	t value	p value	95% Confidence Interval
Age of child (months)	0.32	0.09	3.39	0.001	0.13 to 0.50
Gestational age at birth					
Preterm	Reference				
Term	1.88	0.88	2.13	0.036	0.13 to 3.64
Type of birth					
LSCS	Reference				
Normal vaginal birth	1.05	0.68	1.54	0.126	-0.30 to 2.40
Gender					
Female	Reference				
Male	0.02	0.63	0.03	0.977	-1.24 to 1.27
NICU admission					
No	Reference				
Yes	0.57	1.65	0.34	0.732	-2.71 to 3.85
Neonatal complication					
No	Reference				
Yes	-0.54	1.88	-0.29	0.774	-4.28 to 3.20
Immunization status					
No	Reference				
Yes	-2.27	1.66	-1.37	0.174	-5.56 to 1.02

β , unstandardised regression coefficient; SE, standard error; CI, confidence interval. Model adjusted for gestational age at birth, type of birth, gender, age of child, NICU admission, neonatal complications and immunisation status. Model R^2 = 24.6%; adjusted R^2 = 18.8%.

Graph 2: Multivariable linear regression analysis

Discussion

In this comparative study of 100 infants aged 0–12 months from selected hospitals and Anganwadi centres of Anand district, preterm infants showed consistently lower growth and developmental attainment than term infants, and gestational age at birth remained an independent predictor of developmental score after adjustment for other perinatal and demographic factors.

Preterm infants had lower mean values than term infants across all anthropometric measures, with statistically significant differences observed for MUAC and abdominal girth. This pattern is consistent with Kutar et al., who reported significantly lower weight, length and body mass index among preterm infants born at or before 34 weeks' gestation compared with term infants even at 12–13 months corrected age, and concluded that preterm infants had not fully caught up in growth by the end of the first year [11]. Our findings are similarly consistent with Zhang et al., a retrospective cohort study that found length, weight and BMI z-scores remained lower among preterm infants and continued to decline across the first two postnatal years, indicating that growth deficits associated with preterm birth persist beyond the neonatal period [12]. That length, weight, chest circumference and head circumference did not differ significantly between groups in our sample may reflect the relatively wide gestational-age range included among preterm infants (24–36 weeks) and the modest sample size available for some comparisons.

Preterm infants also scored significantly lower than term infants across all four developmental domains and on total developmental score, and were markedly under-represented in the normal-development category (12.1% vs 43.3%). This is in keeping with Valentini et al., a Brazilian longitudinal cohort study using the Bayley Scales of Infant Development III, which documented a higher incidence of cognitive, language and motor delay among preterm infants that was evident from 4–8 months of age and persisted to 24 months [13]. The gross motor deficit observed in our sample ($p = 0.002$) is also consistent with Ko and Lim, who found significantly lower motor scores among preterm infants using the Alberta Infant Motor Scale, with delays evident across prone, supine, sitting and standing positions [14].

Developmental category was significantly associated with neonatal complications and with immunisation status, but not with gender, type of birth or NICU admission. This finding aligns with Bortagarai et al., who identified prematurity and low birth weight, together with environmental factors such as maternal education and home stimulation, as significant contributors to developmental delay [15], supporting the broader observation that biological vulnerability at birth continues to influence developmental trajectory through infancy. In adjusted multivariable analysis, only chronological age and term gestational status remained independently associated with total developmental score, while mode of delivery, gender, NICU admission, neonatal complications and immunisation status did not reach significance once these factors were accounted for. A comparable pattern was reported by Thomas et al., a retrospective cohort study of preterm neonates in which growth recorded during NICU stay was more strongly associated with later motor development than growth recorded after discharge, suggesting that early biological and maturational factors exert an independent influence on

developmental outcome [16]. Taken together, these findings suggest that gestational age at birth and chronological age are more consistent correlates of developmental attainment in this population than mode of delivery, neonatal morbidity, NICU exposure or immunisation status.

limitations

The cross-sectional design does not allow individual growth or developmental trajectories to be tracked over time, and causal inference between gestational age and developmental outcome cannot be drawn. The overall sample size of 100 infants, while adequate for the primary between-group comparisons, provided limited statistical power for age-stratified subgroup analyses. Non-probability convenience sampling from a defined set of hospitals and Anganwadi centres may also limit the generalizability of the findings to the wider district or state population. Finally, developmental status was assessed using an investigator-developed screening questionnaire rather than a globally standardized developmental assessment instrument, which may limit direct comparability with studies using tools such as the Bayley Scales or the Alberta Infant Motor Scale.

These limitations notwithstanding, the findings reinforce the case for structured, community-level growth and developmental surveillance for preterm infants during the first year of life, with clear referral pathways to paediatric services when delay is identified. Longitudinal studies incorporating additional maternal, nutritional and socio-economic covariates, and interventional studies evaluating structured parental education and early stimulation programmes, would help to clarify which modifiable factors could narrow the growth and developmental gap observed between preterm and term infants in this population.

Conclusions

In this district-level comparative study, preterm infants showed measurable deficits in physical growth particularly MUAC and abdominal girth and in developmental attainment across motor, language and play domains compared with term infants during the first year of life. Gestational age at birth and chronological age were the only factors independently associated with total developmental score after adjustment for mode of delivery, gender, NICU admission, neonatal complications and immunization status. These findings support the integration of routine anthropometric and developmental screening into community-based infant care, with particular attention to preterm infants, to enable early identification of growth faltering and developmental delay and timely referral for intervention.

Declarations

Ethics approval and consent to participate

The study was approved by the Institutional Ethics Committee of Bhaikaka University (approval number: [168]; date of approval: [1 December 2025]). Permission was also obtained from the administrative

authorities of the participating hospitals and Anganwadi. Written informed consent was obtained from a parent or legal guardian of every participating infant prior to enrolment.

Consent for publication

Not applicable. This manuscript does not contain any individual person's identifiable data, images or videos.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Clinical Trial Number

Not applicable

Competing interests

The authors declare that they have no competing interests.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Authors' contributions

All authors contributed equally.

Acknowledgements

The authors thank the administration and staff of Shree Krishna Hospital (Karamsad), Krishna Child Hospital (Petlad), Killol Children's Hospital (Anand), Aparna Children's Hospital (Anand), and the Anganwadi centres of Kasor and Sandesar for their cooperation, and gratefully acknowledge the parents and infants who participated in the study.

References

1. Kemble S, Patil S. Knowledge regarding developmental milestones among mothers of under five years children. *Int J Sci Res.* 2022;11(12):78-79. doi:10.36106/ijsr/9405653.
2. MedlinePlus. Infant and newborn development [Internet]. Bethesda (MD): U.S. National Library of Medicine; 2023 [cited 2026 Feb 15]. Available from: <https://medlineplus.gov/infantandnewborndevelopment.html>
3. Faridi MMA. Growth and development of preterm/very low birthweight infants at 12 to 24 months of corrected age: a marker of quality survival. *Indian Pediatr.* 2020;57(4):290-291. doi:10.1007/s13312-020-1775-0.
4. Misirliyan SS, Boehning AP, Shah M. Developmental milestones. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2026 Feb 15]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK557518/>
5. Centers for Disease Control and Prevention. Healthy habits: child development [Internet]. Atlanta (GA): CDC; 2024 [cited 2026 Feb 15]. Available from: <https://www.cdc.gov/child-development/about/index.html>
6. Asad B, Noor M, Sohail E, Ullah I, Ahmad B. Parental knowledge of developmental milestones in Peshawar, Pakistan: a cross-sectional study. *Eur J Pediatr.* 2025;184(4):248. doi:10.1007/s00431-025-06088-7.
7. Gallen A, Taylor E, Salmi J, Haataja L, Vanhatalo S, Airaksinen M. Early gross motor performance is associated with concurrent prelinguistic and social development. *Pediatr Res.* 2025;98(3):1016-1022. doi:10.1038/s41390-025-03832-5.
8. World Health Organization. Preterm birth [Internet]. Geneva: World Health Organization; 2023 [cited 2026 Feb 15]. Available from: <https://www.who.int/news-room/fact-sheets/detail/preterm-birth>
9. Dixit P, Bhatia M, Bhatia C, Dwivedi LK, Singh S. Risk factors for preterm birth and its effect on neonatal mortality in India: evidence from the National Family Health Survey-5. *Discov Public Health.* 2025;22:481. doi:10.1186/s12982-025-00868-0.
10. El Nokali NE, Bachman HJ, Votruba-Drzal E. Parent involvement and children's academic and social development in elementary school. *Child Dev.* 2010;81(3):988-1005. doi:10.1111/j.1467-8624.2010.01447.x.
11. Zhang L, Lin JG, Liang S, Sun J, Gao NN, Wu Q, et al. Comparison of postnatal growth charts of singleton preterm and term infants using World Health Organization standards at 40–160 weeks postmenstrual age: a Chinese single-centre retrospective cohort study. *Front Pediatr.* 2021;9:595882. doi:10.3389/fped.2021.595882.
12. Murki S, Kallem VR, Gururaj J, Bashir T, Oleti TP, Kiran S. Growth and neurodevelopmental outcomes at 12 to 18 months of corrected age in preterm infants born small for gestational age. *Indian Pediatr.* 2020;57(4):301-304. doi:10.1007/s13312-020-1779-9.
13. Akshara ES, Gohiya P, Shrivastav J. Assessment of physical growth and motor development of preterm babies based on Developmental Assessment Scale for Indian Infants (DASII). *J Neonatol.* 2020;34(1-2):11-14. doi:10.1177/0973217920927906.

14. Salavati S, Berghuis SA, Bosch T, Hitzert MM, Baptist DH, Mebius MJ, et al. A comparison of the early motor repertoire of very preterm infants and term infants. *Eur J Paediatr Neurol*. 2021;32:73-79. doi:10.1016/j.ejpn.2021.03.014.
 15. Crespo K, Libersky E, Poehlmann J, Kaushanskaya M. A comparative analysis of language skills and parent-child interactions in monolingual and bilingual children born preterm. *Languages (Basel)*. 2024;9(12):361. doi:10.3390/languages9120361.
 16. Yoshida-Montezuma Y, Kirkwood D, Sivapathasundaram B, Keown-Stoneman CDG, de Souza RJ, To T, et al. Late preterm birth and growth trajectories during childhood: a linked retrospective cohort study. *BMC Pediatr*. 2023;23(1):450. doi:10.1186/s12887-023-04257-x.
- International journal of special education

Graphs

Graphs 1 and 2 are available in the supplementary files section.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Graphs.docx](#)