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Original Research Article

# Prevalence, Pattern, and Determinants of Developmental Delay Among Under-Five Children in A Tertiary Care Hospital

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**Conflict of interest: Nil**

**Abstract:**

**Background:** Developmental delay in children under five years is a major pediatric concern because early deficits in motor, language, and social development can adversely affect long-term outcomes. Early identification is essential for timely intervention.

**Methods:** This prospective cross-sectional study was conducted in the Department of Pediatrics, GSL Medical College and General Hospital, Rajahmundry, from November 2025 to January 2026. A total of 120 children aged below five years were evaluated for developmental status using age-appropriate developmental assessment. Demographic, perinatal, nutritional, and socioeconomic variables were recorded and analyzed statistically.

**Results:** The mean age of the children was 28.6 ± 14.2 months, and 56.7% were males. Developmental delay was identified in 28.3% of the study population. Language delay was the most frequent domain affected, followed by gross motor and social/personal delay. Developmental delay showed significant associations with prematurity, low birth weight, birth asphyxia, undernutrition, rural background, and low maternal educational level, whereas age and sex were not significantly associated.

**Conclusion:** Developmental delay was common and was influenced by multiple biological, nutritional, and socioeconomic factors. Routine developmental screening in under-five children, especially in high-risk groups, is essential for early diagnosis, referral, and intervention.

**Keywords:** Developmental delay, Under-five children, Language delay, Prematurity, Developmental screening.

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## Introduction

Developmental delay in children younger than five years remains an important public health issue because this period is critical for acquisition of motor, language, cognitive, and socio-social skills, and deficits identified during these years may adversely influence later learning, behavior, and functional independence [1]. Recent evidence also shows that a substantial number of young children worldwide live with developmental disabilities, with the burden being particularly high in low- and middle-income settings; due to limited timely screening and intervention [2]. Early recognition of delay through structured developmental evaluation is therefore essential, as it helps identify affected children at an earlier stage, facilitates referral for appropriate intervention, and may improve long-term developmental outcomes [3], In this context, the present study was undertaken to evaluate developmental delay in children aged less than five years and to describe its clinical pattern in a cross-sectional hospital-based setting.

## Methods

This prospective cross-sectional study was conducted in the department of Pediatrics, GSL Medical College, Rajahmundry, from November 2025 to January 2026. Children aged 0 to 59 months who were brought by their parents or caregivers and were available for developmental assessment were considered eligible for inclusion. Children with acute medical instability requiring urgent resuscitative care, those whose parents or caregivers were unwilling to provide informed consent, and children in whom adequate developmental assessment could not be completed because of severe illness or non-cooperation were excluded from the study. Approval was obtained from the Institutional Ethics Committee before initiation of

the study, and written informed consent was taken from the parents or legal guardians of all enrolled children. A convenient sampling method was adopted in the study.

After enrollment, detailed demographic and clinical information was collected using a predesigned and pretested proforma. Information regarding age, gender, birth history, gestational age, birth weight, perinatal events, immunization status, nutritional status, family history, socioeconomic background, parental education, and history of developmental concerns was recorded. A thorough clinical examination was performed and the findings were recorded. Developmental evaluation was carried out in the domains of gross motor, fine motor, language, social, and adaptive behavior using a standard age-appropriate developmental screening and assessment tool as per institutional protocol. Each child was assessed in the presence of the caregiver to improve the reliability of responses and direct observations. Children who failed to achieve age-appropriate milestones in one or more developmental domains were categorized to be suspected developmental delay. Where relevant, delay was further classified as isolated domain-specific delay or global developmental delay based on involvement of developmental domains. Additional investigations were advised in selected children when clinically indicated [1].

The data was entered into Microsoft Excel and analyzed using SPSS version 22. Continuous variables were expressed as mean and standard deviation, while categorical variables in frequencies and percentages. Association between the variables was assessed using the chi-square test or Fisher's exact test for categorical variables and Student's t-test for continuous variables, as applicable. $P<0.05$ was considered statistically significant.

**Results**

A total of 120 children aged below five years were included in the study and evaluated systematically for developmental status during the study period. The baseline demographic profile showed that the mean age of the study population was 28.6 ± 14.2 months, with a slight male predominance, as 68 children (56.7%) were boys, while 52 (43.3%) were girls. Overall, developmental delay was identified in 34 children, accounting for 28.3% of the study population, whereas the remaining 86 children (71.7%) had age-appropriate development. Among the affected domains, language delay was the most frequently observed developmental abnormality, followed by gross motor delay and social/personal delay, indicating that communication-related milestones were more commonly impaired in the present cohort. On analysis of demographic and nutritional variables, developmental delay was found to be significantly more common among children with undernutrition, rural background, and lower maternal educational status, while age group and sex did not show a statistically significant association with delayed development (Table 1). Similarly, important perinatal risk factors such as prematurity, low birth weight, and birth asphyxia demonstrated a significant association with developmental delay, highlighting the contribution of adverse early-life events to later developmental vulnerability (Table 2).

**Table 1: Association between demographic factors and developmental delay**

| Variable | Developmental delay; n (%) | | $\chi^2$ value | p value |
|---|---|---|---|---|
| | Present | Absent | | |
| Male (n=68) | 21 (30.9) | 47 (69.1) | 0.54 | 0.46 |
| Female (n=52) | 13 (25.0) | 39 (75.0) | | |
| Rural (n=74) | 26 (35.1) | 48 (64.9) | 4.26 | 0.039 |
| Urban (n=46) | 8 (17.4) | 38 (82.6) | | |
| ≤ primary (n=58)* | 23 (39.7) | 35 (60.3) | 6.88 | 0.009 |
| > primary (n=62)* | 11 (17.7) | 51 (82.3) | | |
| Under nutrition (n=49) | 21 (42.9) | 28 (57.1) | 8.77 | 0.003 |
| Normal nutrition (n=71) | 13 (18.3) | 58 (81.7) | | |
| *Maternal education | | | | |

**Table 2: Association between perinatal risk factors and developmental delay**

| Variable | Developmental delay; n (%) | | $\chi^2$ value | p value |
|---|---|---|---|---|
| | Present | Absent | | |
| PP* (n=24) | 13 (54.2) | 11 (45.8) | 10.92 | 0.001 |
| PA** (n=96) | 21 (21.9) | 75 (78.1) | | |
| LBW present (n=31) | 16 (51.6) | 15 (48.4) | 12.14 | <0.001 |
| LBW absent (n=89) | 18 (20.2) | 71 (79.8) | | |
| BA present (n=18) | 10 (55.6) | 8 (44.4) | 8.96 | 0.003 |
| BA absent (n=102) | 24 (23.5) | 78 (76.5) | | |
| *Prematurity present; ** Prematurity absent; LBW = Low birth weight; BA = Birth asphyxia | | | | |

## Discussion

The present study demonstrated that developmental delay was present in 28.3% of children younger than five years, indicating a substantial burden in this hospital-based population. This prevalence is higher than that reported in some recent community-based Indian work, such as the study by Kiran et al., which found developmental delay in 4.9% of under-five children, but it is closer to figures reported in more vulnerable or screened populations where biological and social risk factors are concentrated [4]. Taywade et al. similarly emphasized that developmental delay is frequently under-recognized in routine practice and that the observed prevalence depends heavily on the setting, screening strategy, and referral pathway [5]. The higher burden in the present study is therefore likely to reflect the tertiary-care design, where children with prematurity, low birth weight, nutritional compromise, and prior neonatal illness are more likely to present than in general population surveys. This interpretation is also consistent with a recent systematic review and meta-analysis from low- and middle-income countries, which concluded that the magnitude of developmental delay varies widely across studies because of differences in case definition, screening instruments, and the underlying risk profile of the population studied. Taken together, our findings support the view that hospital-based developmental surveillance identifies a clinically enriched group and should not be interpreted in isolation from the context of care delivery and referral bias. At the same time, the present prevalence is high enough to justify routine developmental screening as part of under-five pediatric assessment rather than restricting screening only to children with obvious neurological deficits [4, 6].

Another important observation in the present study was that language delay was the commonest affected domain, followed by gross motor and social/personal delay. This pattern is noteworthy because language development is often especially vulnerable to cumulative biological, nutritional, and environmental insults in early childhood. The recent Iranian study by Alijanzadeh et al. also demonstrated that developmental difficulties in under-five children are strongly shaped by broader socio-environmental adversity, and domain-specific impairments may be amplified by household disadvantage and reduced developmental stimulation [7]. In a 2024 study of 12-month-old children from northeast Iran, Kazemian et al. reported that suspected developmental delays were common across domains and that prematurity and early-life medical vulnerability increased risk broadly, suggesting that communication-related delay often forms part of a wider developmental vulnerability rather than an isolated problem [8]. In addition, a recent review on language developmental delay highlighted that language problems are among the most frequent early developmental concerns brought to clinical attention, partly because caregivers notice delayed speech earlier than subtle fine-motor or adaptive deficits. Thus, the predominance of language delay in our cohort is clinically plausible and aligns with both caregiver-recognized symptom patterns and biologically sensitive domains of early development. This finding strengthens the case for including structured speech-language and communication surveillance in all under-five developmental assessments, especially in settings where formal developmental pediatric services are limited and pediatricians serve as the first point of developmental screening [8].

The association observed in the present study between developmental delay and prematurity, low birth weight, and birth asphyxia is one of the strongest and most clinically meaningful findings. Tangviriyapaiboon et al., in a large Thai cohort of high-risk children younger than five years with low birth weight and/or asphyxia, found that preterm birth and low birth weight significantly increased the likelihood of suspected developmental delay, closely mirroring our results [9]. Likewise, Kim et al. reported that term low-birth-weight children had greater vulnerability to later developmental, motor, and cognitive disorders, reinforcing the idea that impaired fetal growth has consequences extending well beyond the neonatal period [10]. Saboktakin et al. further showed in 2024 that developmental delay in preterm infants during the first year of life was influenced by multiple early-life risk factors, confirming that prematurity remains a central biological determinant of delayed milestone acquisition [11]. Longitudinal evidence adds further weight to this interpretation: the EPIPAGE-2 cohort showed that abnormal Ages and Stages Questionnaire screening at 2 years' corrected age was associated with neurodevelopmental disability at 5.5 years in preterm-born children, demonstrating that early screening abnormalities are not trivial and often predict persistent developmental burden [10, 12]. Therefore, the present study does not merely identify statistical associations; it supports a clinically coherent developmental pathway in which adverse perinatal events compromise early brain maturation, leading to delays that are detectable during the under-five period. These findings argue for more structured follow-up of NICU graduates, low-birth-weight infants, and children with perinatal hypoxic events, ideally through high-risk infant clinics linked to pediatric outpatient care.

The significant relationship between developmental delay and poor nutritional status in the present study is equally important, because it expands the interpretation of delay from a purely neurological problem to a broader child health and social development issue. Delbiso et al. showed that

nutritional status was closely related to early childhood development indicators, supporting the biologic plausibility that under nutrition may impair attention, activity, brain growth, and caregiver-child interaction, thereby delaying milestone attainment [13]. At the same time, our finding that low maternal educational level was associated with developmental delay aligns with recent studies from both India and Iran. Kiran et al. [4] found a strong association between lower maternal education and developmental delay among under-five children, while Nagaria et al. [14] highlighted poor maternal awareness of developmental milestones in rural settings and argued that limited caregiver knowledge can delay recognition and help-seeking. Alijanzadeh et al. also demonstrated that developmental delay in under-five children was linked to socioeconomic disadvantage and household-level social determinants, reinforcing that developmental vulnerability is rarely explained by biology alone [7]. In practical terms, these comparisons suggest that children with delay in the present study were likely affected by overlapping risks: adverse birth history, malnutrition, reduced developmental stimulation, and delayed caregiver recognition. This multidimensional framework is highly relevant because it emphasizes that developmental delay should be interpreted through a life-course and social-determinants lens. Screening programs that focus only on neonatal morbidity without integrating nutrition counseling, parent education, and follow-up for socially vulnerable families may therefore miss a major part of the preventable burden [7].

A notable strength of the present study is that it captured both biological and socioeconomic correlates of developmental delay in a clinically relevant under-five cohort. Another clinically useful observation was that age group and gender were not significantly associated with developmental delay in our sample, suggesting that targeted developmental assessment should be driven more by risk exposure than by demographic assumptions alone. This interpretation is consistent with contemporary developmental screening literature, which stresses the value of systematic surveillance of all children while giving particular attention to high-risk groups. Recent reviews on the comprehensive evaluation of children with global developmental delay and intellectual disability emphasize that early identification allows timely etiologic work-up, family counseling, and intervention, all of which can improve long-term outcomes when initiated during the highly plastic early years of brain development. Taywade et al. similarly argued that primary care and pediatric services have a central role in screening, initial assessment, and referral for developmental problems before they become entrenched [5]. Accordingly, the present findings support integrating developmental screening into routine pediatric OPD visits, immunization clinics, nutrition rehabilitation contacts, and follow-up of preterm or low-birth-weight infants. This tertiary care center is particularly well placed to function not only as a referral institution for delayed children but also as a hub for anticipatory guidance, parent education, and linkage to early intervention services. The main message of this study is that developmental delay in under-five children is not an isolated pediatric diagnosis but a marker of cumulative biological and social disadvantage that warrants earlier, broader, and more integrated child health action.

The present study had certain limitations. As it was conducted at a single tertiary care hospital, the findings may not be fully generalizable. The cross-sectional design limited causal interpretation of the observed associations. Developmental delay was assessed at a single point of contact without longitudinal follow-up, which may have led to misclassification in some children with transient or evolving delays. In addition, important contextual variables such as home stimulation, paternal education, household income, screen exposure, and neonatal neuroimaging findings were not evaluated.

**Conclusion:**

Developmental delay was identified in a considerable proportion of children aged below five years in the present study, indicating that it remains an important pediatric health concern in tertiary care practice. Language delay was the most common domain affected. Significant associations were observed with prematurity, low birth weight, birth asphyxia, undernutrition, and low maternal educational status, highlighting the multifactorial nature of developmental delay. These findings emphasize the importance of routine developmental screening in under-five children, particularly among biologically and socially vulnerable groups. Early recognition, appropriate referral, parental counseling, and timely intervention may help improve developmental outcomes and reduce long-term functional impairment in affected children.

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