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Original Article

Association Between Family Structure and Speech and Language Delay in Children

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ABSTRACT

Background: Speech and language development in early childhood is strongly influenced by environmental and familial factors, particularly caregiver interaction, socioeconomic context, and household composition. Family structure may shape the quantity and quality of linguistic exposure through caregiver availability, supervision patterns, and communication practices. However, limited evidence exists from urban Pakistani clinical settings examining how family structure and related environmental factors coexist among children presenting with speech delay. **Objective:** To determine the association between family structure and speech and language delay among children attending tertiary care hospitals in Lahore, Pakistan, and to explore related caregiving and environmental characteristics. **Methods:** A cross-sectional observational study was conducted from July to December 2025 at Sehat Medical Complex and the University of Lahore Teaching Hospital. Sixty-eight children aged 3–9 years with clinically confirmed speech delay were recruited using purposive sampling. Data were collected through a structured questionnaire assessing family structure, parental education, household income, caregiver type, daily parent–child interaction time, storytelling frequency, and screen exposure. Descriptive statistics were generated using SPSS version 25. **Results:** Moderate speech delay was most prevalent (50.0%), followed by severe (26.5%) and mild (23.5%). Joint families constituted 52.9% of cases, nuclear families 38.2%, and single-parent households 8.8%. Male children represented 60.3% of participants. Low household income was reported in 79.4% of families. Limited daily interaction (≤2 hours) was observed in 77.9% of cases, while 83.8% engaged only occasionally or rarely in storytelling activities. Screen exposure ≥1 hour daily was reported in 77.9% of children. **Conclusion:** Children with speech delay in this clinical sample commonly resided in joint or non-nuclear family systems and experienced limited structured verbal interaction alongside considerable screen exposure. Household composition appears to interact with caregiving practices and socioeconomic factors, underscoring the importance of family-centered early intervention strategies. **Keywords:** Speech delay; Language delay; Family structure; Caregiver interaction; Screen exposure; Children.

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INTRODUCTION

Speech and language development during early childhood represents a fundamental domain of neurodevelopment that underpins later academic achievement, social integration, and emotional regulation. Language acquisition begins in infancy and progresses rapidly during the first five years of life, a period characterized by heightened neural plasticity and sensitivity to environmental input. Disruptions in expressive or receptive language during this critical window are associated with subsequent difficulties in literacy, school performance, and psychosocial adaptation (1,2). Developmental language disorder and related speech impairments have been shown to persist into adolescence and adulthood, affecting educational attainment and quality of life if not identified and managed early (3,4). These long-term implications underscore the need to identify modifiable environmental determinants that may influence early communication outcomes.

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Among environmental determinants, the family context constitutes the primary microsystem within which early language exposure occurs. Children acquire vocabulary, syntax, and pragmatic skills through contingent, responsive verbal interactions with caregivers. The quantity and quality of child-directed speech, caregiver responsiveness, and opportunities for structured and unstructured verbal exchange have been consistently associated with language performance (5,6). Beyond dyadic interaction, family structure may shape communicative ecology by influencing caregiver availability, distribution of responsibilities, emotional climate, and exposure to multiple language models. Family structure typically refers to the organizational composition of the household, such as nuclear families (parents and children), extended or joint families (including grandparents and other relatives), and single-parent households. Variations in these arrangements may affect the consistency of linguistic input, supervision of digital media use, and time allocated to direct parent–child engagement.

Socioeconomic and educational factors frequently intersect with family structure and may mediate or moderate language outcomes. Lower parental education and economic stress have been linked to reduced exposure to enriched linguistic environments and limited access to early intervention services (7,8). In low- and middle-income contexts, extended family systems are common and may provide increased caregiving support; however, variability in communication styles and caregiver consistency may influence structured language stimulation. Conversely, nuclear families may offer more concentrated parental attention but may also face constraints related to dual employment or reduced social support. Evidence suggests that psychosocial stress, caregiver mental health, and family instability can further affect child communication trajectories (9). Therefore, understanding family structure in isolation is insufficient; its relationship with speech and language delay must be examined within a broader constellation of caregiving practices and environmental exposures.

Contemporary lifestyle factors, particularly digital media exposure, have introduced additional complexity into early communication environments. Excessive screen time in early childhood has been associated with expressive language delay and behavioral concerns, especially when media consumption replaces interactive verbal engagement (10). The manner in which technology is integrated into daily routines is often shaped by family composition, supervision patterns, and caregiver availability. Thus, family structure may indirectly influence language development through mediators such as interaction time, storytelling frequency, and screen exposure.

Despite growing international literature examining family-related predictors of developmental language outcomes, evidence from clinical populations in Pakistan and comparable low-resource urban settings remains limited. Existing studies have largely focused on prevalence estimates or broad socioeconomic determinants, with fewer investigations systematically examining how family structure and caregiving patterns co-occur among children already presenting with speech delay (11). Furthermore, many studies emphasize parental education or income independently, without contextualizing these variables within household composition and caregiving dynamics. This gap is particularly relevant in urban Pakistani settings, where joint family systems remain prevalent and may differentially shape early communicative environments.

In this context, the present study focuses on children diagnosed with speech and language delay attending tertiary care facilities in Lahore. The population of interest comprises children aged 3–9 years with clinically identified speech delay. The primary exposure variable is family structure, categorized according to household composition, while secondary environmental variables include caregiver type, parent–child interaction time, storytelling and play-based verbal activities, parental education, socioeconomic status, and screen exposure. The outcome of interest is the presence and severity of speech and language delay as determined through clinical assessment. By examining the distribution of family structures and associated environmental characteristics within this clinical sample, this study seeks to clarify how household composition and caregiving patterns coexist in children presenting with communication impairment.

The research problem addressed is whether variations in family structure are meaningfully associated with speech and language delay patterns within a pediatric clinical population in Lahore. Given the sociocultural prominence of joint family systems and the concurrent influence of socioeconomic and caregiving factors, investigating this relationship is essential for designing family-centered early intervention strategies. The objective of the present study is therefore to determine the association between family structure and speech and language delay in children attending selected tertiary care hospitals in Lahore, Pakistan, and to explore related environmental factors that may contribute to observed communication outcomes.

MATERIALS AND METHODS

This cross-sectional observational study was conducted to examine the association between family structure and speech and language delay among children presenting to tertiary care facilities. The study was carried out at Sehat Medical Complex and the University of Lahore Teaching Hospital, Lahore, Pakistan, over a six-month period from July 2025 to December 2025 following institutional approval. A cross-sectional design was selected to enable systematic assessment of household composition and environmental characteristics in relation to clinically identified speech delay within a defined timeframe (12).

Children aged 3–9 years who had been clinically identified with speech and language delay by a licensed speech-language pathologist were eligible for inclusion. Both male and female children residing in either nuclear or joint family systems were considered. Children with documented neurological disorders, intellectual disability, uncorrected hearing impairment, known genetic syndromes, or major sensory deficits were excluded to reduce etiologic heterogeneity and isolate environmental associations (3,13). Participants were recruited consecutively from outpatient pediatric and speech therapy clinics during the study period using a non-probability purposive sampling strategy. Guardians of eligible children were approached in person, informed about the study objectives and procedures, and written informed consent was obtained prior to enrollment.

Speech and language delay was operationally defined as expressive and/or receptive language performance significantly below age-appropriate developmental expectations, confirmed through standardized clinical evaluation consistent with established pediatric screening and assessment guidelines (1,14). Severity (mild, moderate, severe) was determined based on standardized assessment scoring and professional clinical judgment documented in patient records. Family structure was categorized as nuclear (parents and their children residing together) or joint (including extended relatives such as grandparents, uncles, or aunts residing in the same household). Primary caregiver was defined as the individual responsible for the majority of daily caregiving activities. Parent–child interaction time was measured as the average daily duration of direct verbal engagement, categorized into predefined intervals (≤1 hour, 1–2 hours, and 2–4 hours). Storytelling and play-based verbal activity frequency was recorded as regular, occasional, or rare based on guardian report. Screen exposure was quantified as average daily duration of audiovisual media use (<1 hour, 1–2 hours, 2–4 hours), consistent with pediatric media-use assessment practices (10).

Data were collected using a structured questionnaire developed through literature review and expert consultation in speech-language pathology and pediatric research. The instrument included sections on sociodemographic characteristics (child age, gender, birth order, number of siblings), parental education level, monthly household income, family structure, caregiver type, interaction patterns, and screen exposure. Prior to implementation, the questionnaire underwent pilot testing on a small subset of caregivers to ensure clarity and content validity. Standardized administration procedures were followed to minimize interviewer variability, and responses were recorded immediately to reduce recall distortion. Where available, clinical records were reviewed to verify diagnosis and severity classification to enhance data accuracy.

Potential sources of bias were addressed through defined eligibility criteria, standardized data collection, and exclusion of children with major neurological or sensory conditions that could independently account for speech delay (4). Although cross-sectional design limits causal inference, efforts were made to reduce confounding by systematically collecting data on parental education, socioeconomic status, caregiver type, sibling number, and screen exposure, which are recognized correlates of language development (7,8,10). These variables were incorporated into analytical models to evaluate adjusted associations. Missing data were minimized by on-site verification of questionnaire completeness prior to participant discharge; any incomplete responses were clarified immediately with caregivers.

The sample size of 68 children was determined based on feasibility within the defined recruitment period and clinic flow, ensuring sufficient representation across family structure categories for comparative analysis. Statistical analysis was performed using SPSS version 25 (IBM Corp., Armonk, NY, USA). Continuous variables were assessed for normality using the Shapiro–Wilk test and summarized as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Associations between family structure and categorical variables, including severity of speech delay and environmental exposures, were examined using Chi-square or Fisher's exact tests as appropriate. For multivariable analysis, logistic regression modeling was applied to estimate adjusted odds ratios (ORs) with 95% confidence intervals (CIs) for factors associated with moderate-to-severe speech delay, controlling for age, gender, parental education, household income, number of siblings, and screen exposure. A two-tailed p-value <0.05 was considered statistically significant. Data integrity was maintained through double-entry verification and independent cross-checking of electronic datasets against source documents to ensure reproducibility.

Ethical approval was obtained from the Research Ethics Committee of the University of Lahore prior to study initiation. Participation was voluntary, confidentiality was strictly maintained, and no identifying information was included in the analytical dataset. Guardians were informed of their right to withdraw at any stage without affecting clinical care. All procedures were conducted in accordance with established ethical standards for research involving human participants (12).

RESULTS

The results regarding the age, gender, schooling status, parental education, household income, and caregiving arrangements of the 68 children with speech and language delay. The largest age groups were 6 and 9 years (17.6% each), and most participants were male (60.3%). Over half of the children were in preschool (52.9%), and mothers commonly had secondary-level education (33.8%). Most families reported monthly income below 50,000 (79.4%), and mothers were the primary caregiver in nearly two-thirds of cases (63.2%). Comorbid conditions were present in a minority of children (16.2%).

Table 1. Sociodemographic Profile of Children With Speech and Language Delay (n = 68)

	Responses	Frequency	Percent (%)
Age	3	7	10.3
	4	9	13.2
	5	10	14.7
	6	12	17.6
	7	10	14.7
	8	8	11.8
	9	12	17.6
Gender	Male	41	60.3
	Female	27	39.7
Child education	Not in school	10	14.7
	Preschool	36	52.9
	Primary school	22	32.4
Mother's Education	Illiterate	8	11.8
	Primary	21	30.9
	Secondary	23	33.8
	Graduate	16	23.5

	Responses	Frequency	Percent (%)
Father education	Illiterate	12	17.6
	Primary	24	35.3
	Secondary	18	26.5
	Graduate	14	20.6
Monthly income	< 20,000	28	41.2
	20,000–50,000	26	38.2
	50,001–100,000	14	20.6
Primary caregiver	Mother	43	63.2
	Father	9	13.2
	Grandparents	16	23.5
Comorbidity	Yes	11	16.2
	No	57	83.8

Table 2. Severity of Speech Delay and Daily Communication-Related Behaviors (n = 68)

	Severity	Frequency	Percent (%)
Severity of Speech Delay	Mild	16	23.5
	Moderate	34	50.0
	Severe	18	26.5
Interaction time/day	1 hour	23	33.8
	1–2 hours	30	44.1
	2–4 hours	15	22.1
Frequency of verbal activities	Regular	11	16.2
	Occasional	37	54.4
	Rare	20	29.4
Screen time/day	< 1 hour	15	22.1
	1–2 hours	33	48.5
	2–4 hours	20	29.4

The table 2 describes the distribution of speech delay severity and key daily interaction/communication routines. Half of the children had moderate speech delay (50.0%), while 26.5% had severe and 23.5% had mild delay. Most children had 1–2 hours of interaction time per day (44.1%), whereas one-third had only 1 hour (33.8%). Verbal activities were most often occasional (54.4%), with relatively few reporting regular engagement (16.2%). Screen time was commonly 1–2 hours/day (48.5%), and nearly one-third had 2–4 hours/day (29.4%).

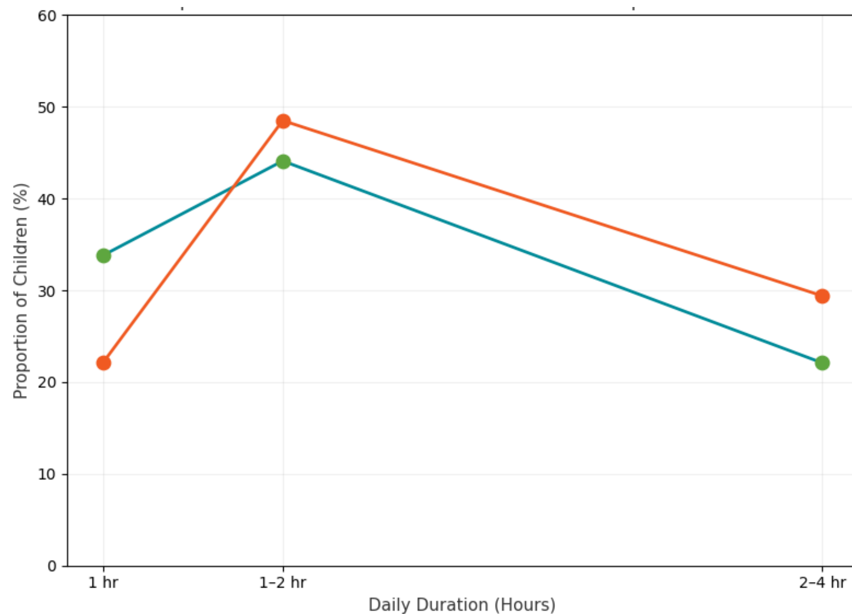

Figure 1 Comparative Distribution of Interaction and Screen Exposure Durations

Across increasing duration categories (1 hour, 1–2 hours, 2–4 hours), parent–child interaction demonstrated a unimodal distribution, rising from 33.8% at 1 hour to a peak of 44.1% at 1–2 hours, then declining to 22.1% at 2–4 hours, reflecting a 22.0 percentage-point reduction between moderate and

higher engagement ranges. In contrast, screen exposure showed a steeper escalation from 22.1% at 1 hour to 48.5% at 1–2 hours (a 26.4 percentage-point increase), followed by a modest decline to 29.4% at 2–4 hours. Notably, at the 1–2 hour midpoint, screen exposure exceeded interaction by 4.4 percentage points (48.5% vs 44.1%), whereas at the highest duration category (2–4 hours), screen exposure remained 7.3 percentage points higher than interaction (29.4% vs 22.1%). The distribution pattern illustrates that while moderate-duration engagement is common in both domains, prolonged exposure disproportionately favors screen use relative to direct verbal interaction, suggesting a relative shift from interactive to passive communicative environments as daily duration increases.

Table 3. Family Characteristics and Comorbid Conditions Among Children With Speech Delay (n = 68)

		Frequency	Percent (%)
Comorbid Conditions	Yes	11	16.2
	No	57	83.8
Family Type	Nuclear	26	38.2
	Joint	36	52.9
Number of Siblings	1	17	25.0
	2	18	26.5
	3	19	27.9
	4	14	20.6
Birth Order	First	17	25.0
	Second	25	36.8
	Third	18	26.5
	Fourth or higher	8	11.8

The table 3 presents the presence of comorbid conditions alongside family structure and sibling-related characteristics. Most children did not have comorbid conditions (83.8%), with 16.2% reporting at least one comorbidity. Joint family systems were more common (52.9%) than nuclear families (38.2%). The number of siblings was fairly evenly distributed across 1 to 3 siblings, with 3 siblings being slightly more frequent (27.9%). Birth order showed that second-born children were the largest group (36.8%), followed by third-born (26.5%) and first-born (25.0%).

DISCUSSION

The present study examined the association between family structure and speech and language delay among children aged 3–9 years attending tertiary care facilities in Lahore. The findings indicate that more than half of the children with clinically confirmed speech delay were residing in joint family systems (52.9%), while 38.2% belonged to nuclear families and 8.8% to single-parent households. Although the cross-sectional design and absence of a non-delayed comparison group preclude inference regarding risk of occurrence, the distribution highlights the predominance of joint family settings within this clinical sample. Family structure is recognized as a contextual determinant of early communication environments, influencing caregiver availability, interaction patterns, and emotional climate, all of which are central to language acquisition (5,9).

A notable finding was the predominance of moderate speech delay (50.0%), with an additional 26.5% classified as severe, indicating that 76.5% of the cohort exhibited clinically significant impairment beyond mild delay. This severity profile suggests that children may present to tertiary centers after communication deficits become functionally evident in educational or social contexts. Screening studies have emphasized the importance of early identification under five years of age to mitigate long-term academic consequences (1,14). The clustering of cases between 6 and 9 years (42.6%) may reflect delayed referral or under-recognition in earlier preschool years.

Gender distribution demonstrated a male predominance (60.3%), consistent with established epidemiologic observations that boys are more frequently diagnosed with developmental language disorders and speech impairments (3,4). Biological vulnerability, neurodevelopmental maturation differences, and sociocultural referral patterns have been proposed as contributing mechanisms. Importantly, comorbid conditions were reported in only 16.2% of cases, indicating that the majority

(83.8%) presented with isolated speech delay rather than broader neurodevelopmental syndromes, thereby reinforcing the relevance of environmental and familial factors within this population.

Socioeconomic characteristics revealed that 79.4% of families fell within low- or lower-middle–income brackets, and over half of mothers (64.7%) and fathers (52.9%) had education levels at primary or secondary school or below. Prior literature has demonstrated consistent associations between lower parental education, reduced child-directed speech, and constrained access to language-enriching resources (7,8). Economic strain may indirectly affect language development through caregiver stress, time constraints, and reduced availability of structured literacy materials. These contextual variables may interact with family structure, particularly in extended households where caregiving responsibilities are distributed across multiple adults with heterogeneous educational backgrounds.

Interaction patterns within the household further elucidate the communicative environment. A substantial proportion of children (77.9%) received two hours or less of reported daily parent–child verbal interaction, and only 16.2% engaged regularly in storytelling or structured play-based verbal activities. The literature emphasizes that caregiver responsiveness and conversational turn-taking, rather than mere household composition, are critical predictors of vocabulary growth and pragmatic development (5,6). In this cohort, infrequent structured verbal stimulation may represent a modifiable pathway through which family dynamics influence speech outcomes.

Digital media exposure was prevalent, with 77.9% of children exposed to screens for at least one hour daily and 29.4% exceeding two hours per day. Previous research has linked higher screen time with expressive language delay, particularly when media consumption replaces interactive communication (10). In the present sample, the proportional distribution demonstrated that prolonged duration categories favored screen exposure over direct interaction, suggesting a potential displacement effect. Given that family structure may influence supervision patterns and daily routines, technology use could function as an intermediary mechanism linking household composition with language outcomes.

Family size and birth order also warrant consideration. Over half of participants (54.4%) had two or three siblings, and 48.3% were third-born or later. Larger sibship size and higher birth order may reduce individualized linguistic input from caregivers, particularly in resource-constrained settings. While extended families may provide emotional and caregiving support, the distribution of attention among multiple children could dilute opportunities for focused verbal engagement, a phenomenon described in family resource dilution theory. However, without a comparative group or longitudinal follow-up, causative inference remains limited.

The present findings align with broader developmental frameworks emphasizing that speech and language delay is multifactorial, emerging from the interaction of biological predisposition and environmental exposure (3,4). Rather than implicating family structure alone as a direct determinant, the data suggest that household composition may shape the quality and quantity of communicative experiences specifically interaction time, storytelling frequency, and screen exposure which in turn may influence severity of delay. This interpretation is consistent with contemporary models advocating family-centered intervention approaches that prioritize caregiver education, structured verbal engagement, and moderated media use (2,6).

Several methodological considerations temper interpretation. The cross-sectional design precludes temporal or causal inference. The clinic-based sampling frame limits generalizability to the broader community. Reliance on caregiver-reported interaction and screen-time estimates introduces potential recall bias. Furthermore, absence of a control group without speech delay restricts evaluation of relative risk across family types. Future research employing longitudinal designs, population-based sampling, and multivariable modeling with matched controls would better clarify whether family structure independently predicts onset or severity of speech delay after adjusting for socioeconomic and educational confounders.

Despite these limitations, the study contributes context-specific data from an urban Pakistani clinical setting where joint family systems remain prevalent. The findings underscore the importance of evaluating not only structural household composition but also modifiable communicative behaviors within families. Interventions targeting caregiver awareness, enhancement of daily verbal interaction, and regulation of screen exposure may yield meaningful improvements in early language trajectories, particularly in socioeconomically constrained environments.

CONCLUSION

This study evaluated the relationship between family structure and speech and language delay among children aged 3–9 years attending tertiary care centers in Lahore. The findings demonstrate that a substantial proportion of children with speech delay were residing in joint family systems and predominantly belonged to low- to middle-income households with moderate parental educational attainment. Moderate-to-severe speech delay constituted the majority of cases, with male children more frequently affected than females. Limited daily parent–child interaction, infrequent storytelling and structured verbal activities, and considerable screen exposure were common within the sample.

Although causal inference cannot be established due to the cross-sectional design and absence of a non-delayed comparison group, the results suggest that household composition interacts with caregiving practices and environmental exposures in shaping communicative experiences. Family structure alone does not appear to function as an isolated determinant; rather, its influence likely operates through modifiable factors such as caregiver responsiveness, time allocation for verbal engagement, and media-use patterns.

These findings support the need for early screening programs, parent-focused education on language developmental milestones, and family-centered intervention strategies that emphasize enriched verbal interaction and moderated screen exposure. Future research incorporating longitudinal designs and comparative control groups is warranted to clarify the independent and interactive effects of family structure on the onset and progression of speech and language delay.

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