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SPEECH DELAY AMONG CHILDREN UNDER SEVEN YEARS OF AGE ATTENDING CHILDREN WELFARE TEACHING HOSPITAL AT BAGHDAD MEDICAL CITY, IRAQ (2025)

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ABSTRACT

Speech and language development is crucial for children's communication, learning and social interaction. Speech delay is considered to be a common problem in the world between 6 - 15 % and seems to be higher in Iraq. Speech delay, if untreated, can lead to future emotional, behavioral, academic and cognitive challenges. Various biological, environmental, and familial factors have been suggested. **Objective:** To assess the prevalence of speech delay and associated risk factors among children aged under 7 years in Children Welfare Teaching Hospital, Baghdad Medical City, Iraq. **Subjects and Methods:** This is a cross-sectional study, conducted in a hospital setting, from 1st May to 31st July 2025. Children, 1 to <7 years of age, were recruited by convenience sampling with a total of 780 children. The data was gathered by conducting interviews of the caregivers using a structured interview, and reviewing medical records. SPSS version 26 was used to analyze the data. Ethical approval and verbal informed consent were obtained. **Results:** Speech delay was detected in 285 of 780 children (36.5%) and 94.7% of the diagnoses were made by psychiatrists. Speech delay was statistically significantly higher in males, 5–6-year-old children and 2nd order of birth. Important risk factors were low household income, parents' inability to read or write, less communication with children, parents' consanguinity, birth asphyxia, admission to a neonatal intensive care unit, prolonged neonatal jaundice, and history of speech delay or autism in the family (all P<0.001). Behavioral and environmental factors were prolonged non-nutritive sucking, limited outdoor play, stressful life events and excessive use of electronic devices without supervision. **Conclusion:** Speech delay was prevalent (36.5%) and linked to socioeconomic disadvantage, adverse perinatal events, family history and modifiable behavioral and environmental factors. Timely identification and intervention can help enhance speech and language outcomes.

KEYWORDS: Speech Delay; Language Development Disorders; Risk Factors; Cross-Sectional Studies.

1. INTRODUCTION

1.1 Background

Speech and language development is an integral part of early childhood and is essential for communication, learning, socializing and emotional development. The development of speech and language skills helps children to communicate their needs, thoughts and feelings and also underpin their cognitive development, education and successful relationships with others.[1]

Speech delay is when a child's speech is developing slower than is expected for his age. The difference between speech and language: Speech is the making of sounds, language is the understanding and use of words, sentences and meaning.[2]

Speech delay is one of the most common developmental disorders in children, with 6% to 15% of children worldwide affected by it[3] In Iraq, the prevalence reported is between 11.9% in the general paediatric cases and 17.6% in children exposed to a smartphone.[4]

Although it occurs at a relatively high rate, speech delay is often underdiagnosed as many families believe a certain amount of delay in speech is a normal family variation and delay the diagnosis and intervention.[5]

Speech delay is a multi-factorial etiology. Biological risk factors include male sex, low birth weight, asphyxia at birth, neonatal complications, hearing impairment, epilepsy, cerebral palsy and other neurological disorders.[6]

Delayed speech development is also linked to structural abnormalities such as cleft palate, oral sucking habits, recurrent ear, nose and throat disorders and hearing loss. Because of environmental factors, such as too much or too unsupervised time spent with electronic devices, insufficient verbal interaction with parents, a lack of language stimulation, and later preschool start age, the risk may be further increased.[7] Other family related issues including positive family history for speech or language disorder, low parent education levels, consanguinity, and multilingual home settings have also been noted as important factors.[8]

Speech delay can continue through the later childhood years and lead to long-term social, emotional, behavioral, cognitive, and academic problems if it isn't addressed.[9] Early identification and timely intervention therefore become extremely important to promote developmental outcomes. Family physicians and primary healthcare providers have a pivotal role in identifying children at risk, referring and intervening early and appropriately.[10]

There is still lack of information about the prevalence and risk factors of speech delay among children in Iraq. Valid local evidence is crucial to the development of effective prevention strategies and early diagnosis and intervention.

1.2 AIM OF THE STUDY

To address this knowledge gap; this study was conducted with two main goals. The main objective was to identify the prevalence of speech delay in children younger than 7 years at Children Welfare Teaching Hospital, Baghdad Medical City, Baghdad, Iraq, in 2025. The second objective was to screen for the biological, environmental and familial risk factors in this population.

2. Literature Review

2.1 Definition and Classification

Speech delay is a developmental disorder in which the child starts speaking words and sentences later and/or advances at a slower rate than is typical for his/her age; the child's course of speech development is the normal one, only later than it is expected to be for the child's age.[10] The diagnosis is made clinically when a child's expressive speech performance is at least one standard deviation below the mean for his or her age on standardized assessments, and no sensory, intellectual, or neurological impairment is found.[11]

The four main types of speech delay are: The most common type of disorder, speech sound disorders, can be caused by either motor impairments (where the child has a problem actually producing sounds, articulation disorder) or by an understanding of the linguistic system that is missing or incorrect (phonological disorder).[12] Motor speech disorders are caused by neurological problems such as childhood apraxia of speech (a motor planning disorder) and dysarthria (neuromuscular weakness).[13] Fluency disorders (mainly stuttering) occur in 5-10% of children and voice disorders include abnormalities in voice quality or pitch and are seen in 1.4-6% of children.[14]

2.2 Developmental Milestones and Signs of Delay

Speech and language development occurs in a typical order of events tracked by organizations such as the CDC and NIDCD.[15] These include cooing at 2 months, babbling and responding to one's name at 6 months, saying first words at 12 months, and two-word sentences at 13, 14 years of age (Key benchmarks). Some early signs of delay are the absence of babbling by 9 months, no pointing by 12 months, no single words by 18 months and diminishment in eye contact and social interaction. It is important to know these deviations, because intervention at this early stage is very beneficial.[1,16]

2.3 Etiology and Pathophysiology

Speech delay has a multifactorial etiology consisting of neuroanatomical abnormalities, genetic mutations, and environmental factors.[17] Structural changes in Broca's area, basal ganglia, cerebellum and arcuate fasciculus (AF) affect the sensorimotor integration.[17] Pathogenic variants of FOXP2 are very tightly associated with childhood apraxia of speech, which in turn affects downstream genes such as CNTNAP2 involved in neural connectivity.[18] Genetic predispositions and perinatal complications combine to worsen the phenotype, as do low-stimulation environments. An integrated model suggests that when the neural inefficiency, genetic predisposition and environmental stressors exceed the child's ability to compensate, speech delay occurs.[19]

2.4 Epidemiology

6-15% of children under 5 years old (cU5) have some degree of speech or language delay globally, and these delays are more prevalent in boys and those from low-income families.[3] The incidence of developmental language disorder is 6.4% and is highest between 18 and 36 months in developed countries such as Australia. Post-pandemic data has revealed more diagnoses, possibly because of decreased peer interaction and more exposure to screens.[20]

Prevalence is higher in developing Arab countries. In Saudi Arabia, the 2023 study indicated 45.5% in under 7 years old children, and related to high screen time and low maternal education. Egyptian and Jordanian studies suggested 25-15%. National statistics in Iraq are scarce. A 2018 study in Baghdad revealed a prevalence of

11.9%, while a 2023 study in Erbil reported 17.6% prevalence, with strong associations to excessive screen time and limited verbal stimulation.[21]

2.5 Contributing Factors

Risk factors are a combination of factors. Child related factors are male gender, birth order and long-term non-nutritive sucking over two years of age. Lower education levels, especially mother's illiteracy, are significant factors in determining the linguistic environment, which will be strongly influenced by parental characteristics. These disadvantages are compounded by low socioeconomic status, and low parent-child interaction is a known risk factor.[22, 23]

Biological risks include serious peripartum problems. Maternal problems during gestation can have adverse effects on the developing fetal brain, and consanguinity can increase the risk for inherited disorders. Hypoxic-ischemic injury or disruption of neurodevelopment may occur due to birth asphyxia and/or postnatal problems such as cerebral palsy, prolonged jaundice, and NICU admissions. Susceptibility is increased if there is a family history of speech-language disorders, autism or hearing loss. Chronic noise exposure, limited outdoor play and psychosocial stressors contribute to further limitations.[16, 24] development. Electronic device use exceeding two hours daily or starting before 12 months is a well-documented risk factor, especially when passive and unsupervised.[25]

2.6 Complications

Speech delay, if left untreated, has lifelong impact on cognitive, academic, emotional and social development. Unresolved deficits can make a child more likely to underachieve in school, into adult life. Emotional frustration, due to communication difficulties, results in behavioral problems such as aggression and social withdrawal. These secondary consequences can be greatly reduced with early identification and intervention.[25, 26]

2.7 Diagnosis, Screening, Treatment, and Prevention

Early identification is crucial. Diagnosis starts with a comprehensive history taken from the caregiver, physical/neurological examinations and hearing assessments. Early concerns can be identified using standardized screening tools, such as the Denver Developmental Screening Test II and Ages and Stages Questionnaire. In Iraq, primary healthcare centers have the Child Growth and Development Monitoring Form and Early Childhood Development programs to monitor progress, but not all centers have adopted the use of structured screening.[27, 28]

An interdisciplinary approach is needed to treatment. Child psychiatrists and speech therapists conduct interventions in Iraq, many of which are parent mediated and home-based, especially in resource limited areas. Prevention aims to reduce risk factors and involves positive prenatal care, extensive verbal interactions, restricted screen time and regular developmental screening to detect early signs.[29, 30]

2.8 Gaps in the Literature

Although the burden of speech delay is known, there is a scarcity of information on the prevalence and risk factors of speech delay in the Iraqi context, especially in children who attend tertiary care hospitals. Past research has done so only in a few geographic areas or focused on a small age range, and no studies have explored all biological, environmental, and behavioral risk factors in the same study population. The purpose of this study was to fill these gaps by finding the prevalence of speech delay among children's attendants of a large teaching hospital in Baghdad and risk factors associated with speech delay.

3. MATERIALS AND METHODS

3.1 Study Design

This is a descriptive cross-sectional study to find out the frequency of speech delay and its risk factors among children below 7 years of age.

3.2 Study Setting and Duration

This study was carried out in outpatient clinic and Speech evaluation clinic at Children Welfare Teaching Hospital, Baghdad Medical City, Baghdad, Iraq. This hospital is a tertiary paediatric centre offering multi-disciplinary services such as speech therapy, psychological assessment and developmental screening. Data collection was done from 1st May to 31st July 2025.

3.3 Study Population and Sampling

Children aged 1 to <7 years who visited the pediatric outpatients clinics were included in the study population. All children with known speech delay as well as children of normal speech development who were admitted to the hospital for other reasons were included in order to determine prevalence and compare associated factors. The participants of the study were 780. The technique used was convenience sampling.

Inclusion Criteria

- Children aged 1 to <7 years.
- Children with a confirmed diagnosis of speech delay documented in their medical records, and children with normal speech development.
- Children whose caregivers provided verbal informed consent.

Exclusion Criteria

- Children with incomplete medical records or missing essential data required for the analysis.

3.4 Data Collection

A structured questionnaire based on past published studies of speech delay and child development was used to collect data via face-to face interviews with

caregivers. Content validation of the questionnaire was achieved by family medicine and child psychiatrist specialists who reviewed the questionnaire and a final version of the questionnaire was translated into Arabic using a professional translator. Where possible, clinical data were cross checked with the child's medical records.

The questionnaire collected data across the following domains:

- **Speech delay diagnosis:** Presence of delay, age at diagnosis, and the specialty of the diagnosing physician.
- **Child characteristics:** Demographics, birth order, gestational age, nursery attendance, feeding history, and prolonged non-nutritive sucking habits (e.g., pacifier or thumb sucking beyond 2 years).
- **Parental characteristics:** Age, education level, occupation, frequency of parent–child communication/reading, and socioeconomic status.
- **Perinatal history:** Prenatal maternal complications, natal factors (e.g., birth asphyxia, delayed crying), and postnatal complications (e.g., NICU admission, prolonged jaundice, neonatal seizures).
- **Medical and family history:** Consanguinity, family history of speech delay/autism/hearing loss, and the child's past medical history (e.g., hearing impairment, structural anomalies, head trauma).
- **Environmental and lifestyle factors:** Outdoor play, exposure to psychosocial stressors, and chronic noise exposure.
- **Electronic device use:** Type of device, daily and total duration of use, supervision status, and type of content viewed.

3.5 Pilot Study

A pilot study was also done before the main survey, with 25 caregivers, to avoid data contamination, at a different facility (Pediatric Teaching Hospital). The same eligibility criteria applied and these participants were excluded from the final analysis. The pilot study evaluated the clarity, cultural appropriateness, and feasibility of the questionnaire, which had an average completion time of 10–15 minutes. The feedback was used to make some minor changes prior to the start of the main study.

3.6 Statistical Analysis

IBM SPSS Statistics 26 software (IBM Corp., Armonk, NY, USA) was used to analyze the data. Summary statistics for continuous variables were mean ± standard deviation or median (range) depending on data distribution, while categorical variables were summarized by frequencies and percentages. Welch's t test was used to compare differences between normally distributed continuous variables and the Wilcoxon rank sum test was used to compare non-normally distributed variables. The associations between categorical variables were tested using chi square test with Yates' continuity correction or Fisher's exact test, whichever was suitable. Statistically significant p values were set at <0.05 (two sided).

3.7 Ethical Considerations

Ethical and scientific approval was obtained from the Executive Office of the Arab Board of Health Specializations in Iraq. Administrative permission to conduct the study was granted by the Center of Training and Human Development at the Medical City Directorate prior to data collection. Verbal informed consent was obtained from all caregivers prior to participation. Participants were informed about the study objectives, the voluntary nature of participation, their right to withdraw at any time without consequences, and the confidentiality of the collected information. A statement emphasizing data protection and anonymity was included on each form, and all data were anonymized and used solely for research purposes.

4.1 Study Population and Diagnosis

A total of 780 children were included in the study. Of these, 285 (36.5%) were diagnosed with speech delay, while 495 (63.5%) demonstrated normal speech development (Figure 1). Among the children with speech delay, the vast majority of diagnoses were made by child psychiatrists (n = 270, 94.7%), with the remainder diagnosed by pediatricians (n = 15, 5.3%).

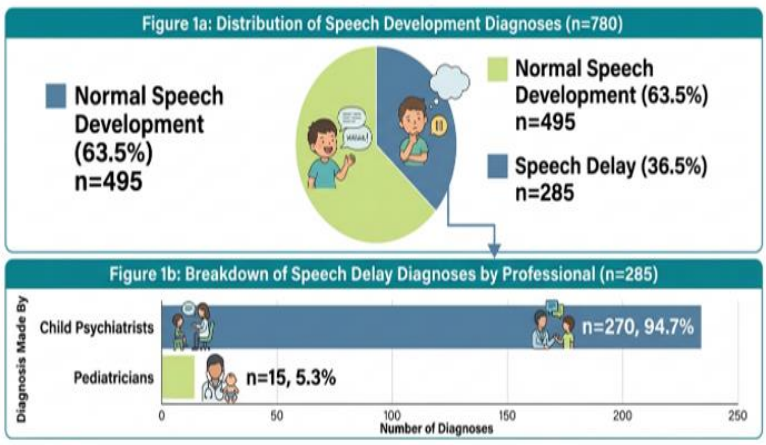

Figure 1: Prevalence of speech dealay among study participants (N=780).

4.2 Sociodemographic Characteristics

Children with speech delay were significantly older (mean age 4.5 ± 1.2 years) than those without delay (3.7 ± 1.7 years; $P \leq 0.001$), with over half (57.2%) aged 5–6 years. Speech delay was significantly more prevalent in males (80.7% vs. 52.9%; $P \leq 0.001$) and second-born children (37.9% vs. 21.0%; $P \leq 0.001$). Term births were more common in the delayed group (94.7% vs. 89.3%; $P = 0.004$), while the median household size was smaller (median 2.0 vs. 3.0; $P \leq 0.001$). Non-parental caregiving (8.4% vs. 4.0%; $P = 0.011$), early weaning (6–12 months: 35.4% vs. 24.4%; $P = 0.001$), and non-nutritive thumb sucking (18.2% vs. 3.8%; $P \leq 0.001$) were significantly more frequent among children with speech delay. Nursery attendance and feeding type did not differ significantly between groups.

Parental sociodemographic factors showed strong associations with speech development. Maternal illiteracy was markedly higher in the speech delay group (31.2% vs. 16.8%; $P \leq 0.001$), as was paternal illiteracy (23.9% vs. 7.9%; $P \leq 0.001$). Parental age also demonstrated protective gradients; mothers and fathers aged ≥35 years were less common in the delayed group (6.0% vs. 12.1% and 12.6% vs. 29.3%, respectively; $P = 0.004$ and $P \leq 0.001$). Maternal public-sector employment was higher in the delayed group (10.2% vs. 5.5%; $P = 0.014$). Low monthly household income (<500,000 IQD) was more common among families of children with speech delay (90.5% vs. 80.4%; $P \leq 0.001$). Furthermore, all children in the speech delay group (100.0%) had ≤1 hour of daily parent–child communication, compared to 39.0% in the non-delayed group ($P \leq 0.001$) (Figure 2).

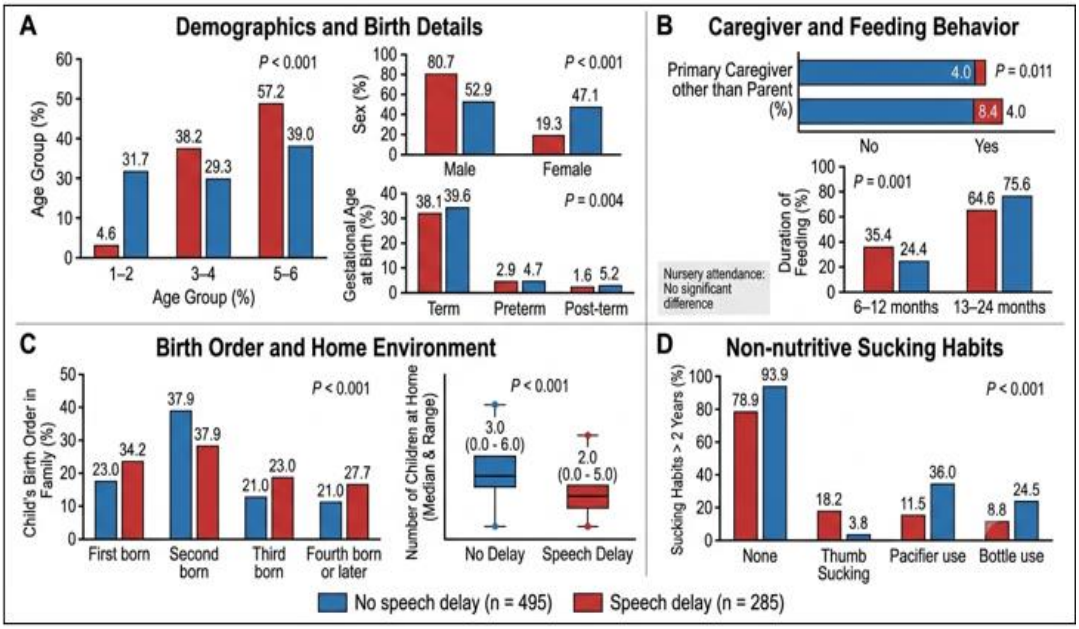

Figure 2: Sociodemographic charactristics of children by speech development status (N=780).

4.3 Perinatal, Medical, and Family History

Adverse perinatal and familial factors were significantly more frequent in the speech delay group. Parental consanguinity was reported in 30.2% of delayed children versus 21.6% of non-delayed children ($P = 0.008$), and multiple pregnancies occurred exclusively in the delayed group (1.4% vs. 0.0%; $P = 0.018$). Prenatal complications showed a significant association ($P \leq 0.001$); while maternal hypertension and diabetes were more frequently reported in the non-delayed group, maternal depression was similar across both groups. Natal complications, particularly birth asphyxia, were significantly higher in the speech delay group (9.8% vs. 2.2%; $P \leq 0.001$), as were postnatal complications including neonatal intensive care unit (NICU) admission (10.5% vs. 4.2%; $P \leq 0.001$) and prolonged jaundice (2.5% vs. 0.0%; $P = 0.003$). Low birth weight was reported exclusively in the non-delayed group (1.0% vs. 0.0%) (figure 3).

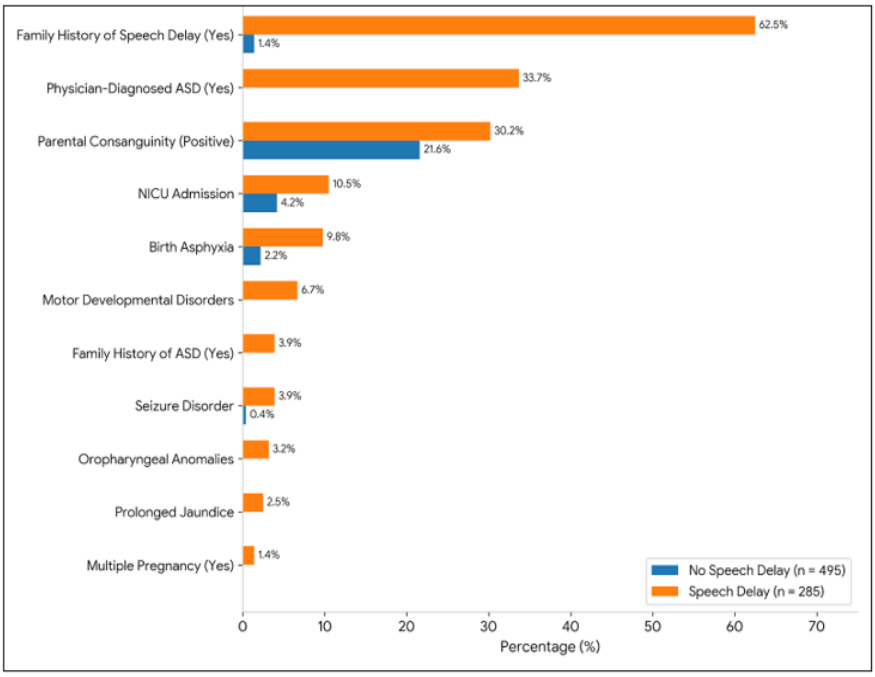

Figure 3: Perinantal, medical and family history factors by speech development status (N=780.

A positive family history of speech delay was the most strongly associated familial factor (62.5% vs. 1.4%; $P \leq 0.001$). Additionally, physician-diagnosed autism spectrum disorder (ASD) was present in 33.7% of the speech delay group and absent in the non-delayed group ($P \leq 0.001$). Children with speech delay also had a higher prevalence of comorbid conditions, including motor developmental disorders (6.7%), seizure disorders (3.9%), oropharyngeal anomalies (3.2%), hearing impairment (1.4%), hypothyroidism (1.4%), visual disorders (1.1%), and head trauma (2.8%). Down syndrome was reported at equal rates in both groups (1.4%) (figure 3).

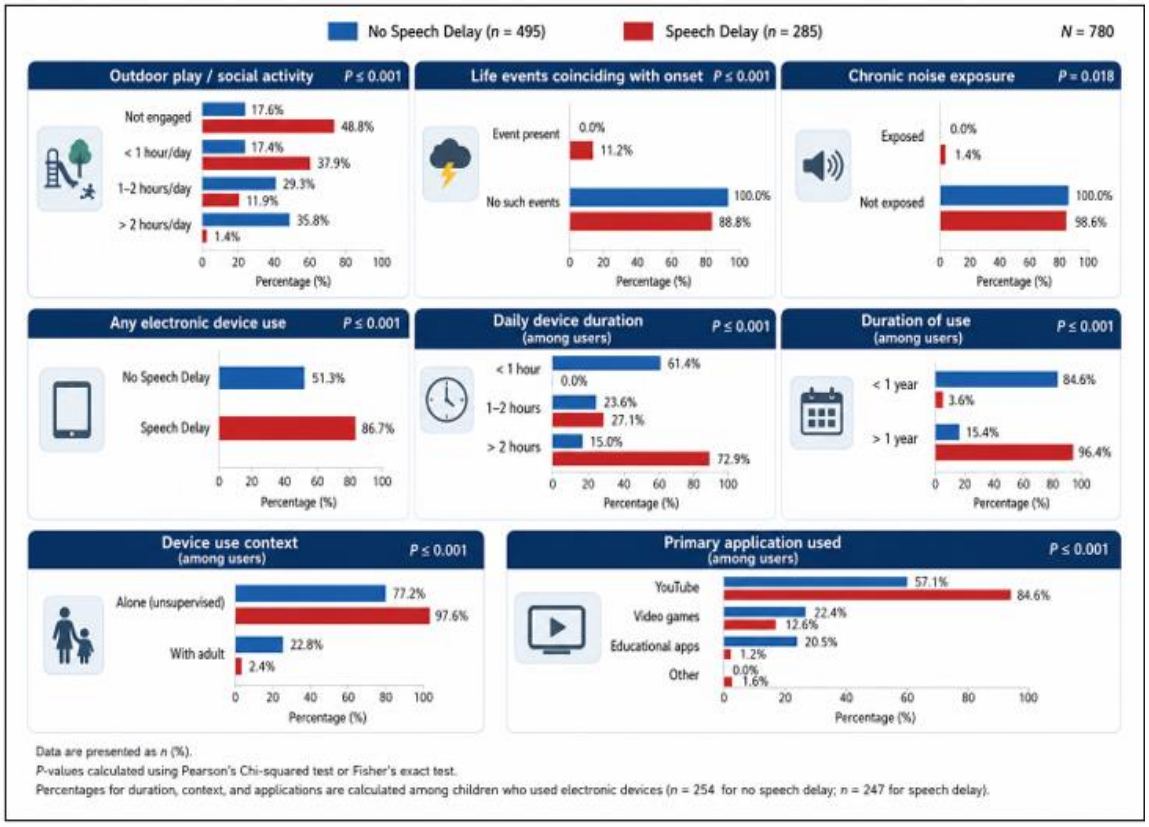

Figure 4: Environmental, lifestyle, and electronic device use characteristics (N=780).

4.4 Environmental, Lifestyle, and Electronic Device Use

Environmental and behavioral factors demonstrated significant divergent patterns. Lack of outdoor play or social engagement was highly prevalent in the speech delay group (48.8% vs. 17.6%; $P \leq 0.001$). Significant psychosocial life events coinciding with symptom onset were reported exclusively in the speech delay group (11.2% vs. 0.0%; $P \leq 0.001$), as was chronic exposure to environmental noise (1.4% vs. 0.0%; $P = 0.018$) (Figure 4).

Electronic device use was strongly associated with speech delay (86.7% vs. 51.3%; $P \leq 0.001$). Among device users, television use was significantly higher in the delayed group (13.0% vs. 1.6%; $P \leq 0.001$). Prolonged daily use (>2 hours) was reported in 72.9% of the speech delay group compared to 15.0% of the non-delayed group ($P \leq 0.001$), and chronic device exposure (>1 year) was much more common in the delayed group (96.4% vs. 15.4%; $P \leq 0.001$). Unsupervised device use was nearly universal in the speech delay group (97.6% vs. 77.2%; $P \leq 0.001$), with YouTube being the predominant content consumed (84.6% vs. 57.1%; $P \leq 0.001$), whereas educational applications were markedly less frequent (1.2% vs. 20.5%; $P \leq 0.001$) (**Figure 4**).

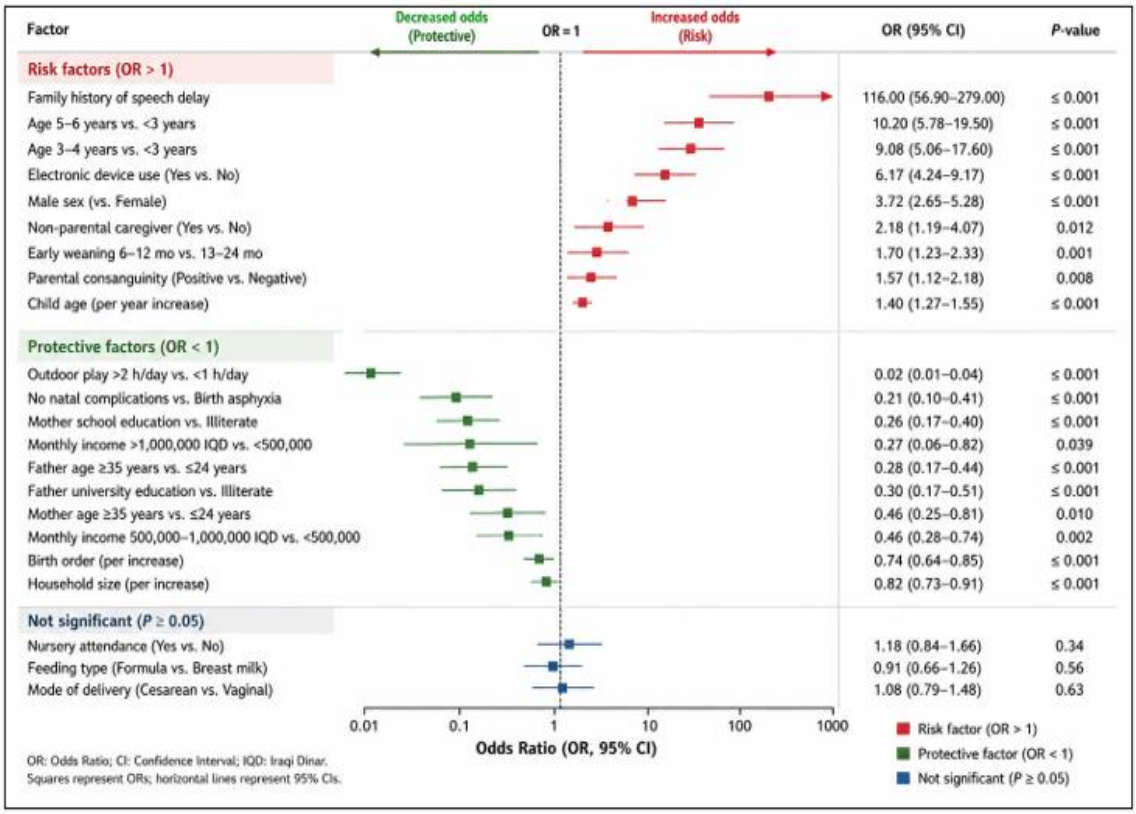

Figure 5: Univariable logistic regressin analaysis of factors associated with speech delay (N=780).

4.5 Univariable Logistic Regression Analysis

In univariable analysis, increasing child age (per year: OR = 1.40, 95% CI 1.27–1.55; $P \leq 0.001$) was associated with higher odds, with the strongest effects seen in children aged 3–4 years (OR = 9.08, 95% CI 5.06–17.60) and 5–6 years (OR = 10.20, 95% CI 5.78–19.50). Male sex (OR = 3.72, 95% CI 2.65–5.28; $P \leq 0.001$) also significantly increased the odds, while higher birth order (OR = 0.74, 95% CI 0.64–0.85; $P \leq 0.001$) and larger household size (OR = 0.82, 95% CI 0.73–0.91; $P \leq 0.001$) were protective. Non-parental caregiving (OR = 2.18, 95% CI 1.19–4.07; $P = 0.012$) and early weaning (OR = 1.70, 95% CI 1.23–2.33; $P = 0.001$) increased the odds of delay (Figure 5).

Higher parental education and higher household income demonstrated protective gradients. Maternal school education (OR = 0.26, 95% CI 0.17–0.40; $P \leq 0.001$) and paternal university education (OR = 0.30, 95% CI 0.17–0.51; $P \leq 0.001$) were strongly protective, as were maternal age ≥35 years (OR = 0.46, 95% CI 0.25–0.81; $P = 0.010$) and paternal age ≥35 years (OR = 0.28, 95% CI 0.17–0.44; $P \leq 0.001$). Higher monthly household income showed a dose-response protective effect (500,000–1,000,000 IQD: OR = 0.46, 95% CI 0.28–0.74; $P = 0.002$; >1,000,000 IQD: OR = 0.27, 95% CI 0.06–0.82; $P = 0.039$). Conversely, positive parental consanguinity (OR = 1.57, 95% CI 1.12–2.18; $P = 0.008$) and the absence of intrapartum complications relative to birth asphyxia (OR = 0.21, 95% CI 0.10–0.41; $P \leq 0.001$) were significantly associated with speech delay. A

family history of speech delay demonstrated the strongest association (OR = 116.00, 95% CI 56.90–279.00; $P \leq 0.001$). Environmental factors showed that greater outdoor play was strongly protective (>2 hours/day: OR = 0.02, 95% CI 0.01–0.04; $P \leq 0.001$), whereas any electronic device use was associated with substantially higher odds (OR = 6.17, 95% CI 4.24–9.17; $P \leq 0.001$). Nursery attendance, feeding type, and mode of delivery were not statistically significant (Figure 5).

5. DISCUSSION

In this hospital-based study, the prevalence of speech delay children under 7 years in Baghdad, in Iraqi was 36.5%. This is significantly higher than the global estimate of 6%–15% and the previous local estimate of 11.9%, but is similar to the recent regional estimates such as Saudi Arabia with 45.5%. This higher rate points to a need for increased early detection and targeted interventions in low-resource settings.[4, 21]

The results show that speech delay is caused by a complex interaction of sociodemographic, biological and modifiable environmental factors. As described in the literature worldwide, male sex was a strong predictor, which is probably explained by the fact that neurological maturation and language acquisition pathways are slower in males, but some studies do not show a significant difference between the two sexes (62). The high percentage of children affected in the age group 5-6 years indicates that the delay is only identified by the time children start school, which is also reported in India although some of the previous data in Iraq does not support this.[4, 31] Also, children who were born second and those born into smaller families were more likely to be at risk, perhaps because of less one-on-one verbal stimulation and fewer peer-like language interactions that occurred at home; there are regional differences. Also, the risk of delay was greater for non-parent caregivers, because they might lessen continual verbal stimulation. Extended periods of non-nutritive sucking (>2 years) were also associated with delayed articulation, which is probably due to oral-motor development changes. On the other hand, feeding type, living conditions, attendance in nursery and mode of delivery did not exhibit any significant association as reported earlier in Pakistan and Iraq.[32, 33]

Sociodemographic factors of parents were key. Speech delay was strongly associated with parental illiteracy, younger parental age and low household income. In an amazing fact, all children with speech delay had only 30-60 minutes of parent-child communication each day. This finding highlights the importance of quality and purposeful linguistic interactions over time spent together. The results are consistent with those from Indonesia where low parental education, low income, and low verbal participation were good indicators of language acquisition delay (67). This interestingly was found to be true for those whose mothers were housewives. This counterintuitive finding may be due to the fact that the mere presence of the child in the home does not mean developmentally rich, structured verbal interaction, and may be exacerbated by the stress of life at home and limited knowledge of early language milestones found in Pakistan.[34]

Biological and perinatal vulnerabilities were also very noticeable. In the delayed group, there were significantly more cases of parental consanguinity, preterm birth, and post-delivery complications including NICU admission and prolonged jaundice, further highlighting the effects of early neurodevelopmental insults.[35] In delayed children, especially, it was noted that birth asphyxia was present in 9.8% while in non-delayed children it was present in 2%. However, prenatal complications had a statistically significant association overall, but distribution was counterintuitive maternal hypertension and maternal diabetes were paradoxically more common in the non-delayed group. This may be due to differential antenatal care, with mothers who had a diagnosis being more closely monitored and receiving more early interventions, which could help prevent adverse neurodevelopmental outcomes, as has been proposed elsewhere.[36] In addition, positive family history of speech delay was the most powerful familial factor and a significant proportion of children in the delayed group had co-occurring physician-diagnosed autism spectrum disorders and other neurodevelopmental disorders such as motor developmental disorders, seizure disorders, and oropharyngeal abnormalities. These are consistent with known genetic and neurobiological causes.[37]

Of particular value is the emphasis in our study on high prevalence, modifiable environmental and behavioral risk factors. Lack of outdoor play and being exposed to psychosocial stressors or chronic noise gave a high-risk profile for language acquisition which is consistent with the finding from the UK.[37] Perhaps more worryingly, almost all of the children who had speech delay were using electronic devices, and most had more than two hours of screen time per day. Most significantly, almost all of this use was unsupervised and only a minuscule proportion was related to education. This passive, isolated screen time directly replaces important, reciprocal, real-world language experiences. The results strongly support recent local and regional research that has shown that having unsupervised extended amounts of screen time are associated with slower language development.[38]

Limitations and Future Directions Several caveats should be noted. The cross-sectional, hospital-based design does not allow for causal inferences to be made; and the sample may not fully represent the general community. Second, there may have been recall bias in parental reports of early developmental history and perinatal events. Thirdly, unmeasured confounding factors (such as the exact nature of the parent-child relationship or formal genetic testing) might have affected our results. For all these limitations, the study

has been able to present local compelling evidence for the multifactorial nature of speech delay in Iraq. There is a need for future research to include longitudinal community-based studies and culturally adapted parent mediated intervention programs.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

This Iraqi cohort is highly prevalent with speech delay (36.5%), as a result of the complex, multifactorial biological, perinatal, socioeconomic, and modifiable environmental risk factors. Although there are some non-modifiable factors that play a significant role in increasing vulnerability such as male sex, parental consanguinity, perinatal complications, and positive family history of speech delay, modifiable behavioral and environmental factors are of critical importance, especially excessive and uncontrolled use of electronic devices and lack of outdoor play. Moreover, these risks are exacerbated by socioeconomic factors, such as parents' illiteracy, young parents age and low family income. To prevent long-term cognitive and academic consequences and to optimize speech and language outcomes in children, early identification is key, and targeted public health interventions that address these specific and modifiable risk factors are essential.

6.2 Recommendations

The results of this study suggest the following recommendations:

1. Capacity Building for Early Detection: Conduct targeted capacity building training sessions for health care, kindergarten teachers and primary school teachers to improve their ability to monitor developmental milestones, spot children at risk of poor outcomes early and provide necessary guidance and intervention.
2. Standardized Screening Protocols: Perform validated, standardized speech and language screenings at routine health check visits, at pediatric hospitals and primary healthcare centers and ensure that all children are screened when they enter kindergarten and primary school.
3. Public and Parental Awareness Campaigns: Create public education campaign with social media, educational booklets, and direct counseling at regular pediatric visits. Such campaigns should highlight to parents and carers the need for their involvement and the dangers of excessive and unsupervised screen time.
4. Future Multicenter Research: Future community-based studies of speech delay in large scale studies in different settings (Hospital, Primary care and Schools) to obtain a comprehensive National prevalence of speech delay and regional variations in risk factors throughout Iraq.

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