INSIGHTS-JOURNAL OF
HEALTH AND REHABILITATION

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

MOBILE SCREEN EXPOSURE AND ITS IMPACT ON SPEECH DELAY AND BEHAVIOURAL ISSUES IN CHILDREN

Original Research

Saima Waheed[1]*, Khalil ur Rehman Khalil[2], Aneeqa Waheed[3], Muhammad Waqas Saeed[4]
[1]Medical Officer, Pediatrics, PMDC 15221-N, Pakistan.
[2]Chief Executive Officer, PMDC 7947-N, Pakistan.
[3]PMDC 19848-N, Pakistan.
[4]PMDC 15812-N, Pakistan.
Corresponding Author: Saima Waheed, Medical Officer, Pediatrics, PMDC 15221-N, Pakistan, Saimmaa16@yahoo.com
Acknowledgement: The authors sincerely thank the staff of the Town Women's and Children Hospital, Peshawar, for their cooperation and support during this study.

Conflict of Interest: None
Grant Support & Financial Support: None

ABSTRACT

Background: The increasing use of mobile and digital screens in early childhood has raised major concerns regarding their impact on development. Excessive exposure in infancy and preschool years is linked to impaired cognitive, language, and socio-emotional growth. Global guidelines from the World Health Organization and the American Academy of Pediatrics recommend minimal to no screen use in infancy and restricted, co-viewed exposure for children aged two to five years. Despite these recommendations, screen use continues to rise in low- and middle-income settings, where developmental risks may be compounded by limited parental awareness and fewer structured interventions.

Objective: This study aimed to examine the association between daily screen exposure and developmental outcomes, particularly speech delay, sleep difficulties, and eye contact, among young children attending a pediatric outpatient clinic in Peshawar, Pakistan.

Methods: An observational cross-sectional study was conducted at the Pediatrics Outpatient Department of the Town Women's and Children Hospital, Peshawar, from November 2022 to August 2025. A total of 215 children with a median age of 3.5 years (IQR: 3.0–4.5) were included using non-probability consecutive sampling. Data were collected on age, daily screen time, speech status, sleep difficulties, and eye contact using structured proformas. Screen time was quantified in hours per day. Statistical analysis included descriptive statistics, Spearman correlation for the relationship between screen duration and speech severity, and odds ratios (ORs) with 95% confidence intervals (CIs) for associations with sleep and eye contact.

Results: All children exceeded the recommended one hour of daily screen time, with a median exposure of 5 hours/day. Speech delay was identified in 204 children (94.9%), slight delay in 7 (3.3%), and no speech in 4 (1.9%). Sleep difficulties were reported in 76 children (35.3%), while 111 (51.6%) demonstrated poor eye contact. Children with prolonged screen exposure (>4 hours/day) had significantly higher odds of sleep difficulties (OR = 2.83, 95% CI: 1.41–5.69) and suboptimal eye contact (OR = 1.59, 95% CI: 1.02–2.48). However, the correlation between screen duration and severity of speech delay was weak and non-significant (Spearman r = –0.087, p = 0.202).

Conclusion: The study demonstrated that excessive screen exposure in early childhood was strongly associated with sleep difficulties and reduced eye contact, though no direct correlation with speech severity was established. These findings highlight the urgent need for clinical counseling to delay screen onset, limit daily exposure, and encourage interactive, co-viewed educational content. Balanced strategies are essential to safeguard language, cognitive, and socio-emotional development during critical early years.

Keywords: Child Development, Eye Contact, Mobile Devices, Sleep Wake Disorders, Social Skills, Speech Disorders, Video Display Terminals.

© 2025 et al. Open access under CC BY License (Creative Commons). Freely distributable with appropriate citation.



INTRODUCTION

Mobile and interactive screens have become deeply woven into the routines of early childhood, with the age of first regular engagement declining drastically from about four years in the 1970s to only a few months in the present era (1). Although digital media can provide opportunities for enrichment in communication and learning, there is increasing evidence that excessive exposure carries potential risks for health and development. Studies have linked high screen use with behavioral concerns, disrupted sleep, and poorer academic outcomes, raising urgent questions about how early and prolonged exposure affects cognition, language, and socio-emotional growth (2,3). Research has shown that high-quality educational applications and e-books can positively influence literacy, creativity, and social learning, particularly when used interactively and under caregiver supervision (4,5). However, excessive screen use has consistently been associated with deficits in executive functions, sensorimotor delays, and reduced academic performance (2,6). Media multitasking, a common behavior among adolescents, has further been linked with impaired working memory and inhibitory control (7). Importantly, longitudinal data highlight the enduring consequences of early exposure: each additional hour of television at age two predicts poorer classroom participation and lower math performance by fourth grade (8). Such findings are supported by broader population studies that associate greater daily screen use with diminished sleep and weaker academic achievement (9,10). Language development, which relies heavily on rich caregiver–child interactions, is another domain vulnerable to displacement by digital media. Excessive exposure reduces opportunities for conversational turn-taking and vocabulary growth, whereas co-viewing and discussion improve outcomes (11–14). Evidence suggests that delayed introduction of screens and strict duration limits may mitigate harm, while background television significantly undermines both language acquisition and attention (13,15).

Socio-emotional and behavioral consequences are also prominent. Heavy screen use correlates with reduced physical activity and sleep, alongside higher risks of mood disturbances, anxiety, and externalizing behaviors (2,10). Persistent early exposure, particularly to non-educational or fast-paced content, has been linked with aggression, attentional dysregulation, and emotional reactivity (6,9). Furthermore, gaming and social media use have been associated with heightened anxiety and depressive symptoms, especially among boys (12). Neuroimaging findings reinforce these behavioral associations, revealing structural alterations in brain regions involved in cognitive control and emotion regulation in heavy users (10). Despite these risks, high-quality media introduced after the age of two can offer measurable benefits for disadvantaged children, enhancing literacy and socio-emotional learning when used appropriately (11). Consequently, expert recommendations for families emphasize strategies such as delaying routine screen exposure during infancy, setting clear daily limits, prioritizing interactive and educational content, and co-viewing with discussion. Additional measures include removing background television, avoiding bedroom screens, safeguarding adequate sleep and physical play, and encouraging device-free family routines like mealtimes and bedtime (10–15). Parental role modeling remains central, as children frequently replicate adult screen habits (13–15). In light of the growing body of evidence, the central research question is whether the benefits of early screen exposure outweigh the documented risks to cognitive, language, and socio-emotional development. This review aims to synthesize current findings, highlight the mechanisms underlying potential harms, and explore protective strategies that can guide families, schools, and healthcare professionals in navigating digital media use. The objective is to rationalize evidence-based recommendations that balance opportunities for enriched learning with the need to safeguard healthy growth trajectories in early childhood.

METHODS

The study was designed as an observational cross-sectional analysis and was carried out in the Pediatrics Outpatient Department (OPD) of the Town Women's and Children Hospital, Peshawar. The research period extended from November 20, 2022, to August 25, 2025. Participants included children presenting to the OPD during this timeframe, with a total of 215 children enrolled. The sample size was estimated using the standard formula for cross-sectional studies, though the final number of participants was also influenced by patient flow and availability during the study period. Children with severe congenital anomalies, neurological disorders unrelated to screen exposure, or incomplete clinical records were excluded to minimize confounding factors, while otherwise healthy children attending the OPD were included. Data were obtained through structured proformas completed by trained personnel, focusing on variables such as age, daily screen exposure (recorded in hours per day), speech status, eye contact, sleep disturbances, and the presence or absence of caregiver interaction during screen time. Speech delay was classified into three categories: delayed, slightly delayed, or no delay. Screen

© 2025 et al. Open access under CC BY License (Creative Commons). Freely distributable with appropriate citation.

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

exposure was quantified with a reported median of 5 hours per day, a figure that is considerably high for the studied age group and may reflect an overrepresentation of children with problematic screen use, which could limit generalizability. Statistical analysis was performed using descriptive statistics to summarize participant characteristics. Spearman's correlation test was applied to evaluate associations between daily screen time and the severity of speech delay, while odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to examine the relationship between screen time and outcomes such as sleep difficulties and reduced eye contact. The presence of caregiver interaction during media exposure was analyzed as a potential moderating factor. Ethical approval for the study was granted by the institutional Ethics Review Committee ensuring adherence to recognized ethical standards. To maintain confidentiality, all data were anonymized and de-identified prior to analysis. Informed consent was reportedly obtained from caregivers before the inclusion of children in the study, aligning with standard ethical requirements for research involving minors.

RESULTS

The study included 215 children, of whom 174 (80.9%) were male and 41 (19.1%) were female, reflecting a predominance of males in the sample. All participants had normal developmental histories, ensuring that subsequent findings could not be attributed to pre-existing developmental anomalies. Sleep assessment revealed that 76 children (35.3%) experienced sleep difficulties, while 139 (64.7%) had no reported disturbances. Speech outcomes showed that 204 children (94.9%) had delayed speech, 7 (3.3%) were slightly delayed, and 4 (1.9%) had no speech development at all. Eye contact evaluation demonstrated that 111 children (51.6%) exhibited poor eye contact, whereas 104 (48.4%) maintained good eye contact. Screen exposure analysis indicated that a substantial majority exceeded the recommended daily limit of one hour. Fourteen children (6.5%) spent 3 hours daily, 37 (17.2%) spent 4 hours, 47 (21.9%) spent 5 hours, 44 (20.5%) spent 6 hours, 40 (18.6%) spent 7 hours, and 33 (15.3%) spent up to 8 hours per day on mobile or LED screens. Comparison of family education status revealed notable differences. In educated families, 140 males (82%) and 30 females (18%) were represented, while in non-educated families 34 males (75%) and 7 females (25%) were included. Sleep difficulties were present in 28 children (35.6%) from educated families and 48 children (35.3%) from non-educated families. Speech delay was recorded in 132 children (94.3%) from educated households and 72 children (95%) from non-educated households. Slight delay and no speech were observed with marginal variation between the groups. Poor eye contact was documented in 56 children (40%) of educated families compared to 55 children (61.4%) of non-educated families. Screen time patterns showed that in educated families the highest proportion, 38 children (27.1%), spent 5 hours daily, whereas in non-educated families the highest proportion, 25 children (29.1%), spent 4 hours daily. These findings demonstrate a consistent association between prolonged daily screen exposure and developmental outcomes such as speech delay, poor eye contact, and sleep disturbances.

Table 1: Gender Distribution

Gender	Count	Percentage
Male	174	80.9%
Female	41	19.1%

Table 2: Development History Distribution

Development History	Count	Percentage
Normal	215	100%

Table 3: Sleep Difficulties Distribution

Sleep Difficulties	Count	Percentage
Yes	76	35.3%
No	139	64.7%

© 2025 et al. Open access under CC BY License (Creative Commons). Freely distributable with appropriate citation.

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

Table 4: Speech Status Distribution

Speech Status	Count	Percentage
Delayed	204	94.9%
Slightly Delayed	7	3.3%
No Speech	4	1.9%

Table 5: Eye Contact Distribution

Eye Contact	Count	Percentage
Poor	111	51.6%
Good	104	48.4%

Table 6: Mobile/LED Duration Distribution

Mobile/LED Duration	Count	Percentage
3 hours/day	14	6.5%
4 hours/day	37	17.2%
5 hours/day	47	21.9%
6 hours/day	44	20.5%
7 hours/day	40	18.6%
8 hours/day	33	15.3%

Table 7: Educated vs. Non-Educated Family Comparison

Parameter	Educated Families (Count/%)	Non-Educated Families (Count/%)
Gender Distribution		
Male	140 (82%)	34 (75%)
Female	30 (18%)	7 (25%)
Development History	Normal: 100%	Normal: 100%
Sleep Difficulties	Yes: 28 (35.6%)	Yes: 48 (35.3%)
	No: 51 (64.4%)	No: 88 (64.7%)
Speech Status	Delayed: 132 (94.3%)	Delayed: 72 (95%)
	Slightly Delayed: 6 (4.3%)	Slightly Delayed: 1 (1%)
	No Speech: 2 (1.4%)	No Speech: 2 (2.7%)
Eye Contact	Poor: 56 (40%)	Poor: 55 (61.4%)
	Good: 84 (60%)	Good: 35 (38.6%)
Mobile/LED Duration	3 hours/day: 5 (3.6%)	3 hours/day: 9 (10.5%)
	4 hours/day: 12 (8.6%)	4 hours/day: 25 (29.1%)
	5 hours/day: 38 (27.1%)	5 hours/day: 9 (10.5%)

© 2025 et al. Open access under CC BY License (Creative Commons). Freely distributable with appropriate citation.

INSIGHTS-JHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION

Parameter	Educated Families (Count/%)	Non-Educated Families (Count/%)
	6 hours/day: 39 (27.9%)	6 hours/day: 15 (17.4%)
	7 hours/day: 29 (20.7%)	7 hours/day: 11 (12.8%)
	8 hours/day: 27 (19.3%)	8 hours/day: 10 (11.6%)

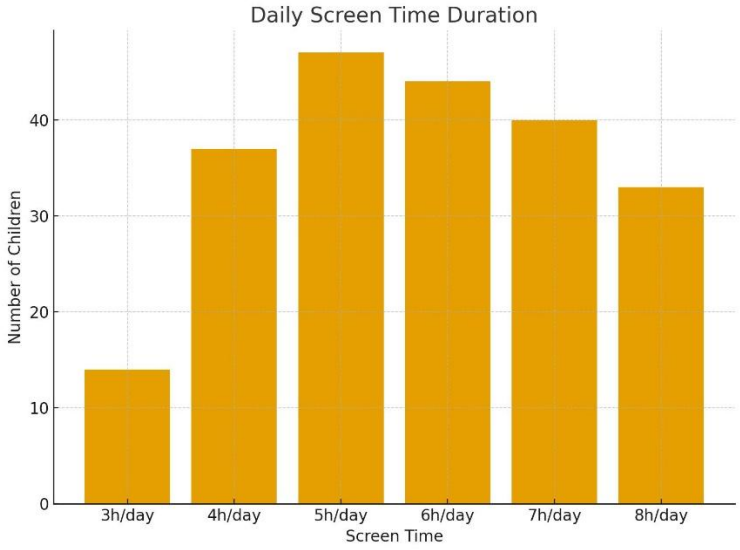


Figure 1 Daily Screen Time Duration

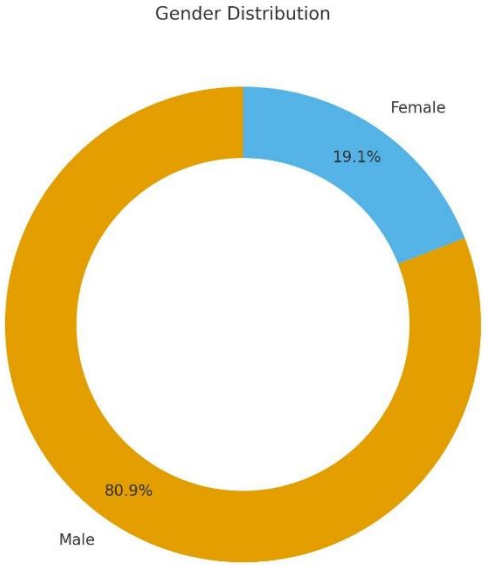


Figure 2 Gender Distribution

DISCUSSION

The findings of this study highlight the pervasive nature of early screen exposure and its measurable association with developmental outcomes in early childhood. Median daily exposure of five hours and onset as early as 12 months suggest that digital media has become embedded into daily routines far earlier than recommended by global health authorities, who advocate minimal to no screen use in infancy and only limited, co-viewed, high-quality content between the ages of two and five years (6,12). Despite a non-significant correlation between screen time and speech severity—likely due to limited variability in outcomes, with nearly all children classified as delayed—screen exposure was strongly associated with sleep difficulties and showed a trend toward suboptimal eye contact. These findings converge with international literature linking excessive exposure to impaired language development, reduced attention span, sleep disruption, and behavioral difficulties (5,14). Comparisons with similar cohorts reinforce both consistencies and differences in outcomes. A large-scale study in rural China reported that nearly 30% of children were exposed before 12 months, with average daily exposure of under 30 minutes, substantially lower than in the present study. In that population, earlier exposure and longer screen use between 12 and 18 months correlated primarily with motor delays, while no clear association was found with cognitive or socio-emotional domains (10,15). In contrast, other cross-sectional and longitudinal analyses have documented adverse effects on cognitive, language, and motor domains, suggesting that the consequences of exposure are highly context-dependent and may be mediated by content quality, caregiver interaction, and displacement of protective routines such as sleep and social engagement (13,16). This variability underscores the complexity of assessing screen exposure in isolation from moderating factors such as co-viewing, content pacing, and parental involvement (17).

The present study contributes novel insight by emphasizing that caregiver interaction during screen use may attenuate harmful effects. Co-viewing, when enriched with interactive dialogue, has been linked to improved vocabulary growth and socio-emotional outcomes, while passive narration or background television has not shown similar benefits (18,19). This aligns with the interpretation that digital media itself is not inherently detrimental; rather, the risks arise when it replaces developmentally essential activities, including caregiver–

© 2025 et al. Open access under CC BY License (Creative Commons). Freely distributable with appropriate citation.

child communication, physical activity, and adequate sleep (20). Evidence that high-quality educational content, when used briefly and interactively, can enhance developmental skills suggests that policy should move beyond blanket restriction toward context-sensitive recommendations (21,22). Several strengths lend credibility to these findings. The study recruited a relatively large clinical cohort with standardized assessment of core developmental variables, including speech status, sleep difficulties, and eye contact. The inclusion of caregiver interaction as an additional factor provided nuanced insight into moderating influences on outcomes. However, limitations must be acknowledged. The cross-sectional design prevents causal inference and cannot account for long-term developmental trajectories. Reliance on caregiver-reported measures introduces recall and reporting bias, while broad categorical classifications of speech status may underestimate subtle differences. Furthermore, the predominance of delayed speech in the cohort restricted the variability needed to detect correlations. The reliance on patient flow rather than strict random sampling introduces the possibility of selection bias.

The implications of these findings are clinically significant. Early and prolonged exposure exceeding recommended thresholds is consistently linked to poorer developmental outcomes, particularly when unsupervised, passive, or fast-paced content is involved. In settings with limited educational resources, carefully curated digital content and structured co-viewing may provide opportunities to support language and social learning, but unregulated exposure carries substantial risks. Future studies should prioritize longitudinal designs with standardized developmental assessments, detailed characterization of screen content, and stratification by socio-demographic and caregiver mental health factors. These refinements will clarify not only the risks but also the potential benefits of digital media when used in controlled and purposeful ways. In summary, this study reinforces the growing body of evidence that high screen exposure in early childhood is a modifiable risk factor for speech, sleep, and socio-emotional difficulties. While caregiver involvement and content quality can buffer against some adverse outcomes, the overarching recommendation remains to delay onset, reduce duration, and prioritize interactive, age-appropriate use, ensuring that digital engagement complements rather than replaces essential developmental experiences.

CONCLUSION

This study concludes that very early onset and prolonged daily screen exposure are strongly linked with disrupted sleep and diminished social-communication skills in young children. These findings emphasize the importance of guiding families to delay the introduction of screens, limit daily duration, and promote co-viewing with interactive alternatives to support healthy development. By aligning clinical counseling with international recommendations, healthcare providers can play a pivotal role in helping caregivers adopt balanced, age-appropriate media practices that protect early childhood growth while encouraging positive learning experiences.

AUTHOR CONTRIBUTION

Author	Contribution
Saima Waheed*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Khalil ur Rehman Khalil	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Aneeqa Waheed	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Muhammad Waqas Saeed	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

© 2025 et al. Open access under CC BY License (Creative Commons). Freely distributable with appropriate citation.

REFERENCES

1. Gastaud LM, Trettim JP, Scholl CC, Rubin BB, Coelho FT, Krause GB, et al. Screen time: Implications for early childhood cognitive development. Early Hum Dev. 2023;183:105792.

2. Huang P, Chan SY, Ngoh ZM, Ong ZY, Low XZ, Law EC, et al. Screen time, brain network development and socio-emotional competence in childhood: moderation of associations by parent-child reading. Psychol Med. 2024;54(9):1992-2003.

3. Takahashi I, Obara T, Ishikuro M, Murakami K, Ueno F, Noda A, et al. Screen Time at Age 1 Year and Communication and Problem-Solving Developmental Delay at 2 and 4 Years. JAMA Pediatr. 2023;177(10):1039-46.

4. Brushe ME, Haag DG, Melhuish EC, Reilly S, Gregory T. Screen Time and Parent-Child Talk When Children Are Aged 12 to 36 Months. JAMA Pediatr. 2024;178(4):369-75.

5. Rocha HAL, Correia LL, Leite Á JM, Machado MMT, Lindsay AC, Rocha S, et al. Screen time and early childhood development in Ceará, Brazil: a population-based study. BMC Public Health. 2021;21(1):2072.

6. Kerai S, Almas A, Guhn M, Forer B, Oberle E. Screen time and developmental health: results from an early childhood study in Canada. BMC Public Health. 2022;22(1):310.

7. McArthur BA, Tough S, Madigan S. Screen time and developmental and behavioral outcomes for preschool children. Pediatr Res. 2022;91(6):1616-21.

8. Wang J, Li Y, Musch DC, Wei N, Qi X, Ding G, et al. Progression of Myopia in School-Aged Children After COVID-19 Home Confinement. JAMA Ophthalmol. 2021;139(3):293-300.

9. Rayce SB, Okholm GT, Flensborg-Madsen T. Mobile device screen time is associated with poorer language development among toddlers: results from a large-scale survey. BMC Public Health. 2024;24(1):1050.

10. Nivins S, Sauce B, Liebherr M, Judd N, Klingberg T. Long-term impact of digital media on brain development in children. Sci Rep. 2024;14(1):13030.

11. Salmerón-Ruiz MA, García de Ribera C, Sebastián Barberán V, Eddy Ives L, Álvarez-Pitti J. Impact of digital media on development and physical health. An Pediatr (Engl Ed). 2025;102(6):503876.

12. Bal M, Kara Aydemir AG, Tepetaş Cengiz G, Altındağ A. Examining the relationship between language development, executive function, and screen time: A systematic review. PLoS One. 2024;19(12):e0314540.

13. Mallawaarachchi S, Burley J, Mavilidi M, Howard SJ, Straker L, Kervin L, et al. Early Childhood Screen Use Contexts and Cognitive and Psychosocial Outcomes: A Systematic Review and Meta-analysis. JAMA Pediatr. 2024;178(10):1017-26.

14. Putnick DL, Trinh MH, Sundaram R, Bell EM, Ghassabian A, Robinson SL, et al. Displacement of peer play by screen time: associations with toddler development. Pediatr Res. 2023;93(5):1425-31.

15. Chaibal S, Chaiyakul S. The association between smartphone and tablet usage and children development. Acta Psychol (Amst). 2022;228:103646.

16. Zhao J, Yu Z, Sun X, Wu S, Zhang J, Zhang D, et al. Association Between Screen Time Trajectory and Early Childhood Development in Children in China. JAMA Pediatr. 2022;176(8):768-75.

17. Children's sensorimotor development in relation to screen-media usage: A two-year longitudinal study. Suggate SP, Martzog P. J Appl Dev Psychol. 2021;74:101279.

18. Screen time of preschool-aged children and their mothers, and children's language development. Mustonen R, Torppa R, Stolt S. Children (Basel) 2022;9:1577.

19. Exposure to screens and children's language development in the EDEN mother-child cohort. Martinot P, Bernard JY, Peyre H, et al. Sci Rep. 2021;11:11863.

© 2025 et al. Open access under CC BY License (Creative Commons). Freely distributable with appropriate citation.

20. The influence of screen time on children's language development: a scoping review. Karani NF, Sher J, Mophosho M. S Afr J Commun Disord. 2022;69:0–7.

21. Effects of screen exposure on young children's cognitive development: a review. Guellai B, Somogyi E, Esseily R, Chopin A. Front Psychol. 2022;13:923370.

22. Screen time and developmental and behavioral outcomes for preschool children. McArthur BA, Tough S, Madigan S. Pediatr Res. 2022;91:1616–1621.

© 2025 et al. Open access under CC BY License (Creative Commons). Freely distributable with appropriate citation.