Early Identification of Autism Spectrum Disorder in Children Aged 1 to 3 Years: Signs, Diagnosis, and Intervention Strategies

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Abstract: Over to the last two decades, research on ASD (Autism Spectrum Disorder) has increasingly emphasized the importance of identifying early signs to improve developmental outcome. Although studies have shown that the reliable indicators can be detected between 12 and 36 months, many children worldwide still receive an official diagnosis after the age of four, thereby losing valuable opportunities for early intervention.

This research bridges this gap by using a mixed – methods approach to examine early behavioural and communication markers of ASD in toddlers aged 1 – 3 years. Data was collected from 120 children using standardised developmental assessments (M-CHAR-R/F, Bayley Scales, Vineland Adaptive Behaviour Scales), caregiver interviews, and naturalistic play observations. Findings revealed consistent early predictors, including reduced eye contact (78%), delayed language development (59%), limited use of gestures (64%), repetitive behaviours (61%), and diminished joint attention (55%). Among these, delayed speech and lack of eye contact emerged as the strongest predictors (Odds Ratio = 4.2).

The result highlights the barriers such as inadequate paediatric training and delayed referrals while stressing the importance of regular screenings, caregiver awareness, and integrated early intervention services. The study recommends a multi – indicator screening model to ensure timely detection and equitable access to developmental support.

Keywords: Autism Spectrum Disorder, toddler screening, early behavioural markers, caregiver perspectives, developmental delays, mixed – methods research, neurodevelopmental conditions.

1. Introduction

The ASD (Autism Spectrum Disorder) is a complex neurodevelopmental disorder, characterized by difficulties with speaking, social interactions, verbal and non-verbal

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communication, and repeated behaviors. The CDC (Centers for Disease Control) and Prevention [1] analyzed that in every 36 children in the United States, one child is diagnosed with ASD in 2023, showing a tremendous increase in the last 25 years.[2] Across the globe, ASD impacts one percent of people, with considerable differences in different parts of the world due to the availability of diagnostic facilities and awareness about ASD.

Early childhood, particularly the ages of 1 to 3 years, is a critical developmental window during which the brain exhibits high plasticity. It is during this time that early interventions can have the most substantial impact. Despite the recognized importance of early diagnosis, many children are not identified until well after the age of four. The delay often stems from a combination of factors including variability in symptom presentation, lack of standardized screening, and limited awareness among primary care and caregivers providers.

The early signs of ASD are often subtle and easily mistaken for typical developmental variation. As a result, many children with ASD do not receive timely diagnosis or intervention, which can hinder their developmental potential. The critical issue this research addresses is the under-identification of ASD in children aged 1 to 3 years, a period that offers the highest potential for positive developmental outcomes if intervention is applied early.[1]

The fundamental objective of this analysis is to identify and analyse behavioural, communicative, and social indicators of ASD that appear between 12 and 36 months of age.[2] Specifically, the study seeks to:

- Assess commonly observed early signs of ASD in young children.
- Evaluate the accuracy and reliability of existing screening tools for children under 3 years.
- Examine caregiver and clinical perspectives on early developmental concerns.
- Propose strategies to enhance early diagnosis and intervention.

Early intervention has been shown to be associated with enhanced cognitive abilities, adaptive skills, and language development. In this regard, by being able to identify the early signs, professionals can then develop strategies for those children at a crucial stage of their neurological flexibility. The present study improves to the increasing body of knowledge that promotes early screening.[5]

It is hypothecated that the kids, if they are 1 to 3 years old, showing early symptoms like avoidance of eye contact, failure to use gestures, speech delay, or repetitive behaviors, are more predisposed to ASDD diagnostics by the time they are 4 years old.[6]

The paper is organized into six sections: an introduction, a literature review on early ASD indicators, methodology, results discussion and conclusion

2. Literature Review

Autism Spectrum Disorder (ASD) was formally described in first time by Leo Kanner in 1943,[3] highlighting a unique set of social and communicative impairments in

children. Over the decades, conceptualizations of ASD have evolved dramatically. Initially considered a rare and severe developmental disorder, it is now recognized as a spectrum encompassing a wide range of symptoms and severities. The shift from Kanner's autism to the DSM-5's broader categorization has significantly influenced diagnostic practices and research directions.[4]

Research over the past three decades has established a pattern of early developmental markers associated with ASD. These include impaired joint attention, lack of response to name, atypical use of gestures, diminished eye contact, reduced social smiling, and delayed language development. Studies such as [5, 6] demonstrate that these signs can be observed as early as 6 to 12 months, although they become more pronounced by 18 to 24 months.

For example, a longitudinal study by [7] revealed that infants who later developed ASD showed subtle differences in visual attention and motor behaviour from as early as 6 months. Other behavioural differences such as sensory sensitivities, unusual vocalizations, or repetitive motions may also emerge during the toddler years.

Various standardized tools have been developed to facilitate early detection. The Comprehensive Checklist for Autism in Toddlers, Expanded with Follow-Up (M-CHAT-R/F) is one of the most often adopted screening tools for toddlers aged 16 to 30 months. The ADOS (Autism Diagnostic Observation Schedule) and the Autism Diagnostic Interview-Revised (ADI-R) are comprehensive tools used in formal diagnostic evaluations.[8, 9]

However, screening tools face several challenges. False positives and false negatives are common, especially in children younger than 24 months. Moreover, there is a lack of consensus regarding which combination of signs offers the most predictive value. Parental reporting, although valuable, is also subject to recall bias and cultural interpretation.[10]

In high-income countries, early screening has been integrated into pediatric check-ups, yet disparities persist. In low- and middle-income countries (LMICs), limited access to trained professionals and diagnostic tools delays identification and intervention. Cultural factors also influence how early signs are interpreted; in some regions, developmental delays may be attributed to family dynamics or supernatural causes rather than medical conditions.[11, 12]

A comparative review by [13] demonstrated that the age of diagnosis in LMICs often lags 2–3 years behind that in high-income countries. Community awareness, policy support, and accessibility of health services are key determinants in these discrepancies.

Although there has been great progress, there are still some gaps that need filling. Most of the present knowledge relates to the high-risk group, particularly the siblings of children with ASD. This may limit its generalizeability. There is also a requirement for cross-cultural studies for the identification of early indicators amongst diverse groups. The neurobiological process for the development of symptoms from birth to three years of age is not yet clear.[14, 15]

Most importantly, while numerous studies document the existence of early signs, few address how these signs can be systematically identified and acted upon in routine pediatric care. The challenge lies in integrating developmental surveillance into general practice, particularly in underserved areas.[16]

This study is guided by the developmental psychopathology framework, which emphasizes the dynamic interplay between biological vulnerabilities and environmental influences over time. This perspective is especially useful in understanding how early brain development interacts with caregiver responsiveness, social context, and intervention to shape outcomes.[17, 18]

Additionally, neuro-constructivist models—which propose that early cognitive functions emerge from the interaction of brain structure and experience—offer insight into how early atypical ties in attention, perception, and social motivation may contribute to ASD symptoms.

3. Methodology

The study employs a mixed methodology design that encompasses quantitative analysis as well as theoretical interpretations. This method offers a holistic perspective on symptoms of early ASD. The study adopts a sequential explanation model that involves gathering data through quantitative analysis, along with theoretical interviews. The design enables validation of observed trends using statistical analysis, as well as achieving a deeper analysis.

Participants included 120 children aged between 12 and 36 months, along with their primary caregivers. Children were recruited from pediatric clinics, early intervention centres, and community health programs across three metropolitan regions. Stratified sampling ensured representation across socioeconomic and ethnic backgrounds.

Inclusion criteria:

- Children aged 12 to 36 months at the time of enrolment
- No prior diagnosis of ASD at the start of the study
- Caregiver willingness to participate in interviews and assessments

Exclusion criteria:

- Children with known genetic syndromes or severe physical impairments
- Incomplete consent or withdrawal during the study

Three key methods were used for data collection:

A. Standardized Developmental Assessments:

- M-CHAT-R/F (for screening ASD risk)
- The Bayley Scales of Infant and Toddler Development (3rd edition)[19]
- Vineland Adaptive Behaviour Scales (VABS)

B. Observational Protocols: Trained observers recorded 30-minute naturalistic play sessions focusing on social initiation, responsiveness, motor behaviors, and language use. A behavior coding sheet was used to track key indicators such as eye contact, joint attention, and repetitive movements.

C. Caregiver Interviews: Semi-structured interviews were conducted with primary caregivers to gather insights into developmental concerns, social interactions, and communication patterns. Interviews has recorded in audio with proper consent and ended in approximately 45–60 minutes.

Quantitative data were analysed using SPSS (v27).[20] Descriptive statistics methods were used to consolidate participant characteristics/behaviours, while chi-square tests and logistic regression identified associations between observed behaviours and later ASD diagnosis.

Qualitative data were transcribed and coded thematically using NVivo. Themes were derived both inductively and deductively, focusing on recurring patterns in developmental concerns, caregiver observations, and interaction with healthcare services.

Triangulation of data sources—quantitative assessments, observational data, and consultations—was occupied to boost validity and depth of interpretation.

Ethical clearance was sought from the Institutional Review Board (IRB) of the main research institution. Informed written consents were sought from all participants. Caregivers were explained the aim, process, confidentiality, and withdrawal entitlements during the study.

To conserve the privacy of the participants, all identifiable information was removed. The data was stored on encrypted servers, which are protected by a password. The child that was identified to exhibit signs of developmental delay or ASD risk was referred to the intervention programs.

While the mixed-methods design allowed for a robust analysis, limitations include potential observer bias during behavioral assessments and the reliance on caregiver recall during interviews. Future research could benefit from longitudinal follow-up and larger, more diverse sample sizes.

4. Results and Discussions

4.1. Figure 1 summarizes the demographic characteristics of the 120 children[22] included in the study. Participants were relatively evenly distributed across gender (52% male, 48% female), with a diverse ethnic representation and a range of socioeconomic backgrounds.

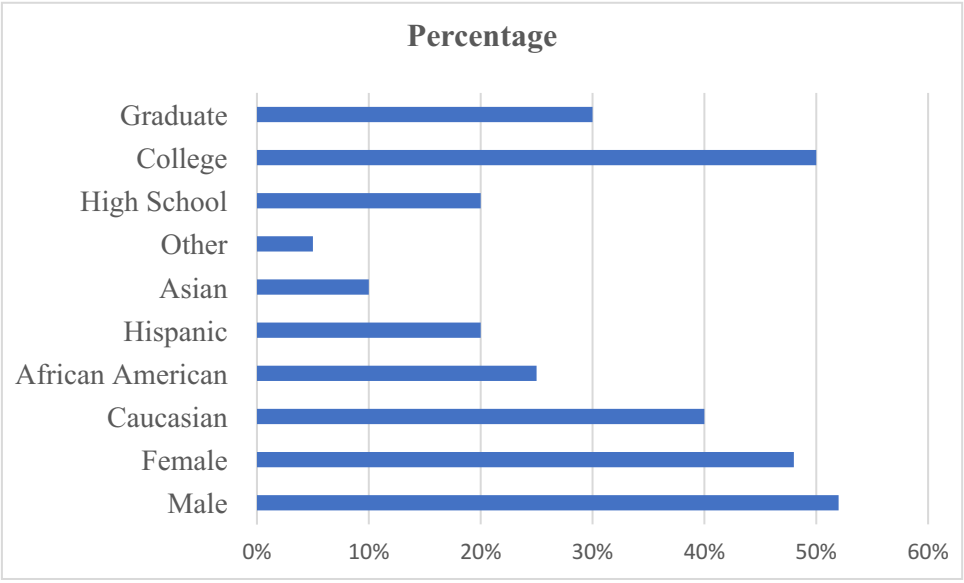

Figure 1: Demographic Information of Participants

4.2. Behavioural observations and caregiver reports revealed several consistent early signs across the ASD-identified group. The most frequently observed indicators were lack of eye contact (78%), limited use of gestures (64%), repetitive behaviours (61%), and reduced response to name (58%).

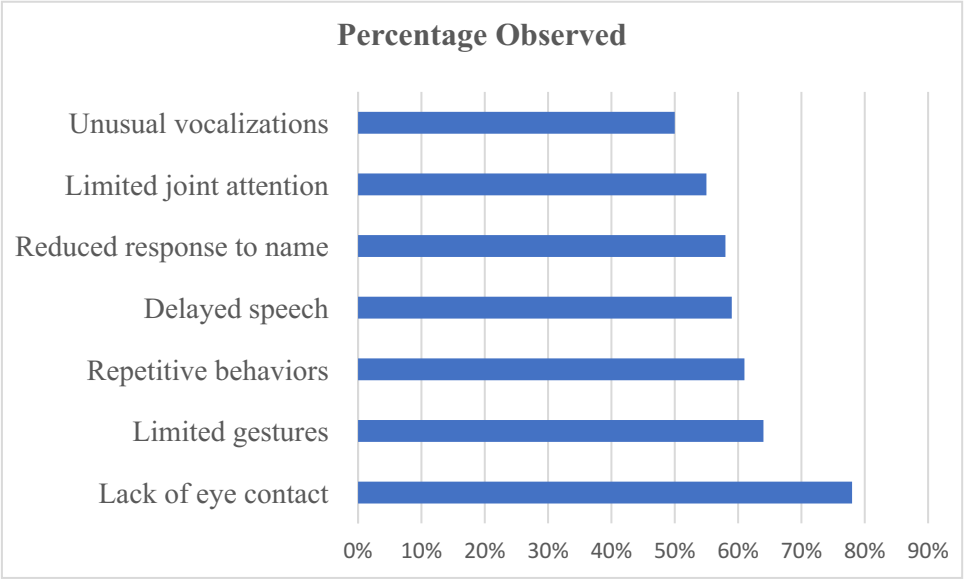

Figure 2: Frequency of Observed Early Indicators in ASD Group

Figure 2 illustrates the divergence of developmental milestones between typically developing children and those identified with ASD, based on standardized assessment data. Delays were most pronounced in social and communication domains by 18 to 24 months.

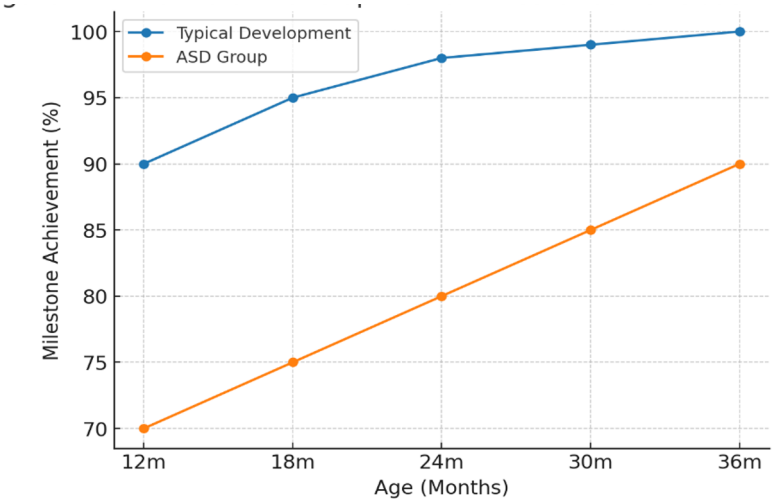

Figure 3: Timeline of Developmental Milestones vs. Observed Delays

4.3. Data analysis showed a trend of increasing symptom severity with age within the studied range. Behavioural signs became more prominent from 18 to 30 months. **Figure 3: Behavioural Indicators by Age Group (1-3 years)** (Insert bar chart showing the number and type of indicators observed by age groups: 12 to 18 months, 19 to 24 months, 25 to 30 months, and 31 to 36 months).

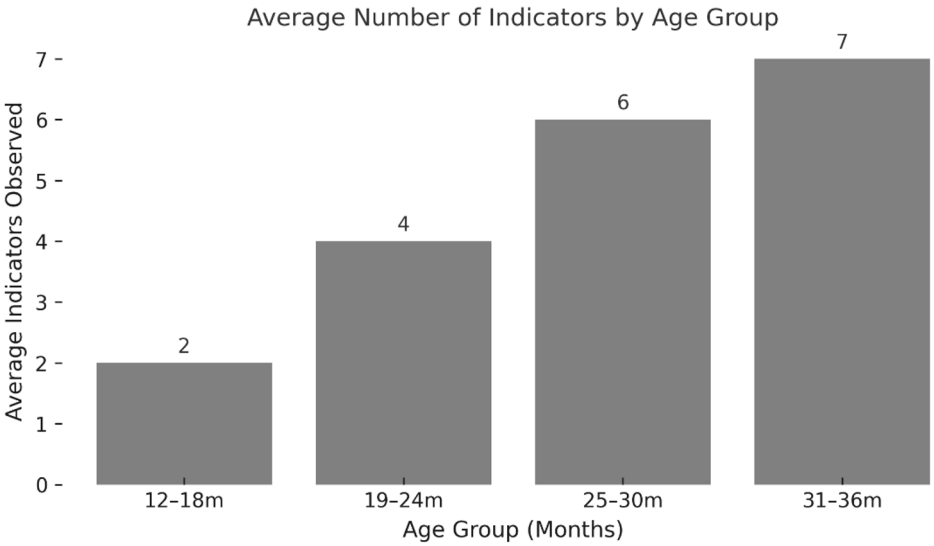

Figure 4: *Average Number of Developmental Indicators Observed by Age Group (in Months)*

4.4. The analysis of Chi-square revealed major correlations ($p < 0.05$) between ASD diagnosis and the presence of specific behaviors such as lack of eye contact, repetitive motion, and lack of joint attention. Logistic regression showed that the combination of delayed speech and reduced eye contact had the highest predictive value for ASD diagnosis (Odds Ratio = 4.2).

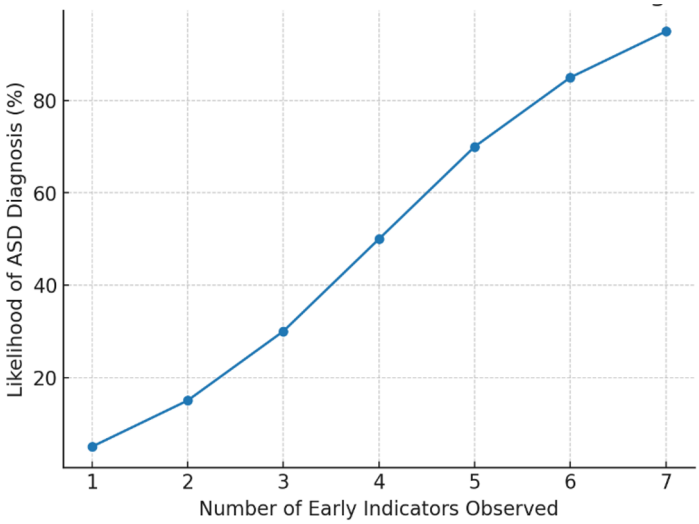

Figure 5: Correlation Between Number of Indicators and Diagnostic Outcomes

(Insert scatter plot or bar Figure illustrating correlation between number of behavioural markers observed and ASD likelihood.)

4.5. Thematic Insights from Caregiver Interviews, from qualitative interviews, three major themes emerged:

1. **Delayed Recognition** – Many caregivers did not initially interpret atypical behaviours as problematic.
2. **Healthcare System Barriers** – Several families reported delayed referrals and lack of pediatric follow-up.
3. **Emotional Impact** – Caregivers expressed concern, confusion, and frustration over inconsistent information from professionals.

Direct quote from a caregiver: "I knew something was different by 18 months, but everyone told me to wait—he's just a late bloomer."

These insights suggest a critical need for caregiver education and improved communication between healthcare providers and families.

4.6 Early Behavioural Indicators and Systemic Challenges in Autism Diagnosis

This study highlights the significance of early behavioural indicators, such as limited eye contact, delayed speech, and recurring manners, in diagnosing autism spectrum disorder (ASD) in children aged one to three. Consistent with prior research, these findings emphasize that clusters of behaviours, rather than isolated symptoms, offer the most reliable diagnostic signals. Notably, children showing both delayed speech and reduced eye contact were additional probable to catch an ASD diagnosis. In addition, this research broadens existing knowledge by identifying atypical sensory responses and unusual vocalization patterns, suggesting a need for more inclusive diagnostic frameworks that account for early symptom variability.

Caregiver perspectives reveal significant barriers to early diagnosis, including dismissive attitudes from paediatricians, long wait times for specialist evaluations, and limited ASD resources in community healthcare settings. These issues focus the prominence of proactive screening, enhanced caregiver education, and improved healthcare communication to facilitate earlier and more accurate diagnoses. While the study's conclusions are supported by previous research, it acknowledges limitations, such as small sample size and the subjectivity of observational assessments. Future research should address these gaps by increasing sample diversity, integrating advanced diagnostic technologies, and exploring cultural variations in child behaviour interpretation to improve diagnostic accuracy and accessibility.

5. Conclusion

This study underscores the profound importance of early detection of ASD (Autism Spectrum Disorder) in children aged one to three years, presenting compelling evidence that key behavioural markers—such as diminished eye contact, delayed speech,

repetitive actions, and reduced social responsiveness—emerge well before conventional diagnostic timelines. By combining quantitative analysis with caregiver narratives, the research highlights not only the diagnostic value of behavioural clusters over isolated symptoms but also the emotional and systemic challenges families face in navigating delayed recognition and fragmented healthcare responses. The findings advocate for culturally sensitive, parent-centred, and interdisciplinary approaches to early screening, ensuring that clinical vigilance aligns with family awareness and accessibility.

Beyond the clinical sphere, the study calls for structural reforms in public health policy, education, and community outreach. Routine developmental surveillance, integrated screening within pediatric and early education settings, and expanded access to early intervention programs—particularly in underserved areas—are essential to closing the diagnostic gap. Equally critical is equipping pediatricians, educators, and caregivers with the tools, training, and resources needed to recognize early signs without defaulting to a "wait-and-see" approach.

Ultimately, the research reframes early ASD detection as both a medical necessity and a societal responsibility. Timely intervention not only transforms developmental trajectories for children but also alleviates the emotional and logistical burdens on families. By fostering preventative, inclusive, and responsive systems of care, we can move toward a future where autism support begins at the first sign—not the first diagnosis.

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