



The Role of BSID-IV in Early Identification of Developmental Delays in Preterm and Low Birth Weight Infants: A Narrative Review

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ABSTRACT

Preterm and low birth weight (LBW) infants face a significantly higher risk for neurodevelopmental delays across cognitive, motor, and language domains. Early developmental screening is essential to identify and address these impairments during critical periods of brain plasticity. The Bayley Scales of Infant and Toddler Development, Fourth Edition (BSID-IV), is among the most widely validated tools to assess developmental status in high-risk pediatric population. This narrative review explores the importance of early developmental screening using BSID-IV in preterm and LBW children, highlighting its clinical relevance, strengths, challenges, and role in guiding early intervention strategies.

Keywords: Preterm, Low Birth Weight, Neurodevelopmental Delay, BSID-IV, Early Developmental Screening

1. INTRODUCTION

Preterm birth (<37 weeks gestation) and low birth weight (<2500 grams) are two major contributors to early childhood morbidity worldwide ⁽¹⁾. Advances in neonatal care have increased survival rates of these infants, but many continue to face neurodevelopmental challenges, including delay & impairment in cognitive, speech, language and motor domains ⁽²⁾. Early identification of developmental delay is critical because it allows for timely intervention, which can significantly improve long-term outcomes ⁽³⁾.

Developmental screening tools play a vital role in monitoring the progress of these at-risk infants. Among them, the BSID-IV is the gold standard tool for its comprehensive evaluation of cognitive, motor, language, social-emotional, and adaptive behavior domains ⁽⁴⁾. This review examines how BSID-IV contributes to early diagnosis of delays and enhances targeted therapeutic strategies for preterm and LBW children.

2. METHODS

A literature search was conducted across PubMed, Scopus, and Google Scholar databases between March and April 2025, using keywords "BSID-IV", "developmental screening", "preterm", "low birth weight", and "neurodevelopmental outcomes". Studies were selected based on their relevance to the role of BSID-IV in developmental assessments of preterm and LBW children. Preference was given to peer-reviewed articles published after 2015, reflecting updated research using BSID-IV. Literature study, review articles, and reference lists of relevant studies were also reviewed for comprehensiveness.

3. RESULTS AND DISCUSSION

3.1. Preterm and LBW Children: At-Risk for Developmental Delays

Multiple studies have demonstrated that preterm and LBW infants are at increased risk for delays in all developmental domains. Cognitive deficits are among the most prevalent, followed by language impairments and motor dysfunctions⁽⁵⁾⁽⁶⁾. Also studies emphasize that without early detection, these impairments persist into school age and adulthood.⁽⁷⁾⁽⁸⁾

Factors contributing to these delays include brain immaturity at birth, neonatal morbidities (such as intraventricular hemorrhage and sepsis), and environmental risks like poor nutrition and socioeconomic disadvantages⁽⁹⁾⁽¹⁰⁾.

3.2. BSID-IV:

BSID-IV is a standardized tool designed to assess developmental outcomes in children between 16 days to 42 months⁽⁴⁾⁽¹³⁾. It evaluates five domains:

Cognitive, Language (receptive and expressive communication), Motor (fine and gross motor skills), Social-emotional functioning and Adaptive behaviour.

The tool offers updated norms, shortened administration time, and digital scoring options, making it more clinician-friendly compared to earlier editions. Research suggests that BSID-IV maintains strong psychometric properties (ICC 0.80–0.83) with improved sensitivity and specificity for identification of developmental delays in high-risk groups⁽¹³⁾.

3.3. Evidence Supporting BSID-IV in Preterm and LBW Populations:

Studies using BSID-IV show that it effectively identifies early deficits in preterm and LBW children.

A 2024 study conducted in Poland provides strong evidence supporting the use of BSID-IV, in assessing neurodevelopmental outcomes in preterm and low birth weight (LBW) populations. They found that BSID-IV is a reliable and standardized tool widely recommended for evaluating cognitive, motor, and language development in infants born before 32 weeks of gestation or with significant neonatal complications. Administered at 12, 24, and 48 months of corrected age, BSID-IV helps detect early developmental delays, enabling timely intervention.⁽¹¹⁾

Another cohort study assessed neurodevelopmental outcomes in infants born preterm & low birth weight with congenital heart disease using BSID-IV. After implementing a neurodevelopmental care program, there was a significant improvement in BSID-IV cognitive scores. This demonstrates the tool's effectiveness in tracking cognitive development and highlights the positive impact of early interventions. Together, these findings provide strong evidence that supports the BSID-IV as a validated and effective tool for assessing neurodevelopmental outcomes in high-risk infant populations.⁽¹²⁾

3.4. Challenges in Using BSID-IV

Despite its strengths, several challenges remain:

BSID-IV is expensive and requires trained assessors. Also, the tool was standardized in Western populations; local adaptation and validation are needed in countries like India⁽¹³⁾.

3.5. Importance of Early Intervention Following Screening

Screening is only valuable if followed by timely interventions. Programs such as Early Intervention Services (EIS) significantly enhance cognitive, language, and motor development⁽¹⁴⁾. A study showed that children enrolled in early intervention after screening show better school readiness, fewer behavioural problems, and enhanced quality of life⁽⁸⁾.

4. CONCLUSION

Preterm and low birth weight children are highly susceptible to neurodevelopmental delays, requiring vigilant developmental surveillance. BSID-IV offers a robust and reliable tool for early identification of cognitive, motor, and language impairments in this vulnerable population. While challenges such as cost and cultural applicability exist, the benefits of early diagnosis and intervention far outweigh the limitations. Integration of BSID-IV into neonatal follow-up programs can greatly enhance developmental outcomes, offering these children a better chance at reaching their full potential.

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