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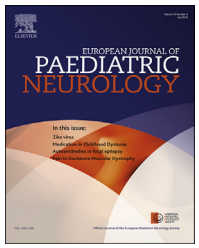

Original article

Early motor repertoire in very low birth weight infants in India is associated with motor development at one year

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ABSTRACT

Background: Most studies on Prechtl's method of assessing General Movements (GMA) in young infants originate in Europe.

Aim: To determine if motor behavior at an age of 3 months post term is associated with motor development at 12 months post age in VLBW infants in India.

Methods: 243 VLBW infants (135 boys, 108 girls; median gestational age 31wks, range 26–39wks) were video-recorded at a median age of 11wks post term (range 9–16wks). Certified and experienced observers assessed the videos by the "Assessment of Motor Repertoire – 2–5 Months". Fidgety movements (FMs) were classified as abnormal if absent, sporadic or exaggerated, and as normal if intermittently or continually present. The motor behaviour was evaluated by repertoire of co-existent other movements (age-adequacy) and concurrent motor repertoire. In addition, videos of 215 infants were analyzed by computer and the variability of the spatial center of motion (C_{SD}) was calculated. The Peabody Developmental Motor Scales was used to assess motor development at 12 months.

Results: Abnormal FMs, reduced age adequacy, and an abnormal concurrent motor repertoire were significantly associated with lower Gross Motor and Total Motor Quotient (GMQ,

Abbreviations: GMA, general movement assessment; AMR, assessment of motor repertoire – 2 to 5 months; FMs, fidgety movements; PDMS–2, peabody developmental motor scales–2; TMQ, total motor quotient; GMQ, gross motor quotient; FMQ, fine motor quotient; Q, quantity of motion; C, centroid of motion.

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TMQ) scores ($p < 0.05$). The C_{SD} was higher in children with TMQ scores <90 (-1SD) than in children with higher TMQ scores ($p = 0.002$).

Conclusion: Normal FMs (assessed by Gestalt perception) and a low variability of the spatial center of motion (assessed by computer-based video analysis) predicted higher Peabody scores in 12-month-old infants born in India with a very low birth weight.

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1. Introduction

Being born preterm or with a very low birth weight (VLBW) is associated with significant motor impairment persisting throughout childhood.[1] As many as 10–15% of VLBW infants are reported to develop cerebral palsy (CP),[2] and sustained adverse outcomes in adolescence and adulthood make preterm birth a major public health issue.[3] The use of early assessment tools to facilitate optimal development may reduce later problems in daily life,[4] but it remains difficult to predict accurately which infants are at the highest risk of impairment.[5] Prechtl's General Movement Assessment (GMA) has shown good clinical utility among neonatal assessments for preterm infants up to a post-term age of 4 months.[5] The GMA estimates the integrity of the infants' nervous system by observing the quality of general movements (GMs) from video recordings. The GMs occur as writhing movements (present until 6–9 weeks post term age) and fidgety movements (present between 9 and 20 weeks post term age). Particularly the absence of fidgety movements (FMs) enables us to predict CP.[6,7] Important principles for the assessment of FMs is that the infant must be in a quiet, alert state, they could best be observed if the infant is in supine position, and they disappear when the infants starts to be fussy or cries, is drowsy or sleeps.[8]

Fidgety movements are interspersed with pauses and can occur as isolated, intermittent, or continual events.[9] It is unclear whether this temporal organization of FMs has any relevance for the later outcome. In addition to the global assessment by means of GMA, a detailed assessment of the motor repertoire can be carried out using the Assessment of Motor Repertoire – 2–5 months (AMR).[8] Certain aspects of the motor repertoire have been shown to be associated with the neurological outcome at 7–11 years,[10] with minor neurological dysfunctions at school age,[11] and with motor and/or cognitive outcomes at 10 years.[12] Major advantages of GMA and AMR include that they are non-intrusive, require no expensive equipment, and can be used by trained observers in clinical settings. However, there will be a high demand for skilled observers if GMA is to be used large scale for screening of high-risk infants. In order to provide non-trained observers with decision support, a number of computer-based assessment tools have been presented with variable results.[13–15]

GMA is based on clinical observations. Studies evaluating whether there are differences in GMs between different ethnic or cultural groups are, to the best of our knowledge, not available. Most studies have been performed in Europe, although more studies are now coming also from Brazil, China, Iran and South Africa.[9,16–18] It has further been claimed that GMA studies have a risk for bias because study samples are selected retrospectively, based on available video recordings rather than well-defined high-risk cohorts.[19] No study has so far dealt with the general movements and motor repertoire of Indian infants, and studies on the feasibility of GMA and AMR in low-resource settings are limited.

The aim of the present study was to determine the feasibility of the assessment of fidgety general movements and their concurrent motor repertoire in VLBW infants in a follow-up clinic at a tertiary teaching hospital in South India. We also investigated associations between the temporal organization of FMs, the concurrent motor repertoire, and motor development at 12 months post-term age. We expected to find higher Peabody Developmental Motor Scale–2 (PDMS–2) scores at 12 months with increased frequency of FMs and age adequate concurrent motor repertoire. Finally, we wanted to examine the association between computer-based video analyses carried out during the fidgety movement period and the motor development at 12 months post-term age.

2. Material and methods

2.1. Design

The present study is a longitudinal cohort study of VLBW preterm infants discharged from a level III Neonatal Intensive Care Unit (NICU) in South India. The infants' FMs and concurrent motor repertoire were assessed between 9 and 16 weeks post-term age, and their motor development was assessed at 12 months post-term age using Peabody Developmental Motor Scales-2 (PDMS–2).

2.2. Participants

Participants in the study included a subgroup of infants recruited from a cohort study of VLBW infants with a birth weight ≤1500 g. They had been discharged from the NICU at Christian Medical College, Vellore, Tamil Nadu, India, between December 2010 and January 2013, and reported for follow-up at 2–3 months corrected age. Data on neonatal morbidity were collected from the hospital's patient records. Intraventricular hemorrhage was classified according to Papille et al.[20] From a total of 345 participants, the video

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