ORIGINAL ARTICLE

Inattention and development of toddlers born in preterm and with low birth weight

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Abstract The objective of this study was to examine the impact of low birth weight and preterm birth on a toddler's inattention and development, including cognitive, language, motor, social—emotional and adaptive behaviors. A total of 105 toddlers enrolled for the study; they were divided into four groups: 40 full-term and normal birth weight (NBW, birth weight greater than 2500 g) toddlers, 24 moderate birth weight (MLBW, birth weight between 2499 and 1500 g) toddlers, 20 very to extremely low birth weight (V-ELBW, 12 between 1000 and 1499 g and 8 lower than 1000 g) toddlers, and 21 term toddlers who were recruited from a clinic of developmental delay as the developmental delay at risk (DDR) group. The Bayley Scales of Infant and Toddler Development—Third Edition (BSID-III) and Disruptive Behavior Rating Scale—Toddler were used. The findings were as follows: (1) DDR group performed worst in BSID-III; (2) although there were no statistical differences among the NBW, MLBW, and V-ELBW groups in BSID-III, the lower the birth weight, the lower the average performance, especially in language, adaptive social behavior, and adaptive practical behavior; and (3) comparing the inattention score, the DDR group was the poorest, normal and V-ELBW groups were the best, and MLBW group was in the middle. In conclusion, low birth weight and preterm delivery affected children's inattention and development of language, adaptive social behavior, and adaptive practical behavior.
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Introduction

Several studies have shown that preterm or low birth weight infants may have cognitive and behavioral problems later. In general, better developmental outcome was associated with a longer period of gestation [1,2]. Very low birth weight (VLBW) infants had higher risk for developmental dysfunction [3]. Extremely low birth weight (ELBW) or very preterm children performed worse in spatial rotation, visual attention, and tracking at 7—9 years of age [4]. Also, tests of attention effectively predicted parents' and teachers' rating in behavioral rating scales. Four hundred and thirty-one very preterm or VLBW children aged 5 scored higher in Child Behavior Checklist (CBCL) than matched controls [5], especially in social and attention problems. If children were diagnosed by pediatricians as having developmental problem or perinatal problem, the differences were even more distinct. School-aged children of low birth weight or born preterm tended to have behavioral and emotional problems resulting in the decisive effect on academics. Immediate target-directed intervention might help children and their parents overcome problems and gain social success. Another study found that 24% of 87 ELBW (birth weight less than 1000 g) children were diagnosed with attention-deficit and hyperactivity disorder (ADHD) and generally had cognitive, social, and academic problems [6]. Early focused attention of preterm infants at 7 months was an effective predictor of later attention and cognitive function at 2—5 years of age, and it is continuously related to cognitive abilities and attention skills through the preschool years [7]. Another study also pointed out that the preterm group performed worse in the motor, cognitive, and behavioral aspects than the control group at 7, and were more likely to be diagnosed with ADHD [8]. These studies indicated that low birth weight was associated with ADHD, and regardless of moderate low birth weight (MLBW), VLBW, or ELBW, preterm infants were at high risk of ADHD in future development.

Prematurity is often determined by low birth weight (<2500 g) or the number of gestational weeks (≤38) [9]. Owing to the factors of maternal nutrition, disease, uncertainty of gestation weeks, environment, etc., infants born full term with low birth weight can still be diagnosed as being premature, and vice versa. Therefore, this study used birth weight to define preterm toddlers. The objective of this study was to examine the following: (1) the development of low birth weight and preterm toddlers; and (2) the impact of low birth weight and preterm on inattention in toddlerhood.

Methods

Subjects

One hundred and five toddlers, aged 1½— to 3 years, from southern Taiwan participated in this study. In the beginning, 117 toddlers were divided into four groups. There were 44 toddlers in the first group, the term and normal birth weight (NBW) group, which were recruited from the community. Four full-term toddlers weighed less than 2500 g and thus were excluded, resulting in a total of 40 toddlers (22 boys and 18 girls) born full term in the NBW group. The second group

was the MLBW group. Twenty-six toddlers weighing between 1500 and 2500 g were in this group. A mother in this group refused to complete the Bayley Scales of Infant and Toddler Development—Third Edition (BSID-III), resulting in 25 pairs of toddlers and respondents. The third group was the very to extremely low birth weight (V-ELBW) group, which included 17 toddlers weighing between 1000 and 1499 g, which was the range of VLBW. Two of 17 parents were fathers as respondents. Eight toddlers weighed less than 1000 g, which was classified as ELBW. However, because of the small sample size and all variables of maternal state during pregnancy, perinatal course of babies, and other developmental-related diagnosis being non-significant ($p > 0.01$) (Table 1), VLBW and ELBW were combined into the third group—V-ELBW group. Gestation and the Apgar score were significantly different between MLBW group and V-ELBW group (Table 1); therefore, low birth weight toddlers were divided into MLBW and V-ELBW groups who were referred by neonatologists at a medical center in southern Taiwan. Moreover, intraventricular hemorrhage (IVH) and periventricular leukomalacia (PVL) will probably affect some aspects of psychological development, so one toddler with IVH in MLBW group and three toddlers with IVH and two toddlers with PVL in VLBW group were excluded. Therefore, there were 24 toddlers in MLBW group and 12 toddlers in VLBW group. The fourth group was recruited from a clinic of developmental delay as developmental delay at risk (DDR) group. One toddler refused to complete the motor scale of the BSID-III, resulting in 21 pairs of toddlers (17 boys and 4 girls) and respondents in this group. All toddlers of DDR group were term, and almost all had normal birth weight (except one being 1750 g). Consequently, DDR group could not be mixed up with V-ELBW group. Informed consent was obtained from all the parents.

Instruments

Bayley scales of infant and toddler development—third edition (Bayley, 2006)

The five subscales of the BSID-III are as follows: (1) Cognitive scale: it had 91 items according to the three dimensions of cognitive development, play (play with objects and symbolic or pretend play), number concepts and counting (one-to-one correspondence, counting, and cardinality), and information processing (attention to novelty, habituation, memory, and problem solving). (2) Language scale: it includes receptive communication subscale (49 items) and expressive communication subscale (48 items). Each subscale had a scale score, of which the mean was 10 and a standard deviation was 3. The composite score of the language scale was combined into two scale scores. Due to the Chinese translation, the items 34, 37, 38, 39, 44 in the receptive communication subscale and items 30, 34, 38, 45, 47, 48 in the expressive communication subscale were deleted. (3) Motor scale: it includes fine motor subscale (66 items) and gross motor subscale (72 items). Each subscale had a scale score with a mean of 10 and a standard deviation of 3. The two subscales were combined into the composite score of motor scale. (4) Social—emotional scale: the basis of social—emotional scale is *the Greenspan Social—Emotional Growth Chart: A Screening Questionnaire for Infants and*