



# Communication Impairments in Early Term and Late Preterm Children: A Prospective Cohort Study following Children to Age 36 Months

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**Objective** To investigate the risk of communication impairments at age 18 and 36 months in children born early term (gestational weeks 37-38) and late preterm (gestational weeks 34-36).

**Study design** A total of 39 423 children and their mothers participated in the Norwegian Mother and Child Cohort Study. The sample included 7109 children (18%) born early term and 1673 (4.2%) born late preterm. Information on gestational age and prenatal and postnatal risk factors was obtained from the Medical Birth Registry of Norway. Information on communication impairments was assessed using standardized questionnaires filled out by the mothers. Stepwise logistic regression analysis was applied to explore the associations between early term/late preterm birth and communication impairments at age 18 and 36 months.

**Results** Compared with children born at term, children born early term and late preterm had an increased risk of communication impairments at age 18 and 36 months. In early term, the aOR was 1.27 (95% CI, 1.12-1.44) at 18 months for communication impairments and 1.22 (95% CI, 1.07-1.39) at 36 months for expressive language impairments. In late preterm, the aOR was 1.74 (95% CI, 1.41-2.14) at 18 months and 1.37 (95% CI, 1.09-1.73) at 36 months.

**Conclusion** Not only children born late preterm, but also those born early term, are at increased risk for communication impairments. Given the large number of children potentially affected, this may result in significant health care costs. (*J Pediatr* 2014;165:1123-8).

The proportion of births at gestational weeks 34-36 (late preterm) and at gestational weeks 37-38 (early term) has increased steadily over the past 20 years, owing primarily to a rise in obstetric interventions, such as cesarean delivery.<sup>1-3</sup> In Western countries today, approximately 5%-7% of all children are born late preterm and 19%-20% are born early term.<sup>1,2,4,5</sup> Complications of pregnancy, such as preeclampsia, gestational diabetes, hypertension, and multiple pregnancies, increase the risk of late preterm and early term birth; in these situations, the risks to the mother's health must be balanced against the risks of mild prematurity in the child. Although children born late preterm and early term are more mature than children born very preterm, they are still at greater risk for neonatal mortality and morbidity compared with children born at term.<sup>1</sup> Moreover, health problems in these children may continue into early childhood,<sup>6</sup> and persistent developmental impairments have been reported in children born late preterm.<sup>7</sup> Developmental impairments in children born early term have only recently come into focus, and research on this group is scarce.

With regard to developmental outcomes, communication impairments are particularly important, because they may be precursors of later emotional, social, and intellectual problems.<sup>8,9</sup> Communication skills (eg, the ability to exchange information through, for example, language) are the basis of learning and social relationships and thus are important domains of child development.

In the present study, we focused specifically on communication impairments in children born early term or late preterm. As demonstrated in a large meta-analysis, some previous studies have explored this association indirectly as a part of a general developmental assessment.<sup>7</sup> Although the particular risk for communication impairments was rarely reported in those studies, Baron et al<sup>10</sup> found that children born late preterm had an increased risk of action-verb fluency impairment, but not of expressive or receptive language impairment. Because of its small size (n = 60), that study had limited statistical power to detect communication impairments, however. As for children born early term, no previous studies have explored a potentially increased risk of communication impairments.

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ASQ	Ages and Stages Questionnaire
MBRN	Medical Birth Registry of Norway
MoBa	Norwegian Mother and Child Cohort Study
SGA	Small for gestational age

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This prospective study examines communication impairments in both children born late preterm and those born early term. The study follows children born late preterm or early term within a large epidemiologic cohort with repeated assessments measuring level and development of communication skills up to age 36 months. The large sample size of the study permits detection of small effects. We hypothesize that children born early term and late preterm are at increased risk for communication impairments at age 18 and 36 months.

## Methods

This study is based on data from the Norwegian Mother and Child Cohort Study (MoBa), a prospective population-based pregnancy cohort study that sought to survey all pregnant women in Norway between 1999 and 2008 (<http://www.fhi.no/morogbarn>).<sup>11</sup> Pregnant women attending more than 50 hospitals across Norway for their first prenatal ultrasound examination (which is offered without charge by the Norwegian Antenatal Healthcare system) were invited by letter (usually at gestational week 17-18). Of the invited women, 38.7% agreed to participate in the study. The cohort now includes roughly 109 000 children and 91 000 mothers.<sup>12</sup> The mothers completed questionnaires at the 17th and 30th weeks of pregnancy and when their children were age 6, 18, and 36 months. The response rates in the mothers who consented to join the study were 95% at gestational week 17, 92% at gestational week 30, 87% at child age 6 months, 77% at child age 18 months, and 62% at child age 36 months.<sup>11,12</sup> In addition, information on maternal age, duration of pregnancy, and prenatal and postnatal risk factors was retrieved from the Medical Birth Registry of Norway (MBRN).<sup>13</sup> The study was approved by the Regional Committee for Medical Research Ethics in Norway.

The inclusion criteria for this study were a complete set of questionnaires from gestational week 17 ( $n = 101\,624$ ), child age 18 months ( $n = 64\,970$ ), and child age 36 months ( $n = 45\,125$ ). Of the 45 125 children who met the inclusion criteria, we excluded those with severe malformations or syndromes ( $n = 1350$ ), severe hearing deficits ( $n = 148$ ), and cerebral palsy ( $n = 54$ ). We also excluded children with gestation longer than 41 6/7 weeks or shorter than 33 6/7 weeks ( $n = 4150$ ). The final sample comprised 39 423 children, of whom 1673 (4.2%) were born late preterm and 7109 (18%) were born early term.

## Measures

**Predictors.** Information on gestational age based on ultrasound examination was retrieved from the MBRN. In accordance with definitions suggested in the recent literature,<sup>14</sup> for the purpose of the present study we chose to discriminate between early term birth (gestational age 37 0/7 weeks to 38 6/7 weeks) and term birth with a gestational age of 39 0/7 weeks to 41 6/7 weeks. Late preterm birth was defined as a gestational age of 34 0/7 weeks to 36 6/7 weeks.

**Outcome Variables at Age 18 Months.** Child communication impairments at age 18 months were measured using 3 specifically selected items from the Ages and Stages Questionnaire (ASQ).<sup>15</sup> Two of these items assess receptive communication skills, and the other item assesses expressive communication skills. Typical items of the ASQ are: "Does your child say 8 or more words in addition to 'mama' and 'dada'?" and "Without showing him first, does your child point to the correct picture when you say 'show me the kitty' or ask 'where is the dog?'" (the child needs to identify only 1 picture correctly). The selection of items for the MoBa study was performed a priori by specialists in clinical and developmental psychology. Mothers were asked to find time to observe the child and rate the extent to which the child would typically show mastery of the skill in question, using the response categories "yes" (1), "very often" (2), "not yet" (3), and "I don't know" (missing). To identify those children at risk for clinically significant communication impairments, we set a cutoff at 2 SD above the cohort mean, as suggested by Squires et al.<sup>15</sup> To explore the reliability of the scale, we used a 2-parameter item response theory<sup>16</sup> analysis. The average factor loading was 0.75, indicating high reliability.

**Outcome Variables at Age 36 Months.** Child communication impairments at age 36 months were assessed using 6 items from the ASQ measuring expressive (3 items) and receptive (3 items) communication skills. Typical items of the ASQ for this age are: "When you ask your child to point to her nose, eyes, hair, feet, ears, and so forth, does she correctly point to at least 7 body parts?" (she can point to parts of herself, you, or a doll), and "Without giving your child help by pointing or using gestures, ask him to 'put the book on the table' and 'put the shoe under the chair.' Does your child carry out both of these directions correctly?" Mothers were asked to rate the extent to which their child mastered the skill using the same response categories as on the ASQ at age 18 months. To identify the children at risk for clinically significant communication impairments, we set a cutoff of 2 SD above the cohort mean. To explore the reliability of the scale, we performed a 2-parameter item response theory analysis. The average factor loading was found to be 0.82, indicating high reliability.

Expressive language impairment at age 36 months was measured using the parent-based assessment of grammar abilities of Dale et al.<sup>17</sup> This measure has been validated against scores on the Communication domain of the Vineland Adaptive Behavior Scale in a subsample of children with autism spectrum disorders in the MoBa study.<sup>18</sup> The measure consists of 1 item with 6 alternate answer categories. Mothers are asked to select which category best describes how their child talks: (1) child is not yet talking; (2) child is talking, but not yet understandably; (3) child is talking in single-word utterances, such as "milk"; (4) child is talking in 2- to 3-word phrases, such as "Me got ball"; (5) child is talking in fairly complete sentences, such as "Can I go outside?"; and (6) child is talking in long and complicated sentences, such as "When I went to the park, I went on the swings."

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