Göteborg, 2023

Pre/Perinatal/Early-life Exposures and Early Child Neurodevelopment

Results from the Japan Environment and Children's Study

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska akademin, Göteborgs universitet kommer att offentligen försvaras i hörsal Arvid Carlsson, Medicinaregatan 3, fredag den 8 september 2023, klockan 13.00

av Kahoko Yasumitsu-Lovell

Fakultetsopponent:

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Avhandlingen baseras på följande delarbeten

I. Yasumitsu-Lovell K, Thompson L, Fernell E, Eitoku M. Suganuma N, Gillberg C. Pre-/perinatal reduced optimality and neurodevelopment at 1 month and 3 years of age: Results from the Japan Environment and Children's Study. *PLoS One* 2023; 18(1):e0280249.

II. Yasumitsu-Lovell K, Thompson L, Fernell E, Eitoku M. Suganuma N, Gillberg C. Birth month and infant gross motor development: Results from the Japan Environment and Children's Study. *PLoS One* 2021; 16(5):e0251581.

III. Yasumitsu-Lovell K, Thompson L, Fernell E, Eitoku M. Suganuma N, Gillberg C. Vitamin D and neurodevelopmental problems at age 2 years: Results from the JECS. *Submitted.*

IV. Yasumitsu-Lovell K, Thompson L, Fernell E, Eitoku M. Suganuma N, Gillberg C. Validity of the ESSENCE-Q neurodevelopmental screening tool among the participants of the Japan Environment and Children's Study (JECS). *Submitted.*

SAHLGRENSKA AKADEMIN
INSTITUTIONEN FÖR NEUROVETENSKAP OCH FYSIOLOGI

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Abstract

Background: Combinations of genetic and environmental factors contribute to aetiologies of neuropsychiatric problems and neurodevelopmental disorders (NDDs) in intricate manners. Among the environmental factors, exposures during the pre-/perinatal periods and early childhood are particularly important. Holistic assessment of additive risks during these periods on child neurodevelopment is crucial for prevention, early detection, and intervention. Equally, when concerns arise about a child's development, comprehensive/ holistic assessment of neurodevelopment is extremely important as comorbidities are the rule rather than the exception. **Aim**: The overall aim of this thesis is to examine possible associations between pre/perinatal and early-life exposures and child neurodevelopment up until 3 years of age. The thesis focuses on the association between pre-/perinatal optimality and child development at 1 month and 3 years of age (*Study I*), between birth month and gross motor development at age 6 and 12 months (*Study II*), and between child vitamin D and neurodevelopment at age 2 years (*Study III*). The fourth study assesses the ability of the ESSENCE-Q used at child age 2.5 years as a screening tool to identify child overall neurodevelopmental problems and relate findings to NDDs diagnosed before 3 years of age (*Study IV*). **Methods**: Medical records, blood samples, and self-administered parental questionnaires from the Japan Environment and Children's Study (JECS), one of the world's largest ongoing national birth cohort studies (more than 100,000 mother-child dyads), were utilised throughout the four studies. **Results**: Obstetric reduced optimality scale scores showed dose-response associations with NDDs at child age 3 years (*Study I*). Summer-born babies lagged behind winter-born babies regarding gross motor development at ages 6 and 12 months (*Study II*). Low vitamin D level was negatively associated with cognitive and communication development in boys (*Study III*). Parent-completed ESSENCE-Q was useful for screening out children without neurodevelopmental problems (*Study IV*). **Conclusions:** Child neurodevelopment by age 3 years was associated with negative pre-/perinatal factors, seasonality, and, in boys, with low vitamin D levels at age 2 years. These findings could be taken to indicate that better support should be provided for children who experienced adversities in their early life, as early as during the prenatal period. The ESSENCE-Q can probably be used for screening out children without major NDDs.

Keywords: ESSENCE-Q, JECS, Neurodevelopmental disorders/problems, Pre-/Perinatal factors, Vitamin D

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