

# High levels of prenatal smoking exposure affect sleep patterns in preterm neonates

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A study in the Dec. 1 issue of the journal *Sleep* is the first to show that high levels of prenatal smoking exposure strongly modify sleep patterns in preterm neonates, which places infants at a higher risk for developmental difficulties that could persist throughout early and middle childhood.

Results indicate that preterm neonates born to heavy-smoking mothers who smoked more than 10 cigarettes per day displayed disrupted sleep structure and sleep continuity. From 7 p.m. to 8 a.m. they slept almost two hours less than controls who were born to non-smoking mothers, and their sleep was more fragmented. Compared with controls, neonates born to both heavy and low smokers displayed more body movements and, as a result, more disturbed sleep.

Frederic Telliez, principal investigator, and professor of neuroscience at the University of Picardie Jules Verne in Amiens, France said that sleep integrity is critical in the brain development of neonates. Disruption of sleep mechanisms by prenatal smoking exposure may predispose neonates to alterations in some physiological function (such as ventilation) and can result in long-term neurocognitive disorders.

According to the authors, abnormal sleep processes may alter compensatory responses to autonomic cardiovascular/respiratory challenge and increase the likelihood of life-threatening events later in life. Prenatal smoking exposure can lead to deficits in sustained attention and impulsivity in adolescence and a higher risk of attention-

deficit/hyperactivity disorder in childhood – effects that could be partially mediated by sleep changes. Prenatal smoking exposure is also highly related to sudden infant death syndrome (SIDS).

"The developing brain is known for its plasticity and ability to reorganize in response to the stimulation provided by the postnatal environment," said Telliez. "Consequently, it is possible that these neonates, if they are not exposed to smoking after birth, could recover and develop normal sleep structures."

Forty healthy preterm neonates (postconceptional age approximately 33.9 weeks) were recruited from the neonatal intensive care unit at Amiens University Medical Center in France. Mothers were subjectively asked how many cigarettes they had smoked during their pregnancy in order to determine the level of in utero exposure to smoking. Neonates born to mothers who did not smoke at all during the pregnancy were placed in the control group; infants born to mothers who smoked less than 10 cigarettes per day were placed in the low smoking group; and those whose mothers had smoked more than 10 cigarettes per day were placed in the heavy smoking group.

The neonates born to heavy-smoking mothers had a significantly lower mean birth weight than controls. Their average weight of 2.92 pounds was 21 percent less than the average weight of controls, which was 3.69 pounds. Neonates born to mothers who smoked less than 10 cigarettes per day had a birth weight that was 11 percent lower than controls, although this result did not achieve statistical significance.

All children were free of neurological, respiratory, and cardiac disorders and had not received caffeine treatment or oxygen therapy. Neonates whose mothers reported substance abuse or passive smoking were excluded from the study. None of the infants had suffered from sleep deprivation in the 48 hours prior to the sleep recording session.

Infants received overnight polysomnographic recordings in isolated rooms. Researchers measured sleep period time, beginning at the first sleep onset and the ending at the last awakening; the percentage and frequency of wakefulness after sleep onset and total sleep time. Special attention was paid to the number and duration of body movements.

Findings indicate that even after 29.7 days without postnatal exposure to smoking or nicotine, and despite the fact that neonates in the heavy-smoking group were nearly 10 days older, infants exposed in utero to high levels of smoking still showed an altered organization of the various behavioral states.

The authors suggest that examining the neurodevelopmental trajectories of neonates exposed to maternal smoking (and of those who were not) could lead to greater understanding of potential deficits in the exposed group, better prediction of outcomes, and potentially more effective compensatory clinical interventions. Researchers also state that longitudinal studies are necessary to assess the persistence of behavioral state effects caused by prenatal smoking exposure.

Source: American Academy of Sleep Medicine

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