ADHD Symptoms Linked to Enterovirus Infection

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Children who had had an enterovirus 71 infection involving the central nervous system were significantly more likely to have symptoms of attention-deficit/hyperactivity disorder than were matched controls in a prospective study that evaluated children at 3-7 years after the infection.

Although herpes simplex encephalitis and other CNS infections can affect neurodevelopment and cognitive function, the authors said that this is the first study to follow up long-term behavioral outcomes or ADHD-related symptoms in children after an enterovirus 71 (EV71) CNS infection.

The findings have "clearly demonstrated the association between the EV71 CNS infection and increased symptoms of inattention, hyperactivity, oppositional defiance, internalizing problems, and increased likelihood of ADHD diagnosis," concluded Dr. Susan Shur-Fen Gau of National Taiwan University, Taipei, and her associates.

The results also support their hypothesis that children who have had an EV71 CNS infection "are more likely to have ADHD-related symptoms regardless of IQ" (Pediatrics 2008;122:e452-8).

The study used standardized mother- and teacher-rated scales to evaluate ADHD symptoms and other emotional and behavioral problems in 86 children (51 boys and 35 girls; aged 4-16 years) who had had an EV71 CNS infection at the mean age of 2.5 years, and in 172 controls in the same neighborhoods or schools who were matched for gender, age, school performance, and parental education levels.

Among the children with the infections, CNS involvement had been mild in 42 cases (aseptic meningitis) and was severe in 35 cases (encephalitis, poliomyelitislike syndrome, or encephalomyelitis); the other 9 children had cardiopulmonary failure after CNS involvement.

The children had been diagnosed with the infections from 1998 to 2003 at Chang Gung Children's Hospital, Taoyuan, Taiwan, and National Taiwan University Hospital; there was an epidemic of EV71 infection in Taiwan in 1998.

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Scores on teacher-rated and mother-rated scales of inattention, hyperactivity-impulsivity, oppositional symptoms, and ADHD index were significantly higher among the children with the EV71 infection, compared with controls. In the former group, 20% had elevated ADHD-related symptoms, compared with 3% of controls, a significant difference.

The maternal reports provided some evidence that children with the EV71 CNS infections had more internalizing problems, but this needs to be studied further, the investigators said.

There was no correlation between the age at which the child had the EV71 infection, any laboratory data, or the severity of CNS involvement with the severity of ADHD-related symptoms, a finding that the investigators said was surprising. They speculated that the EV71 infection may involve the prefrontal-striatum-subcortical area of the brain, or another area that is related to the core symptoms of ADHD.

The investigators acknowledged some limitations of the study, including the inability to assess ADHD symptoms in the children before the CNS infection, and said that more studies were needed to confirm whether the increase in ADHD symptoms was specific to EV71 or also occurred with other microorganisms.

Nevertheless, they concluded that an EV71 CNS infection "may affect long-term regulation of attention and emotion and cause hyperactivity-impulsivity in children," and recommended that children with these infections be assessed early to identify ADHD symptoms and emotional and behavioral problems, because "early intervention may prove beneficial for their future performance."

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