

Key Points

1. Research has shown that a high percentage of Chiari patients suffer from sleep problems such as apnea
2. Research has also linked sleep problems to behavior problems in children
3. Brazilian researchers hypothesized that ADD in a group of Chiari II children was due to sleep problems
4. Recruited 24 children with Chiari II and 24 healthy controls
5. All children underwent sleep testing and psychological evaluation for ADD
6. Chiari group had high rates of sleep problems
7. In both groups, every child with ADD also had a sleep disorder
8. Results strongly suggest that ADD in Chiari II children due to sleep problems
9. Would be interesting to extend the work to Chiari I and cognitive issues

Definitions

ADD - Attention Deficit Disorder, behavioral problem involving lack of concentration, impulsiveness, and sometimes hyperactivity

brainstem - part of the brain which connects with the spinal cord and controls many automatic functions, such as breathing

Chiari Malformation Type II - more serious type of Chiari, which involves more of the brain descending and is associated with spina bifida

DSM - IV - Diagnostic and Statistical Manual of Mental Disorders; book of diagnostic criteria published by the American Psychiatric Association

hydrocephalus - condition where there is an abnormal amount of CSF in the brain

Behavior Issues In Chiari II Children Traced To Sleep Problems

May 31st, 2009 -- In an opinion piece for Chiari & Syringomyelia News, Dr. Regina Bland, a working pediatrician with Chiari (and a member of the Conquer Chiari Research Committee) discussed the fact that many people with Chiari report cognitive problems: [Let's Think About Thinking - The Cognitive Effects Of Chiari](#). Dr. Bland pointed out, however, that it is not clear if the malformation itself is the cause of cognitive issues, or if they are due to secondary effects from things like pain, medication, and lack of sleep.

At this point, the sleep problems associated with Chiari have been well established. Research has shown that a high percentage of Chiari patients suffer from sleep apnea, and that many of these cases are the more severe form, known as central sleep apnea. Sleep apnea is when a person repeatedly stops breathing during sleep and begins to wake up in order to start breathing again. Sufferers can endure this hundreds of times a night, resulting in completely disrupted sleep patterns and daytime fatigue and grogginess.

Episodes of apnea are categorized as either obstructive or central. Obstructive refers to when there is a physical blockage of the airway, such as from enlarged tonsils or swelling from allergies. Central apnea arises when the brain's sleep center, in the brainstem, doesn't signal the body to breathe.

Interestingly, beyond Chiari, research has linked sleep disorders with both cognitive and behavioral problems. It was behavioral issues that two Brazilian researchers (Filho and Pratesi) chose to focus on in a recent publication in the journal, Arquivos de Neuro-Psiquiatria, and their results seem to support the possibility which Dr. Bland raised.. Specifically, they hypothesized that Attention Deficit Disorder in children with Chiari II was due to sleep problems rather than arising directly from the brain malformation.

To study this, they performed sleep studies and behavioral diagnoses on 24 Chiari II children and compared them to 24 age and gender matched healthy controls. The Chiari group was comprised of 15 boys and 9 girls, ranging in age from 7 to 16 years. Each had been born with spina bifida, had undergone corrective surgery as a newborn, and had Chiari II confirmed by MRI. Since many Chiari II children have hydrocephalus, and hydrocephalus can have a profound cognitive impact, in order to control for this, the children in the study also had to be in a mainstream classroom at their age appropriate grade level and be in the normal range of intelligence as determined by testing. Finally, children with respiratory, heart, or other neurological conditions, and children on medications which could interfere with sleep were excluded.

As mentioned previously, both groups of children underwent full-night polysomnography, which means they slept in a lab which monitored their breathing and brain activity while they slept. The researchers were looking for sleep disorders such as apnea, periodic limb movement (which is often associated with spinal problems), and disturbances in the important REM stage of sleep. In addition, the children were evaluated for Attention Deficit as defined by the DSM-IV psychiatric manual using scales which measured hyperactivity, independent functioning, inattention, socialization, and anxiety.

Not surprisingly, the sleep studies revealed that 58% of the Chiari II children suffered from central sleep apnea, while nearly half had periodic limb movement, and one-fourth had REM sleep disturbances (Fig. 1). In the control group, the only sleep problem found was obstructive sleep apnea (not uncommon in children) which appeared in a quarter of the control group. In terms of the psychological testing, six children were identified in each of the two groups (Chiari II and control) as exhibiting ADD.

Figure 1: Sleep Problems Among Chiari II Patients (24) and Controls (24)

	% With, CM II Group	% With, Control Group
Central Apnea	58%	0%
Obstructive Apnea	0%	25%
PLMS	46%	0%
RBD	25%	0%

Note: PLMS = periodic limb movement syndrome; RBD = REM sleep behavior disorder

What is more interesting, and significant, is when the two results - sleep problems and behavior issues - were combined. Specifically, in both groups, every child with ADD also had a sleep disorder and none of the children without a sleep disorder had ADD (Fig. 2). It should be noted however, that in the Chiari II group there were 8 children with sleep disorders that did not have ADD. Statistically, the difference between children with and without sleep disorders and the presence of ADD was statistically very significant.

polysomnography - sleep testing; patients spend the night in a sleep lab where their oxygen levels, breathing, and brain activity are monitored

REM sleep - stands for rapid eye movement; important phase of sleep associated with dreaming

sleep apnea - sleep disorder characterized by frequent interruptions in breathing, resulting in the person waking up many times during the night

spina bifida - birth defect, also known as myelomeningocele, where the spinal cord is exposed; often accompanies hydrocephalus and Chiari II

Common Chiari Terms

cerebellar tonsils - portion of the cerebellum located at the bottom, so named because of their shape

cerebellum - part of the brain located at the bottom of the skull, near the opening to the spinal area; important for muscle control, movement, and balance

cerebrospinal fluid (CSF) - clear liquid in the brain and spinal cord, acts as a shock absorber

Chiari malformation I - condition where the cerebellar tonsils are displaced out of the skull area into the spinal area, causing compression of brain tissue and disruption of CSF flow

decompression surgery - general term used for any of several surgical techniques employed to create more space around a Chiari malformation and to relieve compression

syringomyelia - condition where a fluid filled cyst forms in the spinal cord

Figure 2: ADD as Related to the Presence of Sleep Disorders (SD) in Chiari II and Controls

	CMII		Controls	
	SD	No SD	SD	No SD
ADD	6	0	6	0
No ADD	8	10	0	18

Note: In both groups (CMII and controls), the difference between those with ADD and a sleep disorder versus those with ADD and no sleep disorder (which is actually no one) is statistically significant

Although at first glance one might say wait a minute, the result was the same for Chiari kids and the controls kids, so what did the researchers really prove; the reality is that this result actually strongly supports their hypothesis. The researchers hypothesized that behavior issues in Chiari II children (specifically ADD) were a result of sleep problems and not directly due to Chiari. The fact that they found a strong correlation between sleep disorders and ADD in both Chiari children and healthy controls shows pretty strongly that sleep problems can lead to behavior problems. Naturally, as an extension, since sleep problems are more prevalent in the Chiari community, one would expect to find more behavior issues, at least ADD, among Chiari children. Indeed, this would be an interesting follow-up study to undertake.

It would also be interesting to extend this line of research to Chiari I and cognitive issues. In other words how Chiari patients who report cognitive problems have verifiable sleep disorders?

It is well known that sleep is vital to both a person's physical and mental well-being. Given the prevalence of sleep problems found with Chiari, and the potential consequences, it is important for patients to know whether their sleep is being disturbed.

Related C&S News Articles:

- [Majority of Chiari Patients Suffer From Sleep Apnea](#)
- [Chiari Related Memory & Learning Problems](#)
- [Study Identifies Cognitive Impact Of Chiari II](#)
- [Sleep Apnea Causes Brain Changes In Children](#)
- [Decompression Surgery Helps Chiari Related Sleep Apnea](#)
- [Strong Link Between Chiari And Sleep Apnea](#)
- [It Can Be Hard To Get A Good Night's Sleep With Chiari](#)

Source

[Sleep disorder: a possible cause of attention deficit in children and adolescents with Chiari malformation type II.](#) Henriques Filho PS, Pratesi R. Arq Neuropsiquiatr. 2009 Mar;67(1):29-34.

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