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# The use of complementary and alternative medicine in children with common neurologic diseases

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Complementary and alternative medicine (CAM) is a phrase used to describe additional health care methods such as mind/body practices and natural products not regarded as treatments by conventional medicine. The use of CAM in children with common neurologic diseases is more frequent than its use in healthy children (24%–78% vs. 12%). However, less than half of patients report such use to their physicians. The preferred modalities of CAM vary in different countries due to their different cultures and traditions. The most common factor significantly associated with the use of CAM is parental CAM use in most studies. The frequency of the use of CAM in children and adults with neurologic diseases is similar, and both rates are higher than the rates in those without these conditions. The preferred modalities of CAM in adults are diverse, and megavitamins and mind/body therapy (prayer and chiropractic care) are included. The most common factor significantly associated with the use of CAM in adults with neurologic diseases is high educational level. Physicians need to be concerned with patients' use of CAM and provide correct information about CAM so that patients may make the right decisions. Further study is needed to determine the evidence-based efficacy of CAM use in children with common neurologic diseases.

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## Introduction

Complementary and alternative medicine (CAM) is an additional health care system, comprising mind/body practices and natural products that are not regarded as part of conventional medicine<sup>1,2</sup>. Conventional medicine is used together when complementary medicine is applied, and alternative medicine is employed instead of conventional medicine<sup>1</sup>. Real alternative medicine is unusual<sup>1</sup>. Most patients who try to take non-prevailing approaches use them together with conventional treatments<sup>1</sup>.

Natural products include herbs, minerals, vitamins, and probiotics, and mind/body practices include acupuncture, massage therapy, meditation, movement therapies, relaxation techniques, spinal manipulation, and others<sup>1</sup>. The types of CAM are summarized in Table 1.

Neurologic diseases in children often tend to have a chronic course and require long-term management. Children with chronic health conditions use CAM more frequently<sup>3</sup>, but it was found that only around 30% of patients with epilepsy and 50% of children with chronic health conditions who use CAM reported this behavior to their physicians<sup>4-6</sup>. Physicians should be aware of their patients' use of CAM and provide accurate information about CAM to enable patients to make the right decisions.

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This review aims to investigate the characteristics of the use of CAM in children with neurologic diseases such as epilepsy, migraine, cerebral palsy, and congenital malformations in order to improve management through analysis of several studies of CAM use in children with chronic neurologic conditions<sup>2,6-10</sup>. Further, this review will discuss the differences in the use of CAM between children and adults with neurologic diseases, and between patients with neurologic and nonneurologic conditions.

## Characteristics of the use of CAM

Barnes et al.<sup>9</sup> reported that approximately 12% of children (total sample size [n]=9,417) used CAM in the United States (US), and McCann and Newell<sup>3</sup> reported that 12% of healthy children (n=25) used CAM in the United Kingdom (UK). They also reported that 40% (n=75) of children with chronic health conditions used CAM in the UK, and this proportion is much higher than that in healthy children<sup>3</sup>. In the study by Barnes et al.<sup>9</sup>, the most common modalities used were natural products (neither vitamin nor mineral) and osteopathic or chiropractic manipulation. Regarding significant factors, parental use of CAM was associated with CAM use in children compared to children whose parents did not use CAM (24% vs. 5%). Parental use of CAM was also found to be a strongly associated factor in a study by Birdee et al.<sup>11</sup>. Additionally, for both adults and children, worry about cost was found to be one of the factors related to the use of CAM and delaying using conventional medicine, and patients were more likely to use CAM when expenses were a concern than when expenses were not a problem for conventional medicine<sup>9</sup>. Other factors significantly associated with pediatric use of CAM, in the study of Birdee et al.<sup>11</sup>, were adolescent age rather than that of toddler or infant, parent with a college education, more frequent use of prescription medication, stress or anxiety, musculoskeletal conditions, dermatologic conditions, and sinus infection.

### 1. Characteristics of the use of CAM in children with neurologic diseases

In a recent study on patterns of CAM use in pediatric patients with common neurologic conditions (headaches, migraines, seizures), pediatric patients with common neurological conditions were found to use CAM significantly more compared to children without these conditions (24% [n=586] vs. 13% [n=7,083])<sup>7</sup>. Pediatric patients with neurologic conditions used biological therapies with a similar frequency and mind/body practices with a significantly higher frequency compared to other pediatric patients using CAM. Among mind/body practices, deep breathing was used most commonly (33%), meditation was used in 15%, and progressive relaxation was employed in 10%<sup>7</sup>. In another study in 2010 in North Jordan, 56% of children (n=176) with

neurologic illnesses used CAM for their care<sup>2</sup>. Regarding the most commonly used methods, prayer/reciting the Quran was used in 77%, massage with olive oil in 32%, religious healers in 30%, and consumption of honey products in 29%. Among the reasons provided for the use of CAM, religious beliefs were the most common (68%), and no patients described distrust in conventional medicine<sup>2</sup>. Other significant factors connected to the use of CAM included belief in its effects, speech delay, father's age greater than 30 years, and mother's education less than high school<sup>2</sup>. Additionally, parents' experience or hearing of successful cases from acquaintances or mass media was found to be other reasons for using CAM<sup>8</sup>. Side effects were rare<sup>8</sup>. In a study by Soo et al.<sup>8</sup> regarding the use of CAM in a pediatric neurology clinic, 44% of patients (n=105) were found to use CAM. In regard to the most commonly used CAM modalities, chiropractic manipulation was used in 15%, dietary therapy was used in 12%, and homeopathy, herbal remedies, and prayer healing were each used in 8%. The difference in this study compared to other studies is that the parents' sociodemographic characteristics were not significantly associated with the use of CAM. Pediatric health-related quality of life was also not a significant factor<sup>8</sup>. In total, 59% of patients who used CAM experienced benefits. The total median cost of CAM compared with conventional medicines was not different (\$31.70 vs. \$50.00 per month)<sup>8</sup>. In a study on CAM use in pediatric neurology, the overall rates of CAM use at two centers were 78% (n=151) and 48% (n=55), respectively<sup>6</sup>. As for the most commonly used CAM products, multivitamins were used in 84%, vitamin C was used in 37%, homeopathic remedies were used in 24%, and fish oil/omega-3s were employed in 22%<sup>6</sup>. Regarding the most commonly used CAM practices, massage was used in 47%, and 37% used chiropractic methods, 18% used faith-healing, and aromatherapy, homeopathy, and relaxation were each used in 16%<sup>6</sup>. Over half of patients disclosed to their physicians their use of CAM in addition to conventional medicine<sup>6</sup>.

In a study examining the use of traditional herbal medicines in Korean elementary school children, 65% (n=905) of children were found to be taking herbal medicines<sup>12</sup>. In a 2008 study in Korea, 65 of 378 children (17%) with epilepsy were found to be taking herbal medicines<sup>4</sup>. In our study in 2014, 19% (n=398) of children with epilepsy used traditional Korean medicine (TKM) (acupuncture, moxibustion, herbal medicine)<sup>10</sup>. These results suggest that TKM is not the favored method for attaining seizure control and that patients are careful about using TKM to treat epilepsy. In addition, 60% of children with epilepsy were receiving other types of CAM<sup>10</sup>. According to a study by Lee et al.<sup>4</sup>, patients with psychosomatic disorders used herbal medicine significantly more frequently, whereas in a study by Kim et al.<sup>13</sup>, neurologically normal patients used it slightly more frequently; however, the difference did not have statistical significance. In

our study, among receivers of combination treatments besides TKM, TKM was used more frequently in those receiving language, music, or art therapy than in those undergoing physiotherapy or other combination therapies<sup>10</sup>. This finding suggests that the use of TKM is associated more with the purpose of treatment of cognitive function than motor functions, and parents of children with epilepsy may believe that TKM has an effect on the former rather than the latter<sup>10</sup>. Additionally, regarding significant factors, in the group of patients using a greater number of antiepileptic drugs and having low seizure-free rates, the use of TKM was more frequent<sup>10</sup>.

Regarding the effect of CAM on epilepsy, inconsistent results had been reported in previous studies. Recent Cochrane reviews show that some studies on the use of acupuncture and Chinese traditional herbal medicine did not succeed in providing clear evidence proving the effects of acupuncture and herbal medicine for epilepsy patients<sup>14,15</sup>. According to the study by Lee et al.<sup>4</sup>, 18% of respondents using herbal medicine reported its effectiveness for seizure control, but the rest of the respondents reported no effectiveness or even worsening of symptoms, although many patients (33%) agreed with using herbal medicine. It was also reported that most patients did not feel that CAM was superior to general epilepsy treatments, although 32% of them continued using CAM<sup>16</sup>. It is presumed that this persistent usage is due to people's beliefs that herbal medicines are safe (not dangerous) and help to improve health and enhance cognitive function<sup>10</sup>. In spite of these beliefs, however, according to the report of Kuan et al.<sup>16</sup>, the most frequent adverse effect of CAM was aggravated seizures. It is presumed that this is due to the effects of seizure-inducing materials of herbal medicine or drug-drug interactions. Regarding the frequency of CAM use for epileptic patients in various countries, 49% (n=403) of Taiwanese were found to use CAM, 44% used it in Arizona, 37% (n=265) of Nigerians used CAM, and 32% (n=1,000) in India and 24% (n=92) in Ohio used CAM<sup>5,16-19</sup>. Regarding commonly used forms of CAM for treatment of epileptic patients, prayer and stress relief were used in the West, whereas traditional herbal medicines were employed both in the East and in Africa<sup>5,16-19</sup>. In US, the preferred modalities were biological therapies and mind-body practices<sup>7</sup>.

In Canada, the commonly used methods were chiropractic manipulations, dietary therapy, multivitamins, and massage<sup>6,8</sup>.

However, in North Jordan, prayer/reciting the Quran was the most commonly used modality<sup>2</sup>. In Korea, TKM was used commonly by neurologic patients. These differences in use of CAM between countries may be owing to their different cultures, religions, and traditions<sup>10</sup>. The characteristics of the use of CAM in children with neurologic diseases are summarized in Table 2.

## 2. Characteristics of the use of CAM in adults with common neurologic conditions

According to the study by Barnes et al.<sup>9</sup>, almost 40% (n=23,393) of US adults used CAM in 2007 and the most commonly used modalities were natural products (neither vitamin nor mineral) (18%) and deep breathing exercises (13%). CAM was used more frequently in American adults with common neurological conditions (migraines, regular headaches, strokes, back pain with sciatica, seizures, dementia or memory loss) than in those without such conditions (44% [n=6,587] vs. 33% [n=16,806])<sup>20</sup>. The frequency of use of each CAM modality was higher in adults with common neurological conditions than in those without<sup>20</sup>. The most common modalities were mind/body therapies, and the least common were alternative medical systems<sup>20</sup>. The reasons why those with common neurological conditions used CAM more frequently than those without such conditions included provider's recommendations or little effect achieved with conventional medicine or a cost that was too high<sup>20</sup>. About 50% of adults with common neurological conditions did not report their use of CAM to their doctors<sup>20</sup>. Factors that significantly influenced the use of CAM in those with common neurological conditions included higher educational level than high school education, positive history of anxiety, living in a western area, being a former smoker, and drinking alcohol lightly<sup>20</sup>.

In the previous studies on the use of CAM in various neurologic conditions, the prevalence of use of CAM ranged from 19% to 43%<sup>21-23</sup>. Compared to the frequency of use of CAM in children with common neurologic diseases, the frequency of use in adults with neurologic diseases was similar<sup>2,6-8,10</sup>. For Korean adults with other diseases, several studies showed the following findings regarding CAM use: 60%–70% of patients with stroke used CAM, 53% of those with cancer used it and 53% of patients with asthma and 48% of patients with psychiatric disorders used

**Table 1.** Types of complementary health approaches<sup>1)</sup>

Types	Contents
Natural products	A variety of products such as herbs, minerals, vitamins, probiotics, etc.
Mind/body practices	A large and diverse group of procedures or techniques administered or taught by a trained practitioner or teacher: yoga, chiropractic and osteopathic manipulation, meditation, massage therapy, acupuncture, relaxation techniques (such as breathing exercises, guided imagery, and progressive muscle relaxation), tai chi, qi gong, healing touch, hypnotherapy, integration
Other complementary health approaches	The practices of traditional healers, Ayurvedic medicine, traditional Chinese medicine, homeopathy, naturopathy

**Table 2.** Characteristics of the use of CAM in children with neurologic diseases

Source	Country	Use of CAM, % (n)	Preferred modalities	Factors significantly associated with use of CAM
Treat et al. <sup>7)</sup>	United States	24 (586)	Biological therapies (44%), mind-body practices (39%) (deep breathing, meditation, progressive relaxation)	Adolescent age, white ethnicity, female sex, parental CAM use
Aburahma et al. <sup>2)</sup>	North Jordan	56 (176)	Prayer/reciting the Quran (77%), massage with olive oil (32%), religious healers (30%), consumption of honey products (29%)	Speech delay, belief in its usefulness, father's age greater than 30 years, mothers with level of education less than high school
Soo et al. <sup>8)</sup>	Canada	44 (105)	Chiropractic manipulations (15%), dietary therapy (12%), herbal remedies (8%), homeopathy (8%), prayer/faith-healing (8%)	Caregivers' personal experience, success stories from friends and media
Galicia-Connolly et al. <sup>6)</sup>	Canada	78 (151), 48 (55)	CAM products: multivitamins (84%), vitamin C (37%) CAM practices: massage (47%), chiropractic methods (37%), faith-healing (18%)	Use of CAM by a parent
Yeon et al. <sup>10)</sup>	South Korea	64 (398)	Speech therapy (34%), education (27%; art, music, play), rehabilitation (27%), TKM (19%)	In TKM users: use of more AEDs, lower seizure-free rate

CAM, complementary and alternative medicine; TKM, traditional Korean medicine; AED, antiepileptic drug.

**Table 3.** Characteristics of the use of CAM in adults with neurologic diseases

Source	Use of CAM, % (n)	Preferred modalities	Factors significantly associated with use of CAM
Wells et al. <sup>20)</sup>	44 (6,587)	Mind/body therapies	Higher than high school education, anxiety in the prior year, living in the west, being a former smoker, light alcohol use
Brunelli and Gorson <sup>21)</sup>	43 (180)	Megavitamins (35%), magnets (30%), acupuncture (30%), herbal remedies (22%), chiropractic manipulation (21%)	Slightly younger, more often college-educated
Liow et al. <sup>22)</sup>	39 (228)	Prayer/spirituality (46%), megavitamins (25%), chiropractic care (24%), stress management (16%)	Midwestern patients
Ryan and Johnson <sup>23)</sup>	19 (216)		High educational level

CAM, complementary and alternative medicine.

herbal medicines<sup>24-27)</sup>.

Preferred modalities of CAM use in children and adults had diverse features, and these results may be influenced by individuals' different cultures and traditions of use of CAM. The factor most commonly related to use of CAM in children with neurologic conditions was parental CAM use, and it could be presumed that the use of CAM in children may be due to such usage running in the family, as well as belief in or experience with the efficacy of CAM. In adults with neurologic conditions, increased educational level was the most common factor associated with use of CAM<sup>20,21,23)</sup>, and this result may relate to economic level. Characteristics of the use of CAM in adults with neurologic diseases are summarized in Table 3.

### 3. The use of CAM in children with other chronic diseases

In a systematic review on the use of CAM in pediatric cancer patients, the prevalence of use of CAM (since the diagnosis of cancer) ranged from 6% to 91% (n=2,871). The most common CAM modalities were herbal medicines, diets/nutrition, and faith-healing<sup>28)</sup>. The frequent reasons given for the use of CAM were to help cure or fight the child's cancer, relief of symptom, and

support of ongoing use of conventional medicine<sup>28)</sup>. There were few factors related to patients' sociodemographic characteristics associated with use of CAM, and this result was different from the results of several other studies<sup>28)</sup>.

According to the study by Barnes et al.<sup>9)</sup>, for pediatric patients with specific diseases, the use of CAM was not highly prevalent. The proportions were 2% in insomnia, 3% in attention deficit hyperactivity disorder (ADHD), 5% in other musculoskeletal diseases, 5% in stress or anxiety, 7% in head or chest colds, and 7% in back or neck pain<sup>9)</sup>. From these results, it is presumed that patients in these cases use CAM to manage symptoms, to maintain and manage health, or to prevent illness, rather than to treat specific diseases<sup>28)</sup>. Many studies, however, reported a higher frequency of CAM use in pediatric patients with chronic diseases, such as asthma, autism, ADHD, cancer, and sickle cell anemia. Medical symptoms such as nausea and abdominal pain rather than certain medical diagnoses were found to be some of the factors associated with the use of CAM<sup>28)</sup>.

In the study by Oshikoya et al.<sup>29)</sup>, the researchers interviewed parents of children with epilepsy (n=122), asthma (n=78), or sickle cell anemia (n=118). Three hundred three types of CAM were used

by 99 patients (31%) (epilepsy, 38%; sickle cell anemia, 36%; asthma, 25%). The most commonly used CAMs were biological products (58%), while alternative medical systems (27%) as well as mind/body interventions (14%) were also employed. Important factors influencing the use of CAM were relatives, friends, and neighbors. Eighty-five parents (86%) were going to report the use of CAM to their physicians, but had not yet done so. In 7% of the patients, adverse reactions were associated with CAM use.

Levy and Hyman<sup>30</sup> investigated the use of CAM for children with autistic spectrum disorder (ASD). About 50%–75% (n=50–112) of children with autism were found to use CAM<sup>31</sup>. Patients with comorbid intellectual disability may have a higher frequency of use of CAM. In the study by Levy et al.<sup>32</sup>, one-third of children requested for examination of ASD were found to have already used CAM, even before diagnosis. The most frequently used form of CAM for children with ASD were mind/body practices<sup>30</sup>.

In children with inflammatory bowel disease, adverse effect was the significant predictor of CAM use<sup>33</sup>. In cases of children with asthma, the significant predictors of use of CAM were older age and worse control of symptoms. Also, more medications and more medical visits as well as more side effects were significant predictors in using CAM<sup>34</sup>. A study in Italy showed that the most common reason for the use of CAM was a fear of side effects of conventional therapy for routine illness<sup>35</sup>. In the study by Hanson et al.<sup>36</sup>, 75% of parents of children with ASD chose the use of CAM because they felt CAM was perceived to be safe and it did not have side effect or they experienced side effects of conventional therapy previously. The purposes of the use of CAM in children with ASD are treatment of major symptoms of ASD, improvement of attention, enhancement of relaxation, treatment of gastrointestinal symptoms, regulation of sleep and promotion of general health<sup>31</sup>. The characteristics of the use of CAM in children with other chronic diseases are summarized in Table 4.

## Conclusions

The use of CAM in children with neurologic diseases is common, ranging from 24%–78% and it is more frequent than the use in healthy children. Preferred modalities of CAM differed according to patients' country of residence and due to their different cultures and traditions, with examples such as prayer/reciting the Quran in Jordan, biologic therapies, and mind/body therapies in the US, and TKM in Korea. The most common factor significantly associated with the use of CAM was parental CAM use in most studies. The reasons for using CAM included religious beliefs, parents' personal experience, or exposure to success stories from the media and acquaintances.

The frequency of CAM use in children and adults with neurologic diseases is higher than that in those without these conditions. Preferred modalities of CAM in adults with common neurological conditions were diverse, including megavitamins and mind/body therapy (prayer and chiropractic care). The most common factor significantly associated with use of CAM in adults with neurologic diseases was higher educational level.

Among children and adults with neurologic diseases, less than half of patients who used CAM told their physicians about this usage. Thus, physicians need to ask patients about their use of CAM to allow further careful treatment. Additionally, further study is needed to determine the evidence-based efficacy of the use of CAM in children with common neurologic diseases.

## Conflict of interest

No potential conflict of interest relevant to this article was reported.

**Table 4.** The use of CAM in children with other chronic disease

Source	Types of disease	Use of CAM, % (n)	Preferred modalities	Factors significantly associated with use of CAM
Bishop et al. <sup>28)</sup>	Cancer	6–91 (2,871)	Herbal remedies, diets/nutrition, faith-healing	Few
Barnes et al. <sup>9)</sup>	Insomnia, ADHD, musculoskeletal disease, stress or anxiety, back pain	2–7	Nonvitamin, nonmineral, natural products (4%), chiropractic or osteopathic manipulation (3%)	Parental use of CAM
Oshikoya et al. <sup>29)</sup>	Epilepsy, asthma, sickle cell anemia	31 (99/318) (epilepsy, 38%; asthma, 36%; sickle cell anemia, 25%)	Biological products (58%), alternative medical systems (27%), mind/body interventions (14%)	Relatives, friends and neighbors
Levy and Hyman <sup>30)</sup>	ASD	50–75 (50–112)	Mind/body practices	Perception of safety, absence of side effects or prior experience with side effects of conventional therapy <sup>36)</sup>

CAM, complementary and alternative medicine; ADHD, attention deficit hyperactivity disorder; ASD, Autistic spectrum disorder.

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