

The effect of school meal supplementation with *Anethum graveolens* leaves on ADHD for mentally disabled children

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ABSTRACT

The current study aims to determine the effect of school meal supplementation with (*Anethum graveolens*) leaves powders as a good source of magnesium, zinc and calcium on decreasing ADHD symptoms for mentally disabled children. Children from Model Center for Intellectual Education who were mentally impaired participated in the study. The analyzed sample consists of 25 kids (8–12 years old). The socioeconomic, personal and dietary factors, as well as the clinical indicators, 24-hour recall, and eating patterns besides, attention deficit hyperactivity disorder had been analyzed. The nutritional intervention was by adding 25g of *Anethum graveolens* leaves powder into one cup of yogurt besides taking ADHD children to their normal school meal. The findings showed a significant improvement in calcium and magnesium consumption between the pre- and post-intervention periods, with a difference ratio between (48-54%). However, there were statistically significant differences in the mean overall degree of ADHD (375,297) of behavioral test before and after dietary intervention, favoring the post intervention. These might be connected to an increase in calcium, magnesium, and zinc intake as a result of the addition of dill to school meals. The results indicated that consumes *Anethum graveolens* leaves (25g of powder per day) as a good source of magnesium, zinc, and calcium can decrease the symptoms of ADHD in mentally challenged children.

Keywords: *Anethum graveolens*, leaves, mental retarded children, ADHD, magnesium, calcium, zinc.

INTRODUCTION

One of the most complicated and challenging issues facing kids and teenagers in human cultures is mental impairment (Hollis *et al.*, 2017). During the era of growth and adaptive function, mentally impaired children have restricted mental capacity, communication skills, self-care abilities, and independence. But it's not an illness (Shanti *et al.*, 2018). Children; with mental disabilities are those whose IQs are equal to or below 75, which is considered to be severely below normal intellect. Mental retardation is a disorder characterized by sluggish or average intellectual performance,

with an IQ score that is 70 points below the normal. Mental retardation; is typically classified into four categories: mild mental retardation (IQ; between 55 and 75), moderate mental retardation (IQ; between 40 and 54), severe mental retardation (IQ; between 20 and 39), and very heavy mental retardation (IQ; 20 and below) (American Psychiatry Association, 2013).

Children; who have mental impairments are still seen as a burden on the family and society. Due to their below-average intelligence, they are unable to function as typical children, which will undoubtedly impede all aspects of their daily

lives, including communication, socialization, and, most obviously, his inability to embrace academic courses as his classmates (Kemis and Rosnawati, 2020).

Early malnutrition has a definite impact on children intellectual development in impoverished nations. Additionally, it is well recognized that children with significant mental disabilities are at a high risk of becoming malnourished, which may help to explain why these kids typically experience growth retardation and the difficulties that go along with it as they become older. Anthropometric measurements show that malnutrition is extremely common in children with MR, worsens with age, affects mental function, and is associated with cerebral palsy (Sanchez *et al.*, 2003).

Food rejection, food selectivity, mealtime aggression, rumination, pica, and inadequate feeding skills are some of the feeding and mealtime behavior issues that are frequently seen in children with developmental impairments. In mentally handicapped children, feeding, behavior was found to have a substantial impact on nutritional status in both anthropometric and biochemical measures. Also, the socioeconomic level had an impact on the biochemical parameters. In children with mental disabilities limited appetite, food refusal, coughing, choking, or vomiting during eating are some factors that contributed to their nutritional disorders. Other factors include insufficient nutrient intake as, a result of poor feeding techniques, gross motor self-feeding impairment, swallowing difficulties, regurgitation, and gastro-esophageal reflux. In addition; to obesity and inactivity, constipation and nutrient medication interactions and allergies have also been observed to affect the overall nutritional health of children with mental disabilities (Kuhn and Matson, 2014).

It has been shown that children and teenagers with mental impairment are three to five times more likely than ordinarily developing youngsters to receive an ADHD diagnosis (Neece *et al.*, 2011). Children; with ID were shown to have an ADHD prevalence of 14%, which is almost three times greater than that of children without developmental disabilities (American Psychiatry Association, 2013).

ADHD is a neurodevelopmental disease that manifests as a recurrent pattern of either hyperactivity or inattention and can occur in a variety of contexts, including the family, school, among friends, and other social settings (Brahmbhatt *et al.*, 2018). It is currently recognized as a chronic disorder.

The average age of onset is 6 to 7 years old. A third of the youngsters who are affected will likely carry this disease into adulthood. In school-aged people, the prevalence of ADHD is 5%, and in the US is around 8%. Boys are twice as likely as girls to have ADHD. 76% of the variance appears to be hereditary, although the precise genotype or genetic pattern has not been found (Wolraich *et al.*, 2019).

ADHD is still mostly a clinical diagnosis. A thorough history of prenatal, perinatal, and family history, school performance, environmental factors, and a thorough physical examination are among; the modern criteria for diagnosing potential ADHD. Particular focus should be placed on the cardiovascular and neurologic systems during the physical examination. It is essential to check child mental health and look for coexisting problems. Finally, since the 1960s, specific behavioral criteria have been sought after using teacher- or parent-reported behavior rating systems (Kofler *et al.*, 2018).

Herbal supplements are well-known sources of medicinal ingredients with few side effects and widespread accessibility because of their inexpensive price (Payab *et*

The effect of school meal supplementation with *Anethum graveolens* leaves on ADHD for mentally disabled children

al., 2020). Herbal medicine is now employed to treat a number of disorders in the East, which may offer new opportunities for cutting-edge treatments. According to the World Health Organization (WHO), 80% of adults worldwide already utilize herbal plants to cure a variety of ailments (Wang *et al.*, 2018).

European dill, also known as *Ianethum graveolens* leaves, is primarily grown in the Mediterranean region. In Iran, meals like rice are frequently prepared with it and it is also a component of yogurt, salad, and many other cuisines. In Iranian traditional medicine, dill is frequently utilized as a food-based anti-hyperlipidemia medication. Dill has been used as a spice for a very long time. Numerous studies have demonstrated this herb's ability to lower hyperlipidemia and hypercholesterolemia (Yildiz *et al.*, 2018).

Dill leaves contain 36% carbs, 15.68% protein, 14.80% fiber, and 8.39% moisture in addition to essential oils, fatty acids, and vitamins, making them a particularly rich source of minerals, proteins, and fiber. It is used in traditional herbal medicine to treat a number of ailments such as digestive disorders, stomach pain, breathing issues, insufficient lactation, and the lowering of cholesterol and hyperglycemia (Maunder *et al.*, 2020).

The current study aimed to investigate the effect of school meal supplementation with *Anethum graveolens* leaves powder as a good source of magnesium, zinc, and calcium for ADHD symptoms in mentally disabled children.

MATERIALS AND METHODS

Subjects:

Children with mild mental disabilities from the Model Center for Intellectual Education for Mentally Handicapped Children, Ain Shams Administration, Cairo, Egypt, were the subjects of the current study.

The researched sample of youngsters consists of 25 children (15 boys and 10 girls) who have already been given an Attention Deficit Hyperactive Disorder (ADHD) diagnosis by the school psychologist. Their IQs ranged from (50-75) and they were between the ages of 8 and 12 years. None of the children were taking any medication to augment their diets.

The following data were collected for each child:

1- Personal and Socioeconomic data:

These include name, sex, age, and address, causes of disease and history of the disease, Parent education, occupation, and the number of their children.

2- Assessment of Nutritional status:

through

-Food Habits: The required information was taken from mother's children.

-24 hr. Dietary; Recall: It was applied for 3 days pre and post dietary supplementation for mild mentally disabled children with ADHD. Food Quantities were calculated and analyzed using food composition tables of the national nutrition institute and compared with Recommended Nutrients Intake (USDA, 2020).

Preparation of *Anethum graveolens* leaves powder:

The sample was obtained from the local market in Cairo, Egypt. *Anethum graveolens* leaves were washed and dried in an air oven at 40°C and ground in the blender, then the powder was package in polyethylene bags and kept until use.

Dietary supplementation:

It was constructed and applied for 3 months, three non-consecutive days in a week to improve the nutritional and behavioral status of mild mentally disabled children with ADHD. Dietary supplementation in the present study includes 25g of *Anethum graveolens* leaves

powder /day added in one cup of yogurt besides the normal school meal represented

in Table (1).

Table (1). School meals introduced in ADHD mild mentally disabled children.

Meal content
One loaf brown bread, 2 processed cheese , (50g) Halawa Tehenea and one medium orange

Anthropometric Measurements:

An instrument for measuring the physical parameters and overall make-up of the body is anthropometry. Weight, height, and body mass index (BMI) were the anthropometric parameters employed in this investigation (WHO, 2020).

Clinical indicators:

Clinical symptoms include changes in the state of the nails, gums, and teeth were investigated twice before and after dietary intervention (Jelliffe, 1966).

3. Assessment of behavior statutes:

The test of Attention Deficit Hyperactivity Disorder with mentally disabled children given by Hassan (2013) was applied. The scale has two components: Part 1: Attention Deficit Disorder Associated with Hyperactivity, Impulsivity, and Impulsivity contains 73 sentences (copy of teacher).

Part 2: Attention Deficit Disorder accompanied by Hyperactivity, Impulsivity, and Copy of Mother and made up of 76 sentences. When asked about behavior disorders, teachers and moms chose the most suitable ones for kids with mental disabilities. The answer was sometimes, frequently, infrequently, and never.

According to the test's inventor, grade numbers were determined by adding the grades of the tests of the two sections (teacher and moms) and were then interpreted as follows:

- Children who score 1-73 have minor attention deficit and hyperactivity.

- Children who score between 73 and 146 have moderate attention deficit and hyperactivity.

- Children who score between 146 and 219 have significant attention deficit and hyperactivity disorders.

4- Statistical Analysis: using Mean, Standard Deviation (\pm SD), T-test, Analysis of Variance (ANOVA) and Correlation Matrix by using package software SPSS windows (Vandallen, 1997).

RESULTS AND DISCUSSION

1- Socio-demographic characteristic results:

Concerning the socioeconomic characteristics of the study sample Tables (2 & 3) show the parent level of education of MRC. It was clear that high education level was higher among (52%) of fathers and (36%) of mothers. In the current sample of mentally handicapped children with ADHD, about 25% of fathers and 20% of moms completed their secondary education. 24% of mothers and 4% of fathers can read and write. According to the parent level of occupation, it was obvious that the highest percentage of mothers (70%) was housewives. 80% of father's coworkers were government employees, 15% were self-employed, and 5% were retired. 50% of the family members planned to have 3–4 kids.. These results were in agreement with (Laimayum *et al.*, 2019) who stated that 77% of mothers of children with mental disabilities were housewives who cared for their impaired children. In addition fathers (33%) had higher levels of education than

The effect of school meal supplementation with *Anethum graveolens* leaves on ADHD for mentally disabled children

mothers (23%).

Table (2). Fathers' education of ADHD mentally disabled children

Samples	Univ.		secondary		primary		Read & write	
	NO	%	NO	%	NO	%	NO	%
male	5	42%	2	17%	4	33%	1	8%
Down syndrome male	2	67%	1	33%	-	-	-	-
female	4	50%	2	25%	2	25%	-	-
Down syndrome female	2	100%	-	-	-	-	-	-
Total	13	52%	5	20%	6	24%	1	4%

Table (3). Mothers' education of ADHD mentally disabled children

Samples	Univ.		secondary		primary		Read & write	
	NO	%	NO	%	NO	%	NO	%
male	3	25%	2	17%	3	25%	4	33%
Down syndrome male	3	100%	-	-	-	-	-	-
female	2	25%	2	25%	2	25%	2	25%
Down syndrome female	1	50%	1	50%	-	-	-	-
Total	9	36%	5	20%	5	20%	6	24%

2- Nutritional status results:

Environmental factors, such as eating habits and feeding-related issues like food rejection, food selectivity, mealtime aggressiveness, rumination, and inadequate feeding skills, are known to make ADHD symptoms worse in people with developmental impairments. Food patterns results were shown in Table (4). It was demonstrated that protective foods, either cooked or fresh, were deficient and 86% of the sample did not eat yellow or red vegetables or leafy green vegetables and Fresh fruit. These results were in agreement with Logan and Jacka (2014) who stated that youngsters might be fussy eaters in several ways. This kind of situation occurs frequently, especially in children with ADHD. A typical fussy eater would probably separate anything green on their plate but would still eat the rest of their

meal. However, it might be quite taxing for children who have ADHD. A small bit of a green meal that an ADHD youngster cannot handle can cause hyperactivity, impulsivity, lack of sleep, or even irritability. When it comes to eating sugary foods, it has been found that children with ADHD often overlook wholesome options like vegetables and fish in favor of foods that are high in sugar. In the current study, all the samples ate sugary foods, juices, cakes, biscuits, soft drinks, Potato fried, and chips. It was clear that the highest percentage of the sample (49% & 33%) did not eat eggs and dairy product, respectively. Armstrong (2011) reported that the role of sugar is a contentious subject in ADHD children. Despite the fact that many parents of kids with and without ADHD see negative hyperactive behaviors to high sugar intake, numerous studies have shown this

connection. Additionally, some kids are more sensitive to sweets than others.

Table (4). Food patterns in MRC with ADHD.

Food item	Per day			Per week			Per month			Non
	1%	2%	3%	1%	2%	3%	1%	2%	3%	
Yellow or red vegetables				25%			30%			45%
Leafy green vegetables	35%				25%			20%		20%
Fresh fruit	20%			35%				24%		21%
Whole grains				22%				40%		38%
Fish, steamed, grilled, or tinned				2%			40%			58%
Fast foods				20%			40%	15%		25%
Red meat							20%			80%
Processed meats	15%			20%			40%	20%		5%
Potato, fried,	30%			15%	30%		20%	5%		--
Crisps	30%			50%	20%					--
Soft drinks	22%	15%		30%	20%		13%			---
Cakes, biscuits	50%			30%			20%			----
dairy products	2%			25%			40%			33%
Eggs	1%			20%			30%			49%
Juices	30%	10%		20%	40%					-----
Nuts							30%			70%
Added sugar	15%	10%		30%	20%		25%			----

It was obvious from Table (5) that 25g of Dill dried powder contains high minerals, specially magnesium, calcium, and iron (112.7, 446 and 12.9 mg, respectively). In addition, it contains high amounts of vitamin C (12.5 mg) and vitamin A (1.49 L.U.) Also, Rekha *et al.* (2010) claimed that dill leaves contain 36% carbs, 15.68% protein, 14.80% fiber and 8.39% moisture. Jana and Shekhawat (2010) reported that dill

leaves contain essential oils, fatty acids, vitamins and are a great source of minerals, proteins, and fibers. Dill leaves were used in conventional herbal therapy for a number of ailments, including as gastrointestinal issues, stomach discomfort, respiratory issues, insufficient breastfeeding, as well as the lowering of cholesterol and glucose (Goodarzi *et al.*, 2016).

Table (5). Nutritional value analysis of 25g Dill weed, dried powder according to USDA (2020).

Nutritional component	Mean	Nutritional component	Mean
energy	63.2 k.cal	Fe	12.19 (mg)
protein	4.99 (g)	Zn	0.8 (mg)
fat	1.073 (g)	mg	112.7 (mg)
Cho	13.9 (g)	Vit C	12.5 (mg)
ca	446 (mg)	VitA	1.46 (I.U)

It was clear from Table (6) that magnesium, calcium, and zinc intake were

found to be statistically significantly different between pre and post-dietary

The effect of school meal supplementation with *Anethum graveolens* leaves on ADHD for mentally disabled children

intervention, favoring post-intervention. It was also noted that there was a significant improvement in magnesium and calcium intake between pre and post-intervention, with a different ratio ranging from (54%-48%). This result agreed with Effatpanah *et al.* (2019) who demonstrated that children with ADHD had reduced serum magnesium insufficiency levels. This finding indicated that magnesium appears to be the supplement that helps hyperactivity.

Huang *et al.* (2019) found that ADHD children taken zinc and methylphenidate were performed significantly better than those taken methylphenidate alone. Several studies have shown that ADHD children are zinc deficient, and some recent trials have confirmed the benefit of zinc supplementation.

Table (6). Mean consumption and percentages of magnesium, zinc, and calcium Pre- and post-dietary intervention for children with ADHD.

Parameters	Mg(mg)		Zn(mg)		Ca(mg)	
	Pre	Post	Pre	Post	Pre	Post
Mean	168.3	299.9	15.1	16.2	662	1280
% RNI	70%	124%	188	202	50.3%	98.4%
SD±	43.9	40.14	272	225	88.3	121.4
DF	49		49		49	
T	19.3		3.4		34.4	
Sig.	0.00		0.00		0.00	

*P < 0.01

It was clear from Table (7) that there were no statistically significant differences in height, weight, or BMI of mentally disabled children with ADHD. The children with mental disabilities and ADHD had normal average heights of 131 cm and weights of 38 kg. Besides, all the samples had normal mean BMI (22) compared to WHO (2020) standard measures. These

findings conflicted with those of Bowling *et al.* (2017) who demonstrated that the BMI of the ADHD-positive group was higher than the non-ADHD-positive group and that this difference was not statistically significant. The same findings showed that the ADHD group's obesity rates were generally greater than those of the normal group.

Table (7). Pre and post anthropometric measurements for mentally disabled children with ADHD.

Parameters	weight		BMI	
	Pre	Post	Pre	Post
Mean	38.28	38.52	22.06	22.2
SD	7.78	7.71	3.22	3.25
DF	24		24	
T	-1.6		1.7	
Sig.	0.11		0.08	

Children with ADHD are more likely to exhibit the clinical symptom, which

includes poorer oral hygiene caused by numerous oral hygiene practices such nail

biting and item or pencil chewing, as well as dental problems. Due to motor, sensory, or intellectual problems, their capacity to conduct oral hygiene may be restricted. In addition, their susceptibility to poor oral health is increased by the related comorbidities, increased use of sugary foods, drugs, or limited utilization of preventative dental treatments (Dziwak *et al.*, 2017). It was evident from data in Table (8) that children with ADHD had many oral health issues, such as dental caries (32%), teeth loss (16%), and bruxism (20%). These findings were in line with Table (4), which showed that all of the samples consumed sweet foods such as juices, cakes, biscuits, soft drinks, fried potatoes, and chips. These findings supported those of Rosenberg *et al.* (2014) who found that dental caries is the most prevalent chronic illness in children with ADHD. Bacteria, food, oral hygiene, tooth

shape, salivary flow, and heredity are all common causes of caries. Compared to their healthy colleagues, patients with ADHD are more likely to have dental caries. Children with ADHD may be more likely to experience dental anxiety, poor oral hygiene, excessive consumption of foods and drinks that cause caries, demography, low IQ, low socioeconomic position of parents, and pathophysiological abnormalities. The same findings supported those of Ribeiro *et al.* (2023) who demonstrated that kids with ADHD had a variety of oral health issues, including a higher prevalence of mineralization disturbances in kids with ADHD and a higher prevalence of bruxism, particularly in kids taking amphetamine or methylphenidate. Compared to children with other psychiatric illnesses, children with ADHD have a higher risk of traumatic tooth injury.

Table (8). Clinical indicators in mentally handicapped children with ADHD before and after nutritional intervention.

Intervention	Teeth						Gums		Nails			
	Dental caries		Teeth loss		bruxism		bleeding		biting		spots	
	NO	%	NO	%	NO	%	NO	%	NO	%	NO	%
Pre-dietary intervention	8	32%	4	16%	5	20%	9	36%	4	16%	5	20%
Post dietary intervention	8	32%	4	16%	5	20%	7	28%	3	12%	4	16%

In the current study it was found that between the pre- and post-dietary intervention periods, there was an improvement in the gums and nails. In terms of gums, it was clear that there had been improvement in the percentage of pre- and post-intervention bleeding gums, which was 36% and 28%, respectively. In contrast, nail spots were 20% and 16% prior and post-intervention, and biting the nail was 16% and 12% pre and post-intervention, respectively. These findings corroborated those of Baghchechi (2020) who claimed

that children with ADHD appear to exhibit nail-biting as a more pronounced behavioral trait. In children with ADHD, there was a shorter window of time between the normal starting age for nail biting and the behavior. It's fairly typical for people to bite their nails, particularly kids. 30% of kids bite their fingernails. Biting your nails can cause infections and other negative effects on your fingers. These results are a direct result of the physical harm caused by biting or infected hands. Additionally, it may have

The effect of school meal supplementation with *Anethum graveolens* leaves on ADHD for mentally disabled children

social repercussions including social isolation and aversion to handshakes.

3- Behavioral statutes results:

It was obvious from results in Table (9) that there were statistically significant variations between the mother's average degree (189&158) before and after the dietary intervention, favoring the post intervention. Additionally, there were statistically significant differences in favor of the post-intervention between the mean degree of teacher participation (186 & 138) before and post-dietary intervention, respectively. Using the total degree of ADHD test, it was determined that there were statistically significant differences in the mean total degree (375&297) before and after dietary intervention, favoring the post intervention. These might be connected to an increase in calcium, magnesium, and zinc intake brought on by the inclusion of dill in school meals. It may be concluded that children with ADHD may benefit from vitamin or mineral supplementation. These findings were supported by Huss *et al.* (2020) who concluded that a lack of

magnesium is linked to cognitive function problems, which can result in symptoms like weariness, lack of focus, nervousness, mood swings, and hostility. These agree with Arnold *et al.* (2011) who reported that increasing zinc intake through food may benefit ADHD; patients who are deficient in zinc without requiring psychostimulant therapy since it may increase patients' receptivity to these drugs or at the very least, reduce the dosage required to effectively treat ADHD. However, these findings concurred with Firouzkouhi *et al.* (2017) who looked at the effects of a supplementation with magnesium, calcium, and zinc in a community of ADHD kids in Zahedan. They showed that after 8 weeks of treatment, the mean symptoms in the group treated with methylphenidate with the supplements were 19/5 6/1 (P 0.001).

Generally, it is clear from the current findings that children with ADHD can benefit from taking supplements of zinc, magnesium, and calcium.

Table (9). Mean Behavior Disorders Test scores for intellectually handicapped children with ADHD before and after nutritional intervention.

	Degree of Mothers Part		Degree of Teachers Part		Total Degree	
	Pre	Post	Pre	Post	Pre	Post
Mean	189.2	158.9	186.4	138.3	375.6	297.2
SD±	1.42	1.54	1.44	1.8	2.08	2.3
DF	24		24		24	
T	73.7		109.4		0.68	
Sig.	0.00		0.00		0.00	

***P < 0.01**

Conclusion:

Consumes *Anethum graveolens* Leaves Powder (25g/day) is a healthy source of magnesium, zinc, and calcium and can help children with ADHD symptoms in mentally handicapped youngsters. Also, a diet high in fruits, vegetables, whole grains, protein, and

healthy fats, while avoiding processed foods, salt, sugar, and fast food, may be good for the brain and ADHD, according to the researcher.

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The effect of school meal supplementation with *Anethum graveolens* leaves on ADHD for mentally disabled children

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تأثير تدعيم الوجبة المدرسية بأوراق الشبث المجفف على أطفال الأعاقة العقلية المصابين باضطراب نقص الانتباه وزيادة الحركة

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المستخلص

هدفت الدراسة الحالية إلى معرفة تأثير مكملات الوجبة المدرسية بمساحيق (أوراق الشبث المجفف) كمصدر جيد لعناصر (المغنيسيوم والزنك والكالسيوم) لتقليل أعراض اضطراب نقص الانتباه وفرط الحركة لأطفال الأعاقة العقلية. قد أجريت الدراسة الحالية على أطفال الأعاقة العقلية من المركز النموذجي للتثقيف الفكرى وقد شملت الدراسة على ٢٥ طفلاً تتراوح أعمارهم (٨-١٢ سنة). وتم استخدام استمارة البيانات الشخصية والاجتماعية والاقتصادية، والعادات الغذائية، وتاريخ النظام الغذائي، واسترجاع غذاء ٢٤ ساعة والعلامات الأكلينيكية هذا بالإضافة إلى اختبار اضطراب نقص الانتباه وفرط الحركة. كان التدخل التغذوي بأضافة ٢٥ جم من أوراق الشبث المجفف على كوب من الزبادى بالإضافة إلى الوجبة المدرسية العادية المقدمة. وقد أظهرت النتائج وجود تحسن كبير في تناول المغنيسيوم والكالسيوم بين التدخل القبلى والبعدى بنسبة مختلفة تراوحت بين (٤٨- ٥٤%). ومن ناحية أخرى وفقاً لاختبار نقص الانتباه وفرط الحركة كانت هناك فروق ذات دلالة إحصائية بين متوسط الدرجة الكلية (٣٧٥،٢٩٧) قبل وبعد التدخل الغذائي على التوالي لصالح التدخل البعدى. قد يرجع ذلك إلى زيادة مستوى المغنيسيوم والزنك والكالسيوم الناتج عن إضافة الشبث في الوجبة المدرسية. وقد توصلت الدراسة إلى أن تناول أطفال الأعاقة العقلية المصابين باضطراب نقص الانتباه وفرط الحركة (٢٥ جم من أوراق الشبث المجفف / يومياً) كمصدر جيد للمغنيسيوم والزنك والكالسيوم يمكن أن تساعد في تحسين أعراض اضطراب فرط الحركة ونقص الانتباه لديهم.

الكلمات المفتاحية: أوراق الشبث المجفف، أطفال الأعاقة العقلية، اضطراب نقص الانتباه و فرط الحركة، المغنيسيوم، الكالسيوم والزنك.