

## DIET THERAPIES FOR ADHD



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**Attention Deficit Hyperactivity Disorder (ADHD) is a debilitating behavioural disorder which can have an adverse effect on family relationships and quality of life. While conventional treatments are typically used to manage ADHD symptoms, studies suggest that diet therapy can also be helpful.**

This article discusses the scientific evidence behind various dietary interventions for ADHD, particularly those relating to elimination diets and fatty acid supplementation which seem to offer the most promise.

ADHD is a condition that can lead to inattention, impulsivity, over activity and disruptive behaviour (1) as shown in Table

1. Although ADHD is typically classified as a childhood disorder as it tends to present in the first six years of life, it persists into adulthood in 30 to 70 percent of cases (2), with the worldwide prevalence in adults estimated to be around 2.5% (1, 2).

The causes of ADHD are multifaceted, but are believed to result from a complex interplay between genetic and non-genetic factors, although more aetiological data is needed (4). What is known is that the long-term and challenging nature of this condition can place considerable strain on families while, for the

patient, hyperactivity and impulsivity take their toll on academic achievements and friendships (2). ADHD has been found to significantly reduce quality of life, with the risk of depression possibly having some involvement in this (5).

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(6). The cumulative expense of caring for individuals with severe forms of ADHD represents a significant cost for social and healthcare services (7), while being reported as unsatisfactory or unacceptable in some instances (8).

A growing body of literature points towards dietary change as an alternative way of addressing ADHD symptoms, either alone or as adjunct therapies. For example, Western-style diets, high in sugars and certain fatty acids have been associated with a higher risk of ADHD symptoms (7) while cer-

Table 1: Common problems associated with ADHD

Aggression  
Clumsiness  
Immature language  
Literacy problems  
Mood swings

Non-compliant behaviour  
Sleep disturbances  
Temper tantrums  
Unpopularity with peers

Source: Ruxton and Derbyshire (3)

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tain supplementation programmes, e.g. using fatty acids, zinc, magnesium and phytochemicals, have reasonable benefits for ADHD cases (9). Another advantage is that they encourage self-care in patients and families.

Taking these points into consideration, this article will review the use and efficacy of various dietary and supplement regimes for ADHD.

#### EXCLUSION/ELIMINATION DIETS

Beliefs that artificial food additives and dyes may contribute to hyperactivity in children were originally espoused in the 1970s by Dr Benjamin Feingold and are now enjoying a revival (10). A meta-analysis (11) of 24 studies looking at the effects of food colours and 10 studies on dietary restrictions found that diets restricting food colours provided some benefits for children with ADHD. However, it was noted that several were subject to publication bias.

Equally, the INCA study (12) (Impact of Nutrition on Children with ADHD; n=100), a randomised controlled trial (RCT) found that exposure to high or low immunoglobulin G (IgG) foods led to a relapse of ADHD symptoms in 63 percent of children when introduced after a five-week elimination diet. This implies that elimination diets are useful in establishing whether ADHD symptoms are food-induced.

Earlier work by the same research team found that 70 percent of children randomised to an elimination diet exhibited at least a 50 percent improvement in their behaviour (13). Overall, elimination diets in the form of reducing food colourings appear to be helpful in the management of ADHD symptoms.

#### LOW SUGAR DIETS

Although the causes of ADHD are largely unknown, one theory relates to disruptions in dopamine signalling as observed in various reward-deficiency syndromes, such as drug addiction. Subsequently, it has been proposed that excessive sugar intakes could have similar effects, contributing to ADHD symptoms (14).

The Raine Study (15), a prospective observational survey following 2,868 live births over 14 years, found that a 'Western'-type dietary pattern, characterised by high intakes of refined sugars, was significantly associated with increased ADHD risk. Similarly, another study (16) found that high intakes of sweetened desserts were associated with a greater risk of learning, attention and behavioural problems in Korean children with ADHD.

Although not conducted specifically on children with ADHD, findings from a cross-sectional study (17) of 3,361 German children showed that increased consumption of confectionary was associated with a greater likelihood of emotional symptoms. Other work (18) has revealed that choosing low glycaemic index foods, e.g. for breakfast, can improve markers of cognition in teenagers, such as memory and attention.

However, as all of these studies are observational, they cannot be used to determine cause and effect and further controlled research is required before assuming that adaptations to sugar intake or GI could influence ADHD symptoms.

#### FATTY ACID SUPPLEMENTS

It is now well accepted that omega-3 and omega-6 polyunsaturated fatty acids are needed for normal brain and nervous system function, with low intakes of omega-3s, in particular, being linked to

Table 2: Other dietary interventions to consider

Foods to avoid	Preferred foods
Takeaway fast foods	Fish, particularly oily
Processed meats	Lean red meat
Crisps, potato chips	Fresh fruits and vegetables
Soft drinks	Wholegrains
Foods with a high sugar content e.g. confectionary	Low-fat dairy products, nuts, seeds, dried fruit

Source: Adapted from Millichap & Yee (7) and Howard et al. (15).

neurocognitive disorders such as ADHD (19). A meta-analysis of 10 trials involving 699 children found that omega-3 supplementation, particularly eicosapentaenoic acid, was modestly effective in ADHD treatment and could help to augment pharmacological treatments (20).

These findings are supported by other studies. For example, in a 12-month RCT (21), 90 children with ADHD were randomised to take an omega-3/6 supplement (Equazen eye q™), methylphenidate (a medication used to treat ADHD by increasing brain dopamine levels), or omega-3/6 supplementation, plus methylphenidate. It was found that the supplements offered similar benefits to the medication, although the combined effect of the supplement, plus medication was most effective. Similarly, an earlier study (22), which randomised 75 children with ADHD to take an omega-3/6 supplement versus a placebo for three months, followed by a period of open phase supplementation, showed that plasma fatty acid composition significantly improved in responders (defined as those who had a 25 percent reduction in ADHD symptoms after six months).

Other work randomising children already on methylphenidate to take an omega-3/6 supplement versus placebo for six months showed that signs of inattention, impulsiveness and co-operation with teachers/parents significantly improved in the group receiving the omega-3/6 supplement (23).

#### VITAMIN AND MINERAL SUPPLEMENTS

There is accumulating evidence that iron deficiency may contribute to ADHD symptoms. This assumption makes sense given that iron is needed for nerve cell function in the brain (the dopaminergic system) and can influence cognitive

function (24). A cross-sectional study (25) of 713 children and teenagers with ADHD found that hyperactivity scores were significantly inversely associated with ferritin levels.

Similar findings were seen in a study where children with low ferritin levels ( $\leq 30$ ng/ml; six to 14 years of age) were treated with ferrous sulphate (4.0mg/kg/day) for three months. The intervention was found to successfully manage ADHD symptoms in those cases categorised as inattentive (24). In a RCT (26) on ADHD children aged five to eight years with low ferritin levels, ADHD symptoms significantly improved in children randomised to take 80mg/day ferrous sulphate for 12 weeks compared with a control group. Iron therapy was well tolerated. The impact of iron on ADHD, as well as cognitive function in healthy children, is worth exploring further, given that iron deficiency affects 13 percent of preschool children and four percent of older children, while low ferritin levels are seen in up to 18 percent of children (27).

In terms of other programmes, a RCT (28) of 80 adults with ADHD, allocated to take either a vitamin-mineral or placebo supplement for eight weeks, showed that micronutrient supplementation improved ADHD symptoms, especially amongst those with depression at baseline.

#### DISCUSSION

Interest has been growing in the potential of diet therapies to benefit ADHD patients, either alone or alongside conventional drug treatments, not least because of the risk of side effects with ADHD drugs. As identified in this review, elimination diets (particularly for food additives/colourings), supplementation with omega-3/6 fatty acids and iron supplementation, appear to offer the most promise ▶

for reducing ADHD symptoms in children. That said, further rigorously designed RCTs are needed, given that baseline nutrient/fatty acid status could influence the efficacy of dietary interventions. Other dietary modifications that may be of benefit to children with ADHD are suggested in Table 2.

Given the increased awareness and diagnosis of ADHD, health professionals can support ADHD patients and their parents/carers by offering evidence-based advice on the potential of diet therapies, as well as identifying which interventions are of most relevance to individuals. While sugar reductions and avoidance of certain food additives could prove challenging for many families, particularly those that rely on processed foods, supplementation with fatty acids or iron could represent a simple, achievable option.

However, as with other conditions, advice on supplementation and dietary modification should

be sought from healthcare professionals to ensure that they complement other treatments. In addition, the evidence suggests, at least for omega-3/6 supplements, that dietary therapies seem to work best when used alongside medication.

## CONCLUSION

In conclusion, ADHD is a complex behavioural condition, often impacting on work, family relationships and social interactions with peers (9). There is growing evidence that dietary modifications may help to support the management of ADHD with the most promising results seen in trials of fatty acid supplementation, iron supplementation and avoidance of certain food additives.

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