

**The effects of taking iron supplements on children who suffer from
attention deficit hyperactivity disorder**

Abstract :

The purpose of this study was to investigate whether or not ADD/ADHD youngsters benefited from taking iron supplements. Between 4% and 12% of school-aged children are diagnosed with attention deficit hyperactivity disorder (ADHD), a neurobiological syndrome characterized by a persistent pattern of inattention, hyperactivity, and impulsive behaviors that, if left untreated, can progress into anxiety and depression in adulthood. This disorder appears to affect roughly the same amount of males and females as adults, however it is more common in youth. For the purpose of providing an explanatory research design, this study employed a mixed research strategy, which makes use of both qualitative and quantitative data and research methods. conclusion Adolescents with attention deficit hyperactivity disorder frequently struggle with low self-esteem, problematic interpersonal interactions, and poor scholastic outcomes. There are occasions in which the symptoms lessen with time. However, ADHD can be a lifelong condition for certain people. However, with guidance and effort, everyone can succeed. Although ADHD treatment cannot completely eradicate the condition, it can considerably alleviate its symptoms. Treatment often consists of a combination of medication and Behavioural therapy. Prompt diagnosis and treatment can significantly improve outcomes.

المخلص :

كان الغرض من هذه الدراسة هو التحقق مما إذا كان الأطفال المصابون باضطراب فرط الحركة ونقص الانتباه قد استفادوا من تناول مكملات الحديد أم لا. يتم تشخيص ما بين 4% و 12% من الأطفال في سن المدرسة باضطراب نقص الانتباه وفرط النشاط (ADHD) ، وهو متلازمة عصبية بيولوجية تتميز بنمط مستمر من عدم الانتباه وفرط النشاط والسلوكيات الاندفاعية التي ، إذا تُركت دون علاج ، يمكن أن تتطور إلى القلق والاكتئاب في مرحلة البلوغ. يبدو أن هذا الاضطراب يؤثر تقريباً على نفس عدد الذكور والإناث مثل البالغين ، ولكنه أكثر شيوعاً عند الشباب. لغرض تقديم تصميم بحث توضيحي ، استخدمت هذه الدراسة استراتيجية بحثية مختلطة ، والتي تستخدم كل من البيانات النوعية والكمية وطرق البحث. الخلاصة يعاني المراهقون المصابون باضطراب فرط الحركة ونقص الانتباه في كثير من الأحيان من تدني احترام الذات والتفاعلات بين الأشخاص والمشاكل والنتائج الدراسية السيئة. هناك حالات تقل فيها الأعراض بمرور الوقت. ومع ذلك ، يمكن أن يكون اضطراب نقص الانتباه مع فرط النشاط حالة تستمر مدى الحياة لبعض الأشخاص. ومع ذلك ، مع التوجيه والجهد ، يمكن للجميع النجاح. على الرغم من أن علاج اضطراب فرط الحركة ونقص الانتباه لا يمكن أن يقضي تماماً على الحالة ، إلا أنه يمكن أن يخفف أعراضه بشكل كبير. غالباً ما يتكون العلاج من مزيج من الأدوية والعلاج السلوكي. يمكن أن يؤدي التشخيص والعلاج الفوريان إلى تحسين النتائج بشكل كبير.

Introduction :

Four to twelve percent of school-aged children are diagnosed with attention deficit hyperactivity disorder (ADHD), a neurobiological syndrome characterized by a persistent pattern of inattention, hyperactivity, and impulsive behaviors that, if untreated, can progress into anxiety and depression in adulthood. This condition appears to strike an equal number of men and women as adults, however its prevalence is higher in children. South American, African, and Oceanian countries also have the highest reported rates of ADHD (Mahone ,2017).

Academic failure, difficulty communicating with family members, antisocial behaviors, and low self-esteem are all possible outcomes for children with ADHD. Infantile hyperactivity, poor sleep habits, and excessive crying have all been linked to the development of attention deficit hyperactivity disorder. The most common symptoms of attention deficit hyperactivity disorder (ADHD) are problems paying attention, being overly active, moving around too much, feeling a lack of control over their emotions, being easily distracted, acting without thinking, having trouble remembering things, having trouble concentrating, having trouble learning, being hostile, and not listening (Venkatesh et al ,2012).

Due to its complexity, the etiology and pathophysiology of ADHD remain poorly understood. New evidence lends credence to the idea that a combination of genetic and environmental factors contribute to the development of ADHD and other neuropsychological disorders (Liebrenz et al ,2015).

Methylphenidate is the standard first-line treatment for attention deficit hyperactivity disorder (ADHD); nevertheless, many studies have shown that psychiatric intervention is also necessary for effective treatment. The potential significance of iron deficiency in the pathophysiology of attention deficit hyperactivity disorder (ADHD) has been demonstrated in clinical and laboratory research. Poor focus and behaviour are common symptoms of iron insufficiency. Children with iron deficiency anaemia have been demonstrated in prospective studies to suffer social and academic setbacks. Reduced intelligence, difficulties with motor skills, spatial memory, and selective attention are just some of the long-term effects of iron deficiency in children, with or without anaemia. Alterations in myelin structure, followed by dysfunction in cortical fibres and the dopaminergic system, are connected with low iron content. Dopamine is synthesised in part because of the cofactor iron, which is linked to the dopamine reducer amino-oxidase activity. Researchers have identified dopamine as a critical factor in the development of ADHD. As a result, iron accumulation in the brain might be helpful for dopamine-dependent processes and ADHD symptoms (Liebrenz et al ,2015).

Despite the fact that higher serum ferritin levels are linked to a higher risk of developing attention deficit hyperactivity disorder (ADHD), further research is needed to determine whether or not iron supplementation can alleviate ADHD symptoms. In this study, researchers looked at how supplementing with iron (ferrous sulphate) affected the symptoms of ADHD in children (Carbray,2018).

Five to ten percent of children in school have attention deficit hyperactivity disorder, making it the most common neurobehavioral disease among children. It's marked by inattention, hyperactivity, and impulsivity that don't belong in a child of that age, as well as impaired functioning in two or more contexts. This research aimed to effects of taking iron supplements on children who suffer from attention deficit hyperactivity disorder

Literature Review

One of the most frequent psychiatric problems is attention-deficit/hyperactivity disorder (ADHD), which is also a major reason for referral to child psychiatry clinics around the world. Problems with academic performance and social functioning may arise for children with ADHD because of symptoms like hyperactivity, impulsivity, and inattention. Some studies have linked ADHD with an increased risk of developing a variety of health problems, including but not limited to early initiation of tobacco and substance use, accidental accidents, trouble sleeping, obesity, and dietary deficiencies. The exact cause of ADHD is still unknown, although researchers suspect a combination of genetic and environmental factors(Magnin, 2017).. The disruption of neurotransmitters is assumed to be the molecular aetiology of attention deficit hyperactivity disorder (ADHD), which is associated with a dysfunctional frontalsubcorticalcerebellar catecholaminergic circuit and aberrant dopamine transporters. Methylphenidate, the drug of choice for treating ADHD in children, boosts norepinephrine and dopamine levels by preventing their resorption and is used to treat the disorder due to the aforementioned factors (Wang et al ,2017).

Childhood and adolescent attention deficit hyperactivity disorder (ADHD) is characterised by excessive, pervasive, persistent, and disabling patterns of inattention, overactivity, and impulsivity. Family doctors, paediatricians, neurologists, and psychiatrists who work with children and adolescents report that this is a prevalent basis for patient referrals in the field of mental health. Symptoms of attention deficit hyperactivity disorder (ADHD) have been observed to remain in people into adolescence and into adults, despite the disorder's traditional association with children. One-third to one-half of those who are diagnosed with the illness as children will continue to struggle with symptoms throughout adulthood. It causes problems in many different areas of a kid's life and prevents them from developing normally. Academic underachievement, social isolation, and antisocial behaviour are common among children with ADHD in school, and these problems often persist into adulthood. One of the most prevalent children neurodevelopmental diseases is attention-deficit/hyperactivity disorder (ADHD) (Singh,2015).

Symptoms of attention deficit hyperactivity disorder:

Inattention, hyperactivity, and poor behavior regulation are the three main hallmarks of attention deficit hyperactivity disorder (ADHD) (impulsivity). People with ADHD often struggle with inattentive symptoms. Some people exhibit mostly hyperactive and impulsive behavior. Many others experience a wide range of symptoms. Some people with mostly inattentive symptoms are diagnosed with Attention Deficit Hyperactivity Disorder (ADD). They are typically less disruptive and less likely to be diagnosed with attention deficit hyperactivity disorder (Safavi, et al ,2016).

- Inattentive Symptoms:

- Makes thoughtless errors or fails to pay attention in class.
- Trouble staying focused on activities or games.
- Does not seem to pay attention when addressed directly.
- Is unable to follow through on responsibilities and assignments, either at school or around the house.
- Has trouble keeping track of things to do.
- Has a strong aversion to activities that require constant mental exertion and would rather not do them (such as schoolwork).
- Drops or misplaces things frequently, including toys, homework, utensils, books, and equipment.
- Has trouble focusing on one thing for long.
- Is prone to forgetting simple tasks regularly (Fassbender,2015).

- Hyperactivity Symptoms:

- Shifts about on the seat, tapping their feet or tapping their hands.
- Disrupts the status quo by getting up from a seated position when it is expected that they will remain seated.
- Interrupts what should be a quiet moment by running or climbing.
- Trouble maintaining a calm environment when playing or working.
- Is constantly "on the go," "motoring" along as if propelled by an invisible force.
- Excessive babbling (Gapin , 2011).

- Impulsivity Symptoms

- interrupts the questioner with a response before they're finished
- Finds it hard to wait one's turn interferes with the work of others (butts into conversations or games) (Arnold , 2012).

- Various Signs

Symptoms of attention deficit hyperactivity disorder (ADHD) in males and girls differ greatly, and boys are significantly more likely to be diagnosed with ADHD than girls. Why? It's possible

that the ADHD symptoms boys experience are more overt than those girls experience. Many stereotypical behaviours associated with ADHD are more common in boys. Lack of focus, including inattentiveness, impulsivity/"acting out," hyperactivity (e.g., running, hitting), Because it's not "normal" ADHD behaviour, physical aggression in girls with ADHD can be easy to miss. Unlike in males, the symptoms here are less noticeable. Some examples of these are: having low self-esteem and worry; having trouble concentrating or having a tendency to "daydream;" and being verbally aggressive (via mocking, taunting, or name-calling) (Arnold , 2012).

Evaluation of attention deficit hyperactivity disorder:

Clinical interviews with the caregiver and patient, information about the patient's functioning at school or day care, evaluation for comorbid psychiatric disorders, and review of the patient's medical, developmental, social, and family history should all be part of the evaluation process for attention deficit hyperactivity disorder in children and adolescents (Golmirzaei et al ,2013).

Ideally, the patient should be observed clinically more than once, and ideally in different locations. If there is a disagreement between what the parent and the teacher say, or if there is any doubt regarding the diagnosis, a visit to the school is advised. In most cases, it's best to have a clinician who is unfamiliar to the child conduct school observations (Golmirzaei et al ,2013)..

Establishing whether or whether the kid or adolescent meets diagnostic criteria is a crucial first step. Establishing the presence or absence of each of the 18 symptoms, establishing a chronic course, establishing an onset prior to the age of 7, and establishing that the symptoms are related with functional impairment are all necessary. The child's emotional symptoms should be investigated because of the high likelihood of misdiagnosis of other mental diseases, especially anxiety disorders, as ADHD (e.g. worry, anxiety, beliefs, somatic symptoms, etc.). Some symptoms of ADHD and oppositional defiant disorder overlap, therefore a misdiagnosis between the two is possible (Amiri,2012).

Also important is determining the presence of any co-occurring disorders, the most frequent of which are oppositional defiant disorder and conduct disorder. Besides intellectual disability and mania and depression and anxiety and tic disorders and substance addiction and learning disabilities are also common co-occurring disorders. Symptoms of inattention and hyperactivity may be caused by a condition other than attention deficit hyperactivity disorder. There are instances, however, where a child's ADHD-related symptoms do match diagnostic criteria for a disease. Child depression can result from the effects of attention deficit hyperactivity disorder (ADHD) in many ways, including social isolation and scholastic difficulties. In conclusion, a youngster may meet the criteria for both ADHD and another disorder. In such circumstances, it may be necessary to treat both illnesses separately (Machado et al ,2015).

Even while a physician, teacher, and parent can all fill out a symptom scale to help, it should never be used alone to make a diagnosis. However, scores in the extreme range should raise the red flag. One of the primary functions of symptom measures is to track improvement in response to treatment (Machado et al ,2015).

Untreated ADHD in family members is a typical finding, thus it's necessary to conduct a family history evaluation. The referred kid or teenager may also benefit indirectly from family members receiving treatment. Children and adolescents with attention deficit hyperactivity disorder (ADHD) do better in organised surroundings, whereas an unstructured environment may be the result of parental ADHD.

Laboratory or neurological testing:

It is usually possible to determine whether or not the symptoms of ADHD are caused by a medical problem by taking a patient's medical history and performing a physical examination. Brain damage, hyperthyroidism, encephalopathies, lead poisoning, and foetal alcohol syndrome are just some examples of these types of illnesses. Laboratory or neurological testing is not indicated in the absence of particular signs of such disorder. While an electroencephalogram (EEG) showing no signs of a seizure disorder is beneficial, it is important to keep a high index of suspicion because of the high prevalence of epilepsy in patients with attention deficit hyperactivity disorder (ADHD).

Although they are not required for a diagnosis of ADHD, psychological and neuropsychological evaluations should be conducted if a patient's history points to subpar intelligence or if the patient's academic performance in language

or mathematics appears to be below average. Testing difficulties are a common problem for people with ADHD because of their inability to focus and their tendency to act without thinking things through. Results should be interpreted with this in mind, and considered definitive only after the child is receiving effective treatment for ADHD. Lack of school success is a common symptom of ADHD in children and teenagers. The doctor must determine if the low educational attainment is solely attributed to ADHD, if the symptoms attributable to ADHD are the result of other learning or language impairments, or if both ADHD and other problems are present. It is important to keep in mind that not all language and cultural groups will have access to tests or conventions when interpreting the results (Yang,2019).

Some of the things that can increase your chances of developing ADHD are:

Attention Deficit Hyperactivity Disorder has a complex and poorly understood pathogenesis. In spite of this, there is mounting evidence that points to a mismatch between the dopaminergic and noradrenergic systems. As a cofactor for tyrosine hydroxylase, the rate-limiting enzyme in monoamine synthesis, iron regulates the creation of dopamine and noradrenaline. Further, iron deficiency in animal models reduces dopamine receptor density and activity and alters monoamine uptake and catabolism. Thus, it is hypothesized that iron deposits in the brain play a role in the abnormalities in monoamine-dependent activities seen in ADD/ADHD (Safren,2017).

- Having a first-degree relative (parent, sibling, etc.) who has ADHD or another mental illness.
- Contact with harmful chemicals in the environment, such as the lead that can be present in older homes' paint and plumbing.
- Tobacco, alcohol, and other drug use by the mother.
- Mothers' contact with environmental toxins, such lead paint,
- PCBs (polychlorinated biphenyls) in the womb.
- Despite sugar's widespread suspicion as a cause of premature delivery,
- There is no solid evidence that they cause hyperactivity. Distraction in children is common, but it doesn't mean it's ADHD.

Pharmacological treatment

The use of psychostimulants in the pharmacotherapy of attention deficit hyperactivity disorder is one of the most well-established and reliably effective treatments in the field of psychiatry. Consistent evidence of effect has been found in areas including symptomatic improvement, improved cognitive, social, family, and academic functioning, and reduction of nondiagnostic symptoms commonly associated with the condition. These symptoms include irritability, aggressive outbursts, and difficulties with fine motor co-ordination. Methylphenidate has been shown to have large effects in the clinic, with effect sizes ranging from 0.8 to 1.1. Methylphenidate is strongly recommended for use as a treatment for young individuals (school-age through adolescent) with ADHD, according to the results of the largest study of ADHD treatment to date (the Multimodal Treatment Study of Children with ADHD (MTA)) (Geffen ,2018). It is recommended to begin treatment with the smallest effective dose (typically between 5 and 10 mg) of a short-acting formulation once daily, in the morning. Short-acting methylphenidate has a half-life of around 3 hours, so the instructor should have enough time to report on its effectiveness within the first few hours of class. If it doesn't work, you might try increasing the dosage by 10–20 mg. Initiating treatment with more than 1 mg/kg/day is not recommended. The dose can be given again at 11h00, and the results recorded, if desired. As a next step, switching to a long-acting formulation may be considered. In the event that an ideal dose still fails to elicit an adequate response, the procedure for partial and non-responders should be implemented. On rare occasions, doses more than 1 mg/kg/day may be required; however, these cases should only be discussed with a child and adolescent psychiatrist (Lange et al ,2017).

Methylphenidate's side effects consist of things like headaches, sleep disturbances, stomach pain, and a loss of appetite (which can lead to a loss of weight or an inability to gain it). Anxiety and depression may be aggravated by methylphenidate, causing many doctors to choose alternate drugs for children with comorbid anxiety or mood disorders. Methylphenidate carries a Food and Drug Administration black box warning in regard of a slightly increased danger of sudden death. If there is a history of heart illness or sudden death in the family, or if the kid has

a personal history of fainting or heart problems, the treating physician should seek the advice of a cardiologist before beginning psychostimulant therapy. Most authorities do not consider it necessary to perform a baseline electrocardiogram in the absence of these risk factors (Yüce et al ,2013).

Methylphenidate use has been linked to an exacerbation of tics in children and adolescents with tic disorders. Some students will weigh the benefits of increased tics against the possibility of enhanced academic performance, while others will want to explore other treatment options. Methylphenidate should not be prescribed to anyone who are manic or psychotic. Although there is no evidence that methylphenidate can lead to physical dependence, it should be explored for individuals with co-occurring drug use disorders (Molina,2014) .

A variety of other drugs have shown therapeutic efficacy in treating ADHD symptoms across the lifespan, from early childhood to maturity. The noradrenergic reuptake inhibitor atomoxetine has been the subject of the most research. Patients with an active drug abuse issue, co-occurring anxiety or tics, patients who experience unbearable side-effects to methylphenidate, or patients who prefer this medication should consider it the agent of first choice, despite smaller treatment effect sizes compared to methylphenidate. Atomoxetine dosage begins at 0.5 mg/kg/day and can be increased to 1.2 mg/kg/day over the course of at least 3 days. Although adverse effects are usually moderate, serious liver damage is possible, hence periodic cardiovascular monitoring is necessary. Informed permission and sufficient psycho-education of patient and caregivers is required because atomoxetine is among the category of medications that may promote suicidality in children and adolescents. The effectiveness of bupropion and clonidine, together with the tricyclic antidepressants (desipramine and imipramine), is less well established. In comparison to methylphenidate, these drugs have a limited amount of research data, a shorter amount of clinical experience, the possibility for more frequent medically relevant side-effects, and a higher price tag, hence they may be regarded second-line pharmacotherapy choices (Cheatham, 2019).

Non-pharmacological treatment :

When dealing with extremely young children or those whose challenges are relatively moderate and do not necessitate quick relief, behavioural programmes are the first line of treatment. Non-medical individuals, including mental health nurses or psychologists, can deliver these programmes, given sufficient training. It's possible that parent support groups dedicated to children with ADHD would be useful in this regard (Feldman,2014).

The most effective behavioural programmes often last for 10-20 sessions of 1–2 hours each, during which parents are educated on ADHD and taught how to:

- Pay closer attention to their child's actions and take note of their adherence to or defiance of rules and regulations.
- You must learn the fundamentals and practises of behaviour control.
- Put time out to good use.
- Make use of a daily report card at school.
- Plan ahead for potential challenges (Evans,2014).

Prevention of attention deficit hyperactivity disorder:

In order to lessen the likelihood that your child may have attention deficit hyperactivity disorder, it is important to take precautions while pregnant to ensure the health of the unborn child. Don't indulge in harmful vices like tobacco, nicotine, or narcotics. You should stay away from environmental pollutants like polychlorinated biphenyls (PCBs). Avoid exposing your child to harmful substances like secondhand smoking, pesticides, industrial chemicals, and lead paint (found in some old buildings) (Mikolajczyk et al ,2015).

Previous studies:

In study of Tohidi,2021, the researchers looked at how adding iron (ferrous sulphate) to the diets of kids taking methylphenidate for attention deficit hyperactivity disorder affected their symptoms. Fifty kids on methylphenidate for ADD/ADHD who didn't have anaemia and whose ferritin levels were below 30 ng/ml participated in a randomised, placebo-controlled research trial. Over the course of 12 weeks, half were given ferrous sulphate and the other half were given a placebo. The effectiveness was evaluated using the Conners' Parent Rating Scale (CPRS) after the first, sixth, and twelfth weeks of treatment. The ferrous sulphate group showed statistically significant improvement across the board on the CPRS, with the exception of the conduct subscale ($p = 0.003$). Intergroup comparison revealed no

statistically significant differences in mean changes in scores between the groups. Also, compared to the placebo group, the ferrous sulphate group showed significant improvement on the learning difficulties ($p = 0.007$), conduct ($p = 0.023$), and psychosomatic ($p = 0.018$) subscales after six weeks. Through this investigation, we found that iron supplementation had a positive impact on CPRS subscales.

According to Panahandeh et al ,2017 One of the most prevalent childhood psychiatric diseases, attention deficit/hyperactivity disorder (ADHD) is also one of the most complex. The purpose of this research was to see if the addition of ferrous sulphate to methylphenidate would have any influence on the severity of ADHD symptoms. This study was a double-blind, randomised clinical trial. Children with attention deficit hyperactivity disorder (ADHD) with serum ferritin levels below 30 mg/ml were recruited for this study ($n = 42$; convenience sampling) and randomly divided into two groups (cases and controls; $n = 21$ each). Age and sex disparities between the two groups were eliminated. The case group received ferrous sulphate 5 mg/kg in addition to methylphenidate up to 1 mg/kg, while the control group received only methylphenidate. The ratings on child symptoms inventory-4 (CSI-4) were recorded at baseline and after 2 months of treatment. Statistics were run with SPSS 16 using the t-test, Pearson's correlation, and repeated-measures ANOVA. The scores on CSI-4 declined significantly at month 2 in both groups ($P < 0.001$). The scores on attention deficit and hyperactivity subscales of the CSI-4 were substantially lower in the case group than the control group ($P < 0.05$). Compared to the control group, the case group saw a greater decline in their CSI4 total score ($P 0.04$). Use of ferrous sulphate + methylphenidate can be useful in lowering ADHD symptoms in nonanemic children with low blood ferritin.

Children's attention deficit hyperactivity disorder (ADHD) may be exacerbated by a lack of iron, according to some research. In this study, researchers looked at how adding iron to a child's diet affected their symptoms of attention deficit hyperactivity disorder (ADHD). Twenty-three children (ages 5-8) who did not have anaemia but whose blood ferritin levels were below 30 ng/mL and who matched DSM-IV criteria for attention deficit hyperactivity disorder were randomly assigned to receive either oral iron (ferrous sulphate, 80 mg/day, $n = 18$) or placebo ($n = 5$). After 12 weeks, the ADHD Rating Scale scores of those given iron decreased significantly (11.0 13.9; $P 0.008$) but did not change significantly (0.0 5.7%; $P = 0.308$) for those given placebo. There was no statistically significant improvement on the Conners' Parent Rating Scale ($P = 0.055$) or the Conners' Teacher Rating Scale ($P = 0.076$) after iron supplementation therapy. At 12 weeks, those receiving iron had a considerably lower mean Clinical Global Impression Severity than those receiving placebo ($P 0.01$). Children with low serum ferritin levels may benefit from iron supplementation (80 mg/day), pointing to the need for further study with bigger controlled trials (Konofal et al ,2008)

For children and adolescents, Attention Deficit Hyperactivity Disorder (ADHD) is the most common mental health issue. In children with attention deficit hyperactivity disorder, zinc and iron levels are typically the first to be checked. The current study set out to address this issue by exploring the potential connection between low serum levels of iron and zinc in patients with ADHD and the onset or worsening of a variety of ADHD symptoms. Participants and Procedures This study included 42 children between the ages of 4 and 14 whose parents reported problems with their children's attention, hyperactivity, or academic performance. All of the children who participated in the study underwent a comprehensive medical evaluation that included a full medical history, a physical exam, a neurological assessment, and a battery of laboratory tests. Results, The case population had significantly lower levels of Fe and Zn than the control population did. The prevalence of low Fe and Zn levels also increased significantly among patients compared to controls. There was a statistically significant inverse association between Fe and Zn levels and parent and teacher evaluations. Furthermore, a correlation between Zn and Fe concentrations was discovered. Patients with low Zn levels exhibited a significantly higher prevalence of ADHD C and PH, as well as severe ADHD, compared to cases with normal Zn levels. Patients with low levels of iron and zinc may be at a higher risk for developing ADHD symptoms, as serum levels were found to have a strong link with parent-reported hyperactive symptoms (El-Saadany et al ,2022).

Preschoolers, kids, teens, and adults of different ages and backgrounds are affected by Attention Deficit Hyperactivity Disorder (ADHD), a neuropsychiatric disorder. The dopamine deficit theory is the most popular explanation for what causes ADHD, and it depends on iron being present in the body for dopamine synthesis to occur. Accordingly, people with attention deficit hyperactivity disorder should keep an eye on their serum iron levels. This paper presents six cases to demonstrate the usefulness of diagnosing and treating ID with oral iron supplementation in the effective management of patients with ADHD. All six cases treated with oral iron supplementation in addition to methylphenidate showed improvement in inattentive domain and hyperactivity-impulsivity domain in both the home and school contexts. They were administered methylphenidate and an oral iron supplement at the required body weight. Both parents and teachers were given a 26-item version of the Swanson, Nolan, and Pelham Rating Scale (SNAP-IV) to rate their children on. Both initial and three-month therapy SNAP-IV scores were recorded. Afterwards, the participants' test scores were compared to see if their ADHD symptoms had diminished (Ghogare et al ,2020).

There is mounting evidence that suggests that iron deficiency, among other micronutrient deficiencies, may increase the risk of attention-deficit hyperactivity disorder (ADHD) in children. To further understand the connection between attention deficit hyperactivity disorder and iron levels or iron deficiency, we did a meta-analysis (ID). To this end, we conducted a search of the PubMed, ScienceDirect, Cochrane CENTRAL, and ClinicalTrials.gov databases until August 9, 2017. Primary outcomes included the pooled adjusted odds ratio (OR) of the link between ADHD and ID, variations in peripheral iron levels between children with ADHD and healthy controls (HCs), and the severity of ADHD symptoms between children with and without ID (Hedges' g). There were a total of seventeen items that made the cut. Children with ADHD had lower peripheral serum ferritin levels than typically developing children (children with ADHD = 1560, HCs = 4691, Hedges' g = 0.246, p = 0.013), but there was no significant difference in serum iron or transferrin levels between the groups. Furthermore, there was a significant connection between ADHD and ID (OR = 1.636, p = 0.031), and the severity of ADHD was considerably greater in children with ID than those without ID (with ID = 79, without ID = 76, Hedges' g = 0.888, p = 0.002). We found that both ADHD and ID were linked with decreased serum ferritin levels. Confirming these correlations and elucidating possible causes would require further longitudinal research (Tseng et al ,2018).

Methods:

Based on their goals, researchers can classify their work as either exploratory, descriptive, or explanatory. The first is used when one has to find new knowledge, define terms, discover how something works, or evaluate a phenomenon. The primary objective of this sort of investigation is to form a hypothesis. This approach to research has received high marks for its adaptability. The goal of descriptive research is to offer a vivid image of a topic of study. Before diving into the research, the investigator needs to have a clear idea of what they're looking for. Consequently, it is critical that all necessary modifications be done before the start of the study process. On the other hand, explanations lay out the causal relationships between the many factors involved (Lambert,2012). This study used a mixed research strategy, which combines or integrates qualitative and quantitative data and research methods, to provide an explanatory research design .

Result :

Myelin sheath creation, transducer production, and neuronal metabolism all rely on iron, making it a crucial and highly efficient component. It has a role in the structure and transport of proteins in the brain and is a cofactor of many enzymes. Iron deficiency is the most frequent of all micronutrient deficiencies. Myelination problems and disturbances in monoamine metabolism are the results of an iron shortage. For children in particular, these shifts can lead to a variety of mental and emotional issues, including difficulties with learning, memory, and motor skills. Serum ferritin levels in ADHD patients are decreased compared to healthy controls, according to around studies. all found that people with ADHD eat less calories and less iron than people without the disorder.

However, whether serum ferritin is an accurate measure of iron storage in the brain is a matter of some disagreement. Serum ferritin is an intracellular protein that accumulates iron. While serum iron can be used to diagnose iron deficiency anaemia, serum ferritin is a more sensitive marker that can be used to diagnose iron deficiency anaemia in its earliest stages, even in nonanemic individuals.

An essential cofactor of the tyrosine hydroxylase enzyme and a bottleneck in the production of dopamine, iron is also involved in the process. Increased levels of extracellular dopamine and decreased striatal dopamine receptor abundance have both been linked to iron insufficiency. Results showed that children with ADHD had lower iron levels in the thalamus compared to controls, suggesting that low iron levels in the thalamus may play a role in the development of the disorder.

Conclusions:

Millions of kids have attention-deficit/hyperactivity disorder (ADHD), and it typically follows them into adulthood. Inattention, hyperactivity, and impulsive actions are all symptoms of attention deficit hyperactivity disorder (ADHD). Children with ADHD often have difficulty with low self-esteem, challenging interpersonal interactions,

and subpar academic outcomes. In some cases, symptoms improve with age. Some people, however, suffer from ADHD throughout their entire lives. But with practice and instruction, individuals can achieve their goals. Treating ADHD won't eliminate the disorder entirely, but it can significantly reduce its symptoms. Medications and Behavioural therapies are commonly used in treatment. Outcomes can be greatly improved by prompt diagnosis and treatment.

Serum ferritin levels are lower in children with ADHD than in children without the disorder. Additionally, we found that kids with ID had a higher prevalence of ADHD and more severe ADHD symptoms than kids without ID.

Therefore, we propose that more research is needed to examine the efficacy of iron supplementation in children with ADHD with ID, particularly those with more severe ADHD symptoms.

Children with attention deficit hyperactivity disorder (ADHD) generally struggle socially and academically, and they may have issues establishing and keeping friends. Untreated ADHD can cause problems in the classroom, on the job, and in personal relationships. Boys are more likely to have ADHD and have symptoms including impulsivity and hyperactivity. Girls with ADHD often struggle with paying attention, but they may not be recognised since they are less likely to cause problems in class.