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Attention Deficit Hyperactive Disorder and Physiotherapy: A Review of Literature

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Abstract

Background: The Attention deficit hyperactivity disorder (ADHD) is the condition commonly affecting in pediatric population. Characterized by Children exhibiting high levels of physical movement, lack of focus, and impulsiveness etc. Signs generally seen in young age and encompass a decrease of concentration, attention, inorganization, trouble finishing activities, forgetfulness, and losing items which affects the children's social and academic performance.

Objective: To find out the recent trends in the treatment of ADHD to alleviate the symptom and improve quality of life

Methodology: The internet-based PubMed, Google scholar, Research gate, Cross Ref, Cochrane databases were searched with the keywords like Attention deficit hyperactive disorder, physical activity, hyperactivity, impulsivity, and inattentiveness and articles were included in the study.

Conclusion: Our study suggests that individuals suffering from ADHD may get benefitted from recent interventions like Brain gym, Aquatic exercises, aerobic exercises, Tai-Chi, Yoga, Sensory integration, Neuro-cognitive therapy.

Keywords: ADHD, physical exercise, impulsivity, inattentiveness, hyperactivity and sensory integration.

1. Introduction:

The mental health condition ADHD is also called as attention deficit hyperactivity disorder affecting children [American Psychiatric Association (APA)]. Attention deficit hyperactive disorder is characterized by hyperactivity, inattentiveness, impulsivity[1]. Sir Alexander Chrichton, a Scottish physician presented an example like Attention deficit hyperactive disorder in 1798. He stated that interruption of attention does not have to be pathological; for example, mental stimulus, willpower, and education can all have a significant impact on healthy attention. This disorder was first explained by Heinrich Hoff (1854). It was previously known as Hyperkinetic syndrome, Strauss syndrome, organic drive, and little brain damage are all examples of minimal brain dysfunction (MBD). Excessive motor activity, inattention, impulsivity in kids, and other symptoms are clinical signs of attention deficit hyperactivity disorder. Common signs and symptoms seen at young age and consist of a lack of concentration and focus., inorganization, difficulty completing tasks, carelessness, and misplacing objects [29]**.** Comorbid ailments are frequently present in young people and teenagers with ADHD diagnoses. had minimum one comorbidity like neurodevelopmental issue, psychiatric illness[34], frequently have trouble in their learning[35]. Research has shown that this population experiences higher rates of repetition in grades and inadequate academic achievement[35].

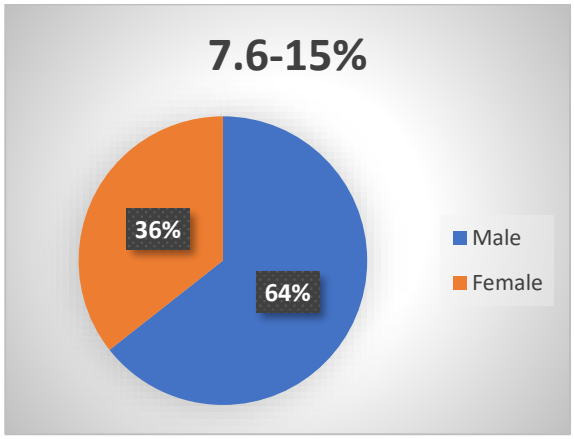
Review:

The internet-based PubMed, Google scholar, Research gate, Cross Ref, Cochrane databases were searched with the keywords like Attention deficit hyperactive

disorder, physical activity, hyperactivity, impulsivity, and inattentiveness.

2. Prevalence:

There are 7.62–15% of children aged 8–15 who have ADHD. Its incidence in male is 9.40%, while it is only 5.20% in female. Since it is influenced by a variety of factors, including heredity, environmental surrounds, cerebral anatomy, neural pathways, and levels of neurological transmitters, the prevalence of attention deficit hyperactivity disorder (ADHD) appears to be spreading much quickly than ever globally[3]. This condition may be brought on by pregnancy problems such alcoholism, smoking, very lower birth weight, toxemia or pre-eclampsia, weak mother's health condition, advanced maternal ages, and another delivery complications[4]



Genetic Co-relation of ADHD:

Attention deficit hyperactivity disorder (ADHD) has a very high inheritance according to formal genetic study. It is estimated that hereditary factors contribute to around 75% of the risk[5]. Recent research indicates that about 22% of heritability is based on single nucleotide variations (SNPs). The frequency of ADHD is higher in rare genetic syndromes. Alternatively, polygenic risk scores (PRS) have the potential to be applied to each patient. a summary of how PRS explain certain behavioral traits associated with ADHD and how they may be used to forecast diagnosis and treatment [7]. A recent meta-analysis of eleven studies predicts that 77-86% of ADHD cases are heritable[7].

Diagnosis of Attention deficit hyperactive disorder DSM IV TR (Text Revision) Criteria:

Hyperactivity is not a required for a diagnosis of ADHD; nonetheless, inattention and impulsivity/hyperactivity are symptoms of the disorder. The presence of symptoms that are more frequent and severe than expected for more than six months is required for the evaluation of ADHD. The signs and symptom should have appeared before the ages of seven and severely impair social, cognitive, or occupational functioning.

Outcome measures for diagnosis – Vanderbilt ADHD Diagnostic Rating Scale:

The Vanderbilt ADHD Diagnostic Rating Scale is framed to evaluate ADHD symptoms in young population between the ages of 6 and 12 and their impact on manners and academic performance9. There are two variations on this scale: - The parent's rating form has 55 questions, and the teacher rating form has 43 questions.10. A child must tick yes to six out of the nine key signs of hyperactivity and lack of attention, or both to be diagnosed with ADHD[11]. The child is graded on a 0–3 scale in both versions: 0-Never, 1-Occasionally, 2-Often, and 3-Very often. Two or three is considered a positive score. In the final eight performance questions in all versions, teachers and parents are asked to grade their child's academic performance and social interaction on a scale of 1 to 5, with a score of 1-2 being above average, a score of 3 being average, and a score of 4-5 being troublesome. At least one performance set score of 4 or 5 is necessary for an ADHD diagnosis, as these levels signify performance impairment[12].The scale has good accuracy and validity according to study conducted by David Bard the sensitivity of .80, specificity of.75, positive predictive value of.19, and negative predictive value of.98 were obtained using the vanderbilt ADHD diagnostic rating scale[31].

Conners' Comprehensive Behavior Rating Scale:

There are two variants of Conner's extensive behavioral rating scale: short and long versions. The Conners' Scale is a tool for identifying specific scholastic, cognitive, and social difficulties in younger children between the ages of 6 and 18. Psychologists regularly employ this scale. There are three different Conner's scale forms, and each one has its own unique set of questions for the person filling it out. The psychologists integrate these reactions to utilize in their study. Three responses are needed: one for the student to complete, one for the teacher, and one for the parents. [13]. The updated scale's psychometric qualities seem satisfactory, as evidenced by its high reliability across tests, good internal reliability coefficients, and effective discriminatory power[32]. This scale is also used to assess behavioral difficulties, emotional problems, and academic disorders, such as

dyslexia, anxiety, depression, and emotional problems[13].

Medical Management:

Methylphenidate (5–60 mg/day) and Dextro-Amphetamine (2.5–20 mg/day) are stimulant medicines. Methylphenidate is a preferred drug due to its fast rate of reaction. By increasing inhibitory effects in the cerebral cortex and activating the reticular activating system, this drug reduces hyperactivity and distractibility[15]. Methylphenidate will boost dopamine levels, which will enhance focus and minimize distractibility[14]. However, it will also have an impact on the growth hormone release, which may disrupt bone growth[15]. When stimulants are unavailable or inefficient, children may be able to benefit from the norepinephrine reuptake inhibitor atomoxetin[16]. Children with ADHD may experience decreased appetites due to stimulants[17]**.**

Recent Advances in Physiotherapy Treatment:

ADHD is more of mental illness rather than physical, but the management of ADHD is a combined team efforts by neurologist, occupational therapist, physiotherapist, psychologist and psychiatrist etc. In physiotherapy there are limited treatment options available for management of ADHD. Following is evidence-based physiotherapy treatment option for ADHD patient.

Role of aquatic exercises:

In aquatic exercises, a program consisting of 90mins/sessions with 2 sessions/week followed by 8 consecutive weeks which include 5mins warm-up period, 40mins of moderate level of intensity aquatic aerobic exercise, 40mins Aquatic exercises for perceptual-motor skills

, 5mins cooling down exercise period has shown improvement in coordination, balance, and motor skill performance as per suggested by Yu-Kai Chang, Chiao-Ling Hung in their article[18.]

Use of aerobic exercises as a treatment option for ADHD:

M Ahmed, Gehan & Mohamed, Samiha (2011) had studied on importance of aerobic exercises in ADHD. Aerobic exercises such as running, slow walking, free walking, and exercises for upper, lower, trunk, and neck exercises for 40min including 10mins of preparation and warm up. Aerobic exercises for 20mins, 5mins of walking between the exercise and 5mins of cool down period for 10 weeks has significant improvement in motor skills, classroom behaviors, academic, and attention[19].

Yoga's impact on ADHD:

According to Hilary Mc Claffetry (2011), yoga has a significant positive impact on one's physical, mental, and social well-being. People who practice yoga can acquire precise positions and breathing exercises that can improve their own self-discipline, concentration, alertness, and adaptability. Yoga has long been widely used as a form of therapy and physical activity for ADHD. (ADHD)20. According to Rosen et al. (2015), yoga helped youngsters with ADHD have better emotive, mental, and behavioral health. Children who regularly practice yoga have been shown to exhibit negative stress reactions, behavior, mood swings, aggressiveness issues, and fatigue[21].

Efficacy of Tai Chi:

The slow, low-intensity movements of Tai Chi, a conventional Chinese martial art, are precisely timed to deeper breathing and proper body weight balance. The symptoms of ADHD, such as anxiety and hyperactivity, may be lessened with regular Tai chi practice. The Hernandez-Reid M., Field T.M., and Thimas E. Cornners Teacher Rating Scale was tested to quantify the impact of signs during a five-week Tai Chi intervention that included two sessions lasting 30 minutes each. The teenager displayed significantly less anxiety, less daydreaming, less incorrect mood, less hyperactivity, and more behaviour after the Tai Chi intervention[22].

Impact of physical exercise and fitness:

Physical exercise and well-being have been shown by Medina J.A. and Netto T.L. (2010) to alter neuroanatomy and improve brain activity related to conflict and attention regulation. Even though the disease's origin is complex, there are a few factors that raise the threat of having attention deficit hyperactivity disorder that may be altered by physical activity. Dopamine function, which is compromised in attention deficit hyperactivity disorder (ADHD)[23], is improved by physical activity. Floel A., Winter B., et al. Physical activities have the potential to impact neurological elements as well as specific brain parts. Exercises are proven to improve cerebral blood flow, which may help people with poor prefrontal and frontal lobe blood flow. According to Hunter et al., physical exercises increase the level of dopamine and norepinephrine in the synaptic cleft responsible to activate neuron[24]. Pharmacological and non-pharmacological treatments

are used in Vanessa Bayo Tallo'n (2020) studies on interventions for attention deficit hyperactivity disorder (ADHD). There were two elements to non-pharmacological management: i) Cognitive behavioral therapy ii) Psycho-Pedagogical Programmed and Manual Therapy both influences enhancing ADHD systems. Eight students participated in the pilot project, with four meeting the requirements for inclusion in the conventional group and four being placed in the intervention group.

The usefulness of sensory integration therapy:

Sensory Integration Therapy: (Jean Ayres): Touch Stimulation: - Touch inputs are the fundamental source of input to the reticular formation, one of the most primitive and strong control integrating systems. A child's hyperexcitability can be decreased or activated through the reticular system and perhaps other systems. It affects muscle tone and the likelihood of muscular contractions. Inputs can be given by rubbing the skin of the child with a dry cloth or any kind of brush. Rubbing can also be given by camel's hairbrush, light touch. This procedure is developed by Rood. Touch input gives afferent support which is required for muscle contraction; they promote muscular contraction by acting on nuclei of the descending reticular activating system and perhaps other pathways[26]. Touch input has a specific facilitating impact on muscle underneath stimulated skin which must be considered when aberrant muscle tone is present.

Vestibular stimulation: - Vestibular stimulation is one of the better intervention methods for the treatment of sensory integrative dysfunction. Swinging or spinning a kid while he is laying or seated in a net hammock (both ends of which are hanging from the common overhead point) provides the most efficient passive vestibular stimulation. Vestibular stimulation may have a unifying and coordinating role in respect to all other sensory inputs[26].

Role of assistive reading software:

Powell, L., Parker, J. & Harpin, V (2018) stated in their article that students having problem with reading, attention, and note making can be improved with use of Assistive Reading Software which helps to improve their skill and can read for long hours, reduce distraction and reduce fatigue while reading[27].

The use of portable computer device:

Shrieber, B., & Seifert, T (2009) demonstrate that pupils who used a portable computer handheld device expressed a greater dependency on the gadget than additional learners. The device made up for the student's both organizational and recall issues: they keyed in assignments, notes and, most importantly, reminders. In contrary to the digital planner's interactivity, the traditional planner demands the learner's initiative at minimum, manually open it once a day. to recollect the written activities. So, uses of handheld computers are found to be effective for organizational and Memory concerned difficulty[28].

Neurofeedback cognitive therapy (Brain computer interface)

Choon Guan Lim et al. 2019 carried out randomized controlled trial (RCT) The study aimed to evaluate the effects of a 12-week low-intensity training program and compare it with an 8-week attention training program using a brain-computer interface (BCI) among children with ADHD. The findings indicated that after completing a minimum of 24 sessions, the BCI-based attention training program effectively reduced symptoms of inattention compared to a waitlist-control group., a BCI-based attention-building programme can reduce signs of ADHD, and subsequent training may be able to maintain these reductions. This form of therapy could be used as a supplemental therapy or to treat lesser cases[33].

3. Conclusion

ADHD is a common mental disorder affecting children. It has characteristics like Hyperactivity, inattentiveness, loss of concentration, impulsivity, lack of focus, etc.

ADHD has a prevalence of 7.62-15% in 8-15years of age. Males are more affected than a female that is 2:1. There are 75% of genetic predispositions. One must have symptoms lasting for more than six months to get diagnosed as ADHD. For assessment of ADHD conner's parent-teacher rating scale and Vanderbilt ADHD Diagnostic Rating Scale is used. Pharmacotherapy for ADHD includes stimulant medicine like Dexamphetamine and Methylphenidate is used. There is limited evidence available on physiotherapy management of ADHD. The available recent articles suggest that physiotherapy and physical activity may prove beneficial in reducing the symptoms of ADHD.

Aquatic exercises improve coordination and balance in children with ADHD whereas academic concentration and classroom behavior can be improved by aerobic

exercises. Yoga has proven to reduce negative stress effects, behavior, mood swings, and anger issues.

Regular practice of Tai Chi helps to improve daydreaming reduced anxiety and decreased hyperactivity. Physical activity and fitness result in improved independence, decreased musculoskeletal problems, improved physiological well-being. Sensory integration therapy in which touch stimulation affect muscle tone and improved muscular contraction. Vestibular inputs stimulate coordination and improved Quality of life

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