Literature Review: Attention Deficit Hyperactivity Disorder

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ABSTRACT

Presentation, pathophysiology and treatment of Attention Deficit Hyperactivity Disorder

This investigation explores the literature on Attention Deficit Hyperactivity Disorder and presents the scientific findings and understanding of ADHD. This disorder has emerged to be one of the most controversial illness. It is, therefore, very beneficial to understand the etiology and pathophysiology of the complication better and it is also important to investigate the development of the disorder. The developmental course of the ailment widely varies across peoples' lifespan. This complication develops from childhood and continues into the period of adolescence and early adulthood until late stages of life. The symptoms of the mental illness are far from being uniform, meaning that the presentation of the disorder varies from one individual to another. The symptoms of the disorder tend to appear differently between gender due to the complexities of the condition.

There are many suspected causes the illness such as physiologic, environmental, genetic, biochemical, behavioral and sensorimotor factors. Other causes include exposure to tobacco, alcohol, lead and cocaine. There are also complications which are associated with ADHD such as iron deficiency, obstructive sleep apnea, head trauma, etc. The diagnosis of attention deficit hyperactivity disorder is primarily based on clinical criteria that consists of thorough medical assessment i.e. developmental and psychological evaluations. Normally, ADHD usually exists together with other disorders and this makes the diagnosis very complicated indeed and not to mention the bias which is inherent in some systems against a ADHD diagnosis. Nevertheless, it is very important to accept the limits of diagnostic techniques. ADHD has usually a serious impact on a person's life that is long-lasting.

This disorder can disrupt a person's life if left untreated. The methods used to manage ADHD are very diverse and subject to debate. These treatment methods are mainly pharmacological in nature, yet there are firmly known to cure ADHD and there exist many treatment methods which effectively assist in the management of ADHD. The methods of treatment include behavioral and pharmacological therapy. For many people suffering from the disorder, medication is an important component of the treatment regime. The management of ADHD by using behavior therapy is labour intensive, expensive and difficult than the treatment using medications. Ideally, a combination of behavioral and medicinaltreatments are better preferred than behavioral treatment methods. Not only does the management and treatment of ADHD the disorder deals with medication alone but includes other broader methods such as a person's accommodations at work or school, behavioral therapy and life skills. A doctor

works closely with the patient in order to determine the most effective medication regime and therapeutic dosage. Learning skills can help in relieving the symptoms of ADHD. The learning of life skills might appear to be seemingly simple. However, these skills can greatly affect a person's quality of life. Therapy or counseling can help to address relationship and self-esteem issues, or depression that can result from attention-deficit-hyperactivity-disorder. Therefore, this thesis investigation attempts to deliver a thorough and better knowledge of the ADHD complexities by investigating how clinical studies of ADHD do translate to an efficient management of a patient with ADHD.

The thesis provides an overview of the past and present investigations on topics about symptoms, etiologies and treatment of ADHD. ADHD is one of the most commonly occurring neurobehavioral disorder of children and young adults and approximately occurs in 8 percent of these people. It is very useful, therefore. to fully understand the complete series of consequences of ADHD. The thesis main goal, also, is to thoroughly examine the existing knowledge pertaining ADHD and provide the specialists with the information on the ADHD diagnosis, assessment and treatment.

INTRODUCTION

Attention-deficit-hyperactivity-disorder i.e. ADHD is a mental health disorder that is commonly marked by the inability to pay attention, impulsivity and hyperactivity. Inattention normally appears when an individual is involved in certain tasks or assignments that demand, for example, sustained and systematic listening, perceptual and visual search, rapid reaction time and vigilance. Impulsivity is marked by actions which are hasty and have the potential risk of negative outcome such as a child running across a street without even paying attention to the traffic, adolescents or adults quitting suddenly important activities such as jobs or school without thoroughly thinking of the consequences. Hyperactivity is essentially marked by excessive motor function. Kids, especially the younger ones like those in church or school mostly show tendencies of hyperactivity. ADHD occurs in all ethnic groups and social classes and is the most common neurobehavioral disorder of childhood (Biederman and Faraone, 2005). Older patients might simply have the tendency of getting talkative or restless or simply be fidgety to, at times, the extent that other individuals feel worn out by just watching them. Impulsivity and inattention impede academic development, thinking and reasoning strategies, skills, adjusting to social demands and school motivation. Parents and teachers, for example, constantly struggle in monitoring kids who have inattentive attention deficit hyperactivity disorder form and tend to be hands on students who experience difficulties in situations of passive learning that require assignment completion and continuous performance.

The illness does not present itself in the same way in all people. As a matter of fact, ADHD present itself as three different ways i.e. more specifically, as three types. These types of ADHD people present principally depends mainly on the symptoms and signs which a person has. The symptoms of ADHD fall into two main categories. The first category is inattention and the second category is impulsivity or hyperactivity. ADHD symptoms in children can change as they get older and may translate to a different ADHD type. Type 1 has a predominantly hyperactive – impulsive presentation. Type 2 is marked by a predominantly inattentive presentation and Type 3 has a combined presentation. Globally, ADHD has an overall mean prevalence of approximately 2.2 percent. A 0.1-8.1 percent range in children and young adults under the age of 18 has been estimated. In adults suffering from ADHD i.e. aged 18 to 44 years from several randomly selected countries in the Americas, Middle East, Europe and Asia was reported to be around 2.8 percent overall and has range of 0.6 to 7.3 percent.

The prevalence rates of ADHD may vary and this is dependent on various factors such as: age i.e. the disorder shows no age discrimination and the prevalence rates are shown to be variable between children and adults; age i.e. a higher prevalence is mostly present in men than women; the presentation i.e. The illness can be variable between patients based on severity, impulsive and hyperactive symptoms, and the inattention combination; many adults suffering from ADHD have undiagnosed or diagnosed psychiatric co-morbidities that may complicate the ADHD diagnosis as well as treatment. The validity of diagnosing ADHD in adults has been a source of much controversy(Spencer, Biederman andWilens,

1994). The dissimilarities in the ADHD prevalence rates also may vary as a result of the cultural and environmental differences and the diagnostic criteria variability used in studies. The ADHD etiology may be multifactorial and has environmental and genetic factors. Probably there are several genes which interact to result in ADHD phenotype or ADHD has a common final pathway for the variant alleles. Maternal smoking and low birth weight have the most concrete data for ADHD association.

OBJECTIVES

The investigation assesses the potential differential diagnoses that tend to be a time consuming and comprehensive part of ADHD diagnosis and mapping. One of the goals of this project is to provide guidelines as a comprehensive collection of suggestions which are based on evidence and employed during for the assessment, care and management of children, preschoolers, teenagers and other people with ADHD. Wherever it is possible, recommendations are developed based on currently known ADHD data that was brought about by a systematic review. One of the main aims of the study is to try to understand how the signs and symptoms of ADHD do stem from the pathophysiological mechanisms. The research will attempt to tackle the ADHD neurobiology by focusing on, among others, the genetics and imaging components. Although there remains much evidence for the genetic etiology of ADHD, one study indicated that the contribution of personality aspects in combination with genetics may be significant. Specifically, the presence of high neuroticism and low conscientiousness in conjunction with genetic vulnerability may constitute a risk factor in the expression of ADHD (Martel, Nikolas, Jernigan, Friderici andNigg, 2010).This investigation, will also try to focus on the middle point by incorporating and intervening the symptom and gene level.

The research also attempts to summarize the findings already done by several and trusted ADHD investigators and try to understand why the ADHD diagnosis is relatively accepted generally as well as introducing the basic aspects of the ADHD development. ADHD mainly manifests non-observable signs and symptoms, thus, it demands further interpretive understanding of the patients' data, which is then translated into diagnostic terms. One of the aims and objectives of this thesis is to explore the ADHD literature on the versatile functioning of the day to day life and studies the academic and family aspects of patients. The difference in a person's activities and academic standing should be noticeable. One of the objectives of the thesis is to analyze the comorbid complications on the necessary functioning of people. The thesis also aims to evaluate and develop an efficient strategy for new treatment methods used in addressing the problems associated with the disorder. This study attempts to enlarge and reinforce the understanding of the ailment and to encourage a translational understanding of some of the many effective strategies that are used during the disorder management. This study also tries to investigate how the illness affects the patients and family.

MATERIALS AND METHODS

The methodology of this research is mainly based on the evaluation several electronic databases that are found on both a national and an international level. The data

collection for this project is primarily literature based on books, journals, conference publications and on elements which are relevant to the disorder normally referred to as attention deficit hyperactivity disorder or ADHD. On many occasions, this project use the academic websites and publications that include academic information databases such as SID, Google, PubMed and Scopus. The library data rigorously searches data by referring carefully to the libraries' journal archives and also analyzing the available data in electronic publications. The research use both Norwegian and English educational databases that include articles and textbooks, documents of the annual seminar of psychology and medicine.

The thesis also theoretically uses the data through empirically conducting interviews on people diagnosed with ADHD and through a broad literature review. A series of investigations are also used order to widen the scientific understanding of ADHD. The study uses the literature on the disorder by searching, systemically, the literature on the complications and uses relevant keywords to guide the search. The published review data do directly contribute to the study evidence base.

RESULTS

There are several investigations which have demonstrated that several medications can be used to treat ADHD and can significantly alleviate the symptoms of ADHD. Regardless, there is not enough evidence that can be used as a standard for the treatment of ADHD. In the future, better treatment methods may translate to the improvement of clinical or social or academic standing. Research investigations have estimated that the individuals who outgrow the disorder in the end, is approximately 15 -50%. Unfortunately, the figures which were collected during the ADHD investigations were the results of the follow-up investigations. These investigations did not use the current diagnostic ADHD criteria that is far more rigorous. ADHD is the most common neurobehavioral disorder in children and occurs in approximately 8% of children and youth (Centers for Disease Control And Prevention, 2007).

If the diagnostic criteria uses modern day and widely accepted criteria, maybe, between 20 to 35 % of children who are assumed to be suffering from the disorder will not present the symptoms of the disorder. This, in turn, can lead to several impairments in individuals during their period of adulthood. In a small segment of the people who are affected by the ailment, there is relatively a higher risk of developing abnormal or oppositional behavioral characteristics. Statistically, half of these individuals do experience learning disabilities and between 25 to 40 percent of people suffering from ADHD have problems socializing and conduct issues. Between 25 to 45 percent of people with ADHD do suffer from low-esteem.

Symptoms of depression are observed in almost 25 % of the patients and 38 percent of ADHD patients are academically challenged and are most unlikely to finish basic education. Roughly 5 to 10 percent of people with ADHD tend to seriously develop mental complications. The complications include bipolar disorder and maniac depression. By adulthood, between 10 to 20 percent of the ADHD patients are likely to develop antisocial disorder and they tend to abuse

drugs and alcohol. On average, between 10 to 25 percent of ADHD patients tend to develop a very serious addition to drugs or lethally use or abuse legal or illegal substances or even both. That is to say, people with ADHD are more likely to abuse legal and/or illegal substances such as prescription drugs, heroin, cocaine, marijuana, tobacco, and, alcohol. People with the greatest risk of suffering from addiction are those who are delinquent or suffered from conduct disorder as young people. Despite the presence of the risks mentioned earlier, it should be well noted that more than fifty percent of the people suffering from ADHD are not likely to develop very serious addiction problems and do not necessarily require medical attention. A significant majority of the people suffering from the disorder are most likely to experience academic problems. A figure of between 30 to 50 percent of these people usually attained low grades or kept out the classroom on many occasions and between 25 to 36 percent having failed to successfully finish high school.

Most likely, individuals with ADHD are unable to achieve the same academic status and intellectual competency as their family members. A part of these individuals are more likely to encounter complications when they are, for example, at their place of work or doing school assignments. ADHD individuals tend to change their careers or jobs constantly compared to other people. This is mostly because of, for example, disagreements in their place of work or it might be simply because of boredom. A change of acquaintances and romantic partners is relatively greater in people with ADHD and are apparently more susceptible to marital problems and/or separation.

DISCUSSION

The ADHD symptoms in childhood are marked by inattention, impulsiveness and overactivity. Nonetheless, all of these symptoms might not be invisible or present. There are three ADHD subtypes which are defined clearly in the 4th edition of the diagnostic and statistical manual of mental disorders: Type 1 of Attention-Deficit-Hyperactivity-Disorder is the predominantly inattentive form; Type 2 of Attention-Deficit-Hyperactivity-Disorder is the predominantly hyperactive impulsive form; the third type of Attention-Deficit-Hyperactivity-Disorder is the combined form. Some researchers contend that the variants: Attention Deficit Hyperactivity Disorder, hyperactive Type and Attention Deficit Hyperactive Disorder, Predominantly Inactive Type ought to be considered as quite different type of ADHD rather than as being variants of ADHD. The typical motor complications that children suffering from ADHD suffer are classified as neurological soft signs i.e. NSS include coordination difficulties between the left and right leg or arm, choreiform dysdiadochokinesis and dyskinesia, mild problems in muscle tone regulation, balance difficulties and fine motor skills disabilities. Cerebellar symptoms in children with ADHD have been linked to difficulties in broad working memory.

The ADHD symptoms in adolescence patients tend to shift as the patient enters a period of adulthood. As the responsibilities and roles in adulthood change, the manifestations of symptoms can change too, especially the symptoms of hyperactivity-impulsivity. Inattention symptoms in adolescents may also include difficulties in maintaining attention when performing

activities and tasks and unable to follow through a set of instructions, unable to listen when directly spoken to, losing the things that are needed to perform activities and tasks. These symptoms of ADHD in adults might include poor time management, problems finishing tasks, difficulty in sustaining attention e.g. when doing paperwork or reading, poor concentration, forgetfulness and distractibility. In adults, in particular, the symptoms may also include a very poor frustration tolerance that may lead to high relation turnover, quickness to anger and irritability. Impulsivity can lead to high impairing, meaning that acts due to impulsivity cannot be reversed once they are done. Inattentive symptoms consequences can be often corrected. Symptoms, especially of motor hyperactivity develop during the late period of adolescence and during adulthood, despite the fact that other patients do have or most ADHD symptoms into their mid-adulthood. In adult people, clinical interviews and evaluations are necessary when performing a ADHD diagnosis. This also takes into account, the patient's personal recall of any of the ADHD symptoms experienced during childhood.

The impact of current symptoms on social functioning, home and work should be explored as well. Clinicians must assess the detectable impairments in a family structure and history in relation to alcohol or substance abuse, disorganization, job or financial instability, criminal tendencies, etc. Although the vast majority of individuals with ADHD will never become involved with crime, research indicates a consistent association between delinquency, criminal behavior and recidivism. Identifying the role of ADHD in crime, however, is a complex task, particularly given the fact that ADHD frequently develops with other mental problems such as substance use disorder, depression, anxiety disorder, anti-social personality disorder and CD. In addition, IQ, medical and socio-economic factors can have an impact on the risk of developing ADHD. A meta-analysis of studies assessing a link between ADHD and crime and delinquency (Pratt, Blevins, Daigle andUnnever, 2002). Rating scales may be handy in collecting data from patients regarding current and childhood symptoms. If it is practical, a thorough interview of a patient can be carried out by including the family members during the assessment of the patient and may provide crucial data which a patient fails to self-report. A member of the family, for example, may participate during the completion a ADHD scale so that a clinician can confirm and complement the impairment and symptom report data. Formal records like conduct reports and report cards are useful as well. In addition, the clinician has to extrapolate other information and symptoms to functioning adult domains. Research data, apparently tend to be in agreement with the hypothesis that it is the frontal cortex or surrounding regions which projects to the frontal cortex that functions improperly in certain children, at least.

The frontal cortex has an important relevance to the understanding of ADHD and as such, imaging results indicate that patients normally have smaller frontal cortex and are predominantly affected on right hand side of the brain. Since neuropsychological tests provide indirect evidence of ADHD, the brain function measures, then care should be exercised when a person uses the tests data for the purpose of making a conclusion on the locus of the brain impairment which marks ADHD. Nevertheless, many of these ADHD tests have been used earlier as a

yardstick on normative populations as well as extensively administered to brain damaged populations. The recorded deficit test has also stimulated the hypotheses about the function of certain brain regions in the physiology of ADHD. The presence of abnormalities in the prefrontal cortex or neural connections to the subcortical structures in people with ADHD support the view that there is neurophysiological impairment pattern. Most notably, lesions of orbital frontal cortex tend to predict that impulsivity and social disinhibition and dorsolateral lesions do affect attention, working memory, planning and organizational abilities. Investigation of people with ADHD did discover impairments in all of the neuropsychological domains. Therefore, clinical features of ADHD along with the data of neurophysiological test both implicate dorsolateral, prefrontal and orbitofrontal dysfunction in the disorder. The mesial prefrontal region, in contrast, where lesions basically predict the spontaneous behavior slowing, is hardly implicated in attention deficit hyperactivity disorder. Presented with the prefrontal complexity, together with the neuropsychological interference, ADHD simple lesion model could not be endorsed. The abnormalities of prefrontal cortex in ADHD can result from prefrontal cortex abnormalities, but they also may reflect brain areas dysfunction with noticeable extensions to prefrontal cortex. Subcortical networks role is prefrontal functioning modulators.

The neurophysiological discoveries in ADHD do provide scientist with ideal data that can be used to speculate the subcortical structures roles. For example, the cingulate cortex does influence the motivational factors of attention and in inhibition and in response selection. The reticular activating system of the brainstem regulates the interference of the reticular thalamic nuclei filter and attentional tone. Deficits in the working memory involves a distributed network that include the dorsolateral prefrontal cortex, parietal cortex, anterior cingulate, dorsolateral thalamus, ventral anterior and anterior hippocampus. In addition, the problems with attention in people with ADHD can involve neural networks that are widely distributed. In ADHD, a system that mainly involves the parietal cortex and right prefrontal cortex is activated. A directed and sustained activity is observed across all sensory modalities in patients and include the superior temporal and inferior parietal lobule.

There are polymodal sensory convergence areas which offers representation of extra-personal space and crucially play a role in the selecting and focusing of a target stimulus. The pathophysiology of attention deficit hyperactivity disorder is still unclear to this day in age but there are many in the neuroscientific world who speculate that certain areas of the brain which are responsible for attention. These areas do lack neural transmission capability and this is supported by the fact that noradrenergic tricyclics and psychostimulants which do facilitate the release of dopamine are used to treat ADHD. PET scan images show that methylphenidate does act to increase dopamine. In particular, one of the neurotransmitter called dopamine is believed to be associated with ADHD. The neurotransmitters known as norepinephrine i.e. NE and dopamine i.e. DA are, as well, thought to be involved in the pathophysiology of ADHD.

The neurotransmitter dopamine is involved in mood, risk taking, reward and impulsivity.

Norepinephrine has been implicated in ADHD traits such as arousal, mood swings and problems with attention. Brain investigations on people with ADHD suggest that there is a defected region in the dopamine receptor DRD4 i.e. D4 receptor make use of NE and DA to modulate attention and responses to an individual's environment. When the D4 gene is disabled in a knockout mouse model, dopamine synthesis increases in the dorsal striatum, and the mice show locomotor super sensitivity to ethanol, cocaine, and methamphetamine(Rubinstein andBunzow, 1997). D4 knockout mice also show reduced novelty-related exploration(Dulawa, Grandy and Low, 1999), a finding consistent with human data suggesting a role for D4 in novelty-seeking behaviors. Dopamine and DAT1 transporter protein moves NE or DE the location called the presynaptic nerve terminal in order to hinder the sufficient interaction with the postsynaptic receptor. The findings and implications of the limited receptor action may require further investigation and it seems clear however, that norepinephrine and dopamine are involved heavily in the ADHD pathophysiology.

Other investigation types provide us with the data on the (i) ADHD locus physiology of the brain. For example, animal models and neuroimaging studies and neuropsychological investigations show the involvement of the dorsolateral and orbitofrontal cortex or protruding locations; (ii) ADHD monkey module that involves frontal striatal neural networks; (iii) SHR rats investigation which involves frontal cortex, nucleus accumbens, putamen and caudate; frontal lobe damaged patients display ADHD like behaviors; (iv) Structural neuroimaging which involves the frontal cortex and usually limited to the corpus callosum, caudate, globulus pallidus and cerebellum; (v) Functional neuroimaging hypoactivity of subcortical structures, typically on the right side, anterior cingulate cortex and frontal cortex; (vi) ADHD lesions in the brain's right putamen as well the right globulus pallidus and right caudate nucleus; (vii) disabling gene D4 which results in the synthesis increase of dopamine in dorsal striatum; missing of the D2 genes which in turn, results in long term changes in the synaptic efficacy in striatum, synaptic plasticity abnormality at corticostriatal synapse and decreased functioning of striatal DAT; a lack of the normal chemical release in the dorsal striatum structure of the coloboma mouse. In children with ADHD, there might be deformations in the basal ganglia nuclei i.e. the globus pallidus and/or putamen and/or caudate. If the deformations are more prominent, then the severity of the symptoms is greater and it has been shown that the use of stimulants might normalize the deformations.

Adults suffering from ADHD, reported also as experiencing deficiencies during the anterior cingulate activation when carrying out of tasks. Children who suffer from a serious form of ADHD do show cortical thinning rate which is relatively slow. This is mostly seen in the prefrontal cortical regions which are bilaterally oriented in the middle premotor or frontal gyri and extending all the way down the wall of the medial prefrontal to the anterior cingulate. This is observed in the brain structures of, for example, the orbitofrontal cortex and many other structures. One of the main features of ADHD in adolescents is the cortical thinning. When performing similar tasks, adults with ADHD might show deficits during anterior cingulate activation. Minors

with higher levels of impulsivity/hyperactivity have a slower cortical thinning rate in the prefrontal cortical regions and this is particularly noticeable, in the middle premotor/frontal gyri (i.e. bilaterally) and stretching down the wall of medial prefrontal to anterior cingulate. In adults suffering from ADHD, there is dopamine activity in caudate which is depressed and evidence in the limbic regions is associated with increased strengthened reaction to intravenous methylphenidate. This means that dopamine dysfunction might be associated with inattention symptoms but may contribute, as well. to substance abuse comorbidity.

People with attention deficit hyperactivity disorder do have retardation impairments that are difficult to restrain. Early brain structural changes can be observed in pre-school minors suffering from ADHD. It is now well accepted that children with ADHD have significantly smallertotal brain volume compared to matched healthy controls (Krain and Castellanos. 2006). There are notable reductions in the gray matter density, parietal and frontal lobe gray matter density and bilateral temporal in minors with ADHD compared to normally developing minors. For the left temporal and right frontal lobes, there are largest effect sizes present. Frontal lobe sub-regions examination reveals that the largest group effect sizes are evident in the left supplementary motor complex i.e. SMC, left primary motor cortex i.e. M1 and left OFC. ADHD associated reductions in certain sub regions (left M1, right sensorimotor cortex, left frontal eye field, left premotor and left prefrontal) are highly associated with symptom severity, such as the higher level of impulsive or hyperactivity symptoms are linked to reduced cortical volumes. When exploring the relationship between development of SADHD i.e. secondary ADHD and TBI, early traumatic brain injury is linked to an increased SADHD. Accordingly, it is a requirement that patients are monitored after injury and patients who show symptoms of ADHD. Cogitation of factors may affect the injury characteristics like the functioning of a family and is important in the planning of follow up in adolescences with TBI.

CAUSES

ADHD has no known single, specific cause. Potential causes of ADHD include genetic, biochemical, sensorimotor, physiologic, and behavioral factors(Froehlich, Lanphear and Epstein, 2007).Some risk factors include birth weight that is < 1500 g, head trauma, iron deficiency, obstructive sleep apnea, and lead exposure, as well as prenatal exposure to alcohol,tobacco, and cocaine. ADHD is the most common neurobehavioral disorder in children and occurs in approximately 8% of children and youth (Centers for Disease Control and Prevention, 2010). A small segment i.e. fewer than five percent of minors suffering from attention deficit hyperactivity disorder do show signs of neurologic damage. The ever accumulation of data has blamed the differences in noradrenergic and dopaminergic systems with the decreased stimulation or activity in the upper brain stem and frontal-midbrain tracts.

Deficit Hyperactivity Disorder has quite strong biological attributes to its existence. Even though the exact causes of ADHD are yet to be established, there are relatively a few who doubt that genetics or heredity contributes largely to the development of this disorder in a population. The ADHD

heritability factor accounts for almost 80 percent. This means that the genetic factor contributes to up to about 80 percent of a person differences in a set of psychological traits. Comparatively considering that this percentage competes with the genetics role such as human height, is remarkable indeed. Even though the heritability factor of ADHD is relatively high, it is the environmental factors that are important in deciding whether the disorder will develop in a particular individual and how it will present. Within a family, not everyone with the susceptibility genes will develop ADHD, and among those family members who do develop the disorder, the clinical presentation may differ widely (Smalley, McCracken and McGough, 2001).

Several genes that are associated with ADHD have been recognized and unquestionably, many more will be identified. ADHD is marked by complicated behavioral attributes and not only just one gene is likely to be responsible for the disorder pattern. In cases where the heredity factor does seem not to be a factor such as low body weight, pre-natal exposure to tobacco smoke and alcohol, complications during pregnancy, post-natal trauma to the brain prefrontal regions as well as excessively high levels of lead in the body have been all found to be associated with the risk for ADHD in varying degrees. Investigations have not popularly supported the views that the disorder stems from excessive television viewing or high sugar intake, poor parental management, or food additives.

Some medication which are used for the treatment of seizures in children can increase ADHD symptoms because these drugs produce reversible side effects. Studies have been able to show that there might be a correlation between the drinking of alcohol and smoking of cigarettes. There can be a risk of ADHD in babies resulting from the pregnancy. Just as a precaution, it is recommended that pregnant mothers should avoid both alcohol and cigarette use. One extensively studied risk factor has been maternal smoking during pregnancy. By exposing the fetus to nicotine, maternal smoking can damage the brain at critical times in the developmental process. The smoking mother is at increased risk of antepartum hemorrhage, low maternal weight, and abruptio placentae(Landesman-Dwyer and Emmanuel, 1979). Children living in old buildings that are still contaminated by paint and lead in the plumbing can suffer from ADHD. In contrast to the mostly negative studies of dietary factors, some toxins are suspected to be the cause of some cases of ADHD. Several groups have shown that lead contamination leads to distractibility, hyperactivity, restlessness, and lower intellectual functioning (Needleman. 1982).

Some people who are suffering from brain injury do exhibit behavioral signs and symptoms which are considered to be are similar to those of ADHD and have been diagnosed to be suffering from traumatic brain injury. Environmental risk factors of the disorder include antenatal exposures to substances such as tobacco and alcohol, adverse early childhood experiences (including social, family and cultural factors), head trauma, and environmental toxins such as lead. The relative contribution of environmental risk factors is the subject of a significant body of research (Asherson, Kuntsi and Taylor, 2005). There are suggestions that most attention disorders are mainly caused by food additives or refined

sugar or that ADHD symptoms are exacerbated by food additives and refined sugar e.g. children who are sensitive to sugar are given a sugar substitute called aspartame and are shown to be more hyperactive compared with other children living in the same environment.

Attention disorders such as Attention Deficit Disorder and ADHD run so often in family circles, therefore genetic influences are more likely to be present. It has been shown in many investigations that there are strong genetic factors that are most likely present in ADHD. Even though much evidence is needed for the genetic causes of ADHD to be generally accepted, one specific study has shown that the contribution of personality aspects in combination with genetics may be significant. Specifically, the presence of high neuroticism and low conscientiousness in conjunction with genetic vulnerability may constitute a risk factor in the expression of the disorder (Martel, Nikolas, Jernigan, Friderici andNigg, 2010).

Some discoveries of the brain structure are useful in the investigation of the physical basis of ADHD and have shown that children with ADHD have a 3 to 4 %, in all regions, smaller brain structures (the cerebellum, frontal lobes, caudate, nucleus and temporal gray matter). Genetic investigations of ADHD clearly show, on the other hand, that genes pose as risk factors for ADHD, though they show also that the environment plays an important role in the emergence and development of this disorder. ADHD is a neurobiological disorder with genetic and environmental contributions. The dominant current paradigm suggests that disordered fronto-striato-cerebellar brain circuitry underpins the executive function deficits at the core of this condition(Castellanos and Tannock, 2002).This particular conclusion stems from the studies of identical twins that demonstrate that when one member of the twins suffers from ADHD, the chances of the other twin who is genetically identical of having the disorder is just about 60 percent. On contrary, there is also evidence which support the association between the genetic factor and ADHD. Adoption studies of ADHD also implicate genes in its origin. The adoptive relatives of children with ADHD are less likely to have ADHD or associated disorders than are the biological relatives of children with ADHD(Morrison and Stewart, 1973). This imperfect concordance of perfect identical twin involves environmental risk factors. The way these particular risk factors seem to have emerged from the investigations assessing the features of the psychosocial and biological environmental factors is very impressive and sheds important data on exactly how and why these mentioned factors may significantly increase the risk of an individual developing attention deficit hyperactivity disorder.

DIAGNOSIS

The ADHD diagnosis is clinical and based on a clinical criteria that consists of psychologic, thorough medical and developmental evaluations. The diagnosis of ADHD is made based on a careful history and physical examination(Centers for Disease Control and Prevention, 2016]. The initial screening assessment involves a short scale like the Diagnostic Rating Scale i.e. DRS or Strength and Weakness of Attention Scale and for adults, a Barkley's Adult ADHD Quick Screen or Short Adult ADHD Screening Scale can be adopted as an initial screening procedure. The diagnosis as well as the evaluation of individuals with ADHD

is based primarily on clinical studies. Most notably are the DSM-IV and DSM-V diagnostic criteria which include nine symptoms of impulsivity and hyperactivity and nine inattention symptoms. This DSM-IV diagnostic criteria is composed of two main dimensions which are impairment and symptoms and each of the dimension consists of subtype specific descriptions.

The DSM-IV test requires psychiatric impairment and presence of symptoms in order for a specialist to perform an ADHD diagnosis, but the test fails to define impairment clearly. Implicit in this requirement is that the construct of functional impairment is distinct from the ADHD symptoms. A recent review of impairment scales indicates that this is a general problem when diagnosing any psychiatric disorder (Winters, Collett and Myers, 2005). It is not just a distinction between impairment and symptom that is not clear, but also a rating which is symptom based can be problematic because of the judgement and subjective nature of what is normal and abnormal behavior. On a similar note, impairment is not clear and is dependent on the challenges and demands a person encounters in daily life. Therefore, the assessment of psychological characteristics is controversial and can be differently interpreted in different cultures and observed differently.

There is no definite answer pertaining the cultural validity of DSM-IV and DSM-V in neuroscience. DSM-IV requires that six inattentive and/or hyperactive/impulsive criteria be met for a diagnosis of one of the three subtypes of ADHD (i,e. inattentive, hyperactive or impulsive or combined). It is clear that the six-symptom cut-off needs to be more age- and gender-specific(Barkley, 2007). On the other hand, it is suggested that the rates of prevalence variations do embolden the theory of the effect social factors and cultural factors in the process of performing diagnosis of patients i.e. the presence of biases of diagnostic criteria. For example, the prevalence of ADHD in Europe is not as high as it is in North America. In many countries in Europe, the ADHD diagnosis is based primarily on the DSM-IV criteria. DSM – IV and DSM – V are different and an ADHD diagnosis that is positively accepted. A DSM-V based diagnosis is three to four times much more accurate than DSM – IV. ADHD normally co-exists with other disorders and makes diagnosis much more complicated. Almost a third of ADHD in children is associated with one or several co-morbidities, and depressive disorder, conduct disorder, defiant disorder, anxiety and tics are the most commonly encountered disorders.

Children and young adults who are out of assisted living facilities do pose certain problems during the assessment and treatment because of the issues of differential diagnosis of comorbidity and of alternative causes of symptoms. In addition, there is inherent bias in some systems against a diagnosis of ADHD (Sawyer, Carbone, Searle and Robinson, 2007). Many of these disorders do share feature which are common such as age of onset or symptom similarity. Currently, there are no ADHD biomarkers which could assists diagnosis such as a treatment efficacy assessment. It is important, nevertheless, to accept the limits of DSM -IV including many objective alternatives in order to establish a process of diagnosis. The verification of the diagnostic criteria of DSM – IV is needed for the ADHD which is more specific and takes into account the cultural bias, developmental and

gender variations. The ADHD diagnosis in adults can be relatively challenging due to fact that as in all mental illnesses, no objective neuropsychological or medical tests can be employed to confirm or make a diagnosis and there is no available and concrete consensus established on certain symptom cluster. Performing a diagnosis in a grown-up demands the use of different kinds of resources which are more diverse than those that are available when performing a diagnosis in a young child. When it comes to children, teachers or parents intensely see the child for longer periods of time, whereas in adults, there is occasionally no single individual who sees that one specific patient throughout a specific day. Therefore, the careful assessment of history by the doctor which integrates other information and reports which are trusted for the rational review of symptoms and deficits are not usually that easy to collect in adult patients.

Here are the shortened DSM-5 criteria for diagnosing ADHD: (i) people with attention deficit hyperactivity disorder demonstrate a persistent behavioral pattern of hyperactivity impulsivity and inattention that interferes with development or functioning: (ii) six or several symptoms of inattention disorder in patients who are under the age of 17, or 5 or more for younger adolescents 17 and older, and adults; inattention symptoms have been present for a period of at least half a year and they are not appropriate for developmental level: seemingly, does seem not to listen if directly spoken to; constantly experiences trouble maintaining play, performing activities or a task; often makes mistakes at work, in schoolwork or other activities, fails to pay attention to details closely; often fails to follow through on simple instruction or unable to finish workplace duties (e.g. side-tracked, loses focus), schoolwork; has often trouble when organizing tasks and performing activities; often dislikes, or is reluctant or dislikes doing tasks that demands mental work over a prolonged period of time such as homework or schoolwork; lose things that are necessary for activities so often (e.g. books, tools, keys, wallets, paperwork, mobile telephones, eyeglasses), gets easily distracted on many occasions; constantly fails to perform the day to day duties: (iii) Impulsivity and hyperactivity – 6 or more hyperactivity-impulsivity symptoms for children below 16 years, 5 or more for children 17 and older, hyperactivity impulsivity have been apparently not appropriate for the developmental level of a person. A person: often squirms in seat or taps feet or hands or fidgets; often vacates a seat in certain circumstances when a person is expected to be in a seating position; often climbs or runs about in an environment where it is not appropriate (adults or adolescents can be limited to the feeling or restlessness); in most cases, the person experiences problems in quietly playing or participating in leisure activities or play; a person constantly pretends to be driven by a vehicle or pretends to be walking. Often; talks excessively, has trouble waiting for his or her turn, intrudes or interrupts on other people such as butting into games or conversations.

The following conditions should be met, in addition: several hyperactive impulse and inattentive symptoms are present before the age of 12; many symptoms are noticeable in 2 or more settings such as at school or work or home or with relatives or friends or in other activities, there is obvious evidence that the symptoms reduce or intermeddle with a person's ability to work or socialize or attend school; the symptoms do happen not

just during the course of another psychotic issue or schizophrenia. The person symptoms are better not explained by another different mental illness such as anxiety disorder or dissociative disorder or personality disorder or mood disorder: based on the symptom types, many kinds of attention deficit hyperactivity disorder presentations can occur as follows – combined presentation: when and if symptoms are enough for hyperactivity-impulsivity were present during the last 6 months; predominantly Inattentive presentation – if there were inattention symptoms but not hyperactivity symptoms were present during the last 6 months. It is because the symptoms of ADHD can change during any time period, the symptoms of disorder might, as well, change over time.

The diagnostic methods which uses the above mentioned criteria do follow the rule: more or equal than six signs and symptoms from at least a single group should be used. The symptoms too, need to be: often present for more than or equal to six months; more detailed than what is expected normally for the child's development level; occur in several areas such as in school or at home or work; likely present before a person turns 12 (or a least, other symptoms); and affect person's ability to work or complete academic assignments. Inattention symptoms include the following: a person normally loses focus at work or school; makes mistakes in school or other duties that are careless or seems not pay attention to detailed assignments; being unable to listen or at least hear when someone directly speaks; experiences difficulties when following orders; fails to complete a set of commands; a person failing to perform activities; dislikes or avoids engaging in duties that demand sustained and strong mental use over a protracted period of time; often misplaces the equipment required for school duties or activities; is distracted easily; constantly shows the inability to perform routine activities such the brushing of teeth. Impulsivity and hyperactivity symptoms often includes: fidgets with squirms or feet or hands; leaves chair in classroom; excessively climbs or runs about where such an activity is deemed not appropriate; unable to play quietly; excessively talks; has difficulties awaiting a queue turn; interrupts other people.

Though the following ADHD diagnostic tests have not been firmly proven, they have little value in diagnosing ADHD and they include: screening for thyroid problem; electroencephalogram i.e. EEG or brain wave test; brain imaging studies e.g. MRIs, CAT scans; computerized continuous tests; high levels of lead in the blood. Though these tests may not be useful in diagnosing ADHD, other known symptoms and signs of ADHD can warrant brain imaging studies, blood tests or an EEG. Several subregions of the brain which include basal ganglia, parietal and frontal cortexes, corpus callosum, hippocampus and cerebellum are all affected in ADHD. These structures do affect in the functional networks which are considered to be linked to ADHD. These networks show that more specific and diffuse alterations in neural networks and brain structures are probably combined in the disorder and may result in brain phenotypes that are organized. Functional MRI of patents such as children and teenagers suffering from ADHD, for example, demonstrate that there might be reduced connectivity in the fronto to striato to parieto to cerebellar network. This connectivity is normalized by MPH with the exception of the parieto to cerebellar functional circuit.

Modern techniques that include diffusion tensor imaging use the direction of water molecules diffusion in the white matter tracts of the brain to clearly show early dysfunction signs of anatomical connections in attention deficit hyperactivity disorder patients. Neuroimaging techniques only can contribute further to the documentation of gene effects on the brain structure and function but provide also an insight into the GxE and environmental impact in the near distant future. The process of making the distinction between the disorder attention deficithyperactivitydisorder and other related mental disorders can be very difficult indeed. Overdiagnosis has to be avoided and other disorders should be identified accurately. A lot of ADHD signs are expressed during the early school years might indicate also problems in communication which can result from other forms of neurodevelopmental illnesses such as depression, autism spectrum disorders, anxiety, conduct disorders.

Clinicians and other specialist must decide whether the patient is distracted by internal factors such as worries, anxieties, thoughts or sorely by external factors like environmental factors. Nevertheless, during the part of childhood, the signs of ADHD become even more qualitatively apparent; kids with the impulsive/hyperactive or combined type normally exhibit motor impersistence such as fidgeting of hands, purposeless movement, movement of lower extremities, an apparent awareness lack of their environment and impulsive talking. Kids who suffer from the predominantly inattentive type can have physical signs absent. In order to make a ADHD diagnosis, a person must receive hearing and vision screening plus a full physical exam. An EEG neuropsychiatric based Assessment Aid i.e. NEBA system is very useful and is a non-invasive scan which measures theta brain waves as well as beta brain waves. The theta to beta ratio of the brainwaves have shown to be remarkably higher in adolescents and children with ADHD than in the children with ADD. The scan is approved to be used in children aged 6-17 years and is supposed to be employed as a part of a full psychological and medical exam. A detailed medical history of a person has to be considered in case there are other disorders present that can possibly affect the behavior of a person.

There are some types of mental disorders which could cause or mimic ADHD like behaviors include undetected seizures, major life changes, lead toxicity, depression, anxiety, sleep problems, thyroid problems, among others. In an adult person, it is very difficult for a doctor to perform a ADHD diagnosis ADHD. On many occasions, it is sorely the adults themselves who recognize the symptoms of ADHD in himself or herself, especially when a sibling is diagnosed. These people tend to seek doctors' help on their own and find out that their anxiety, depression or other symptoms are linked to ADHD. Including the symptoms of impulsiveness and/or inattention. Adults suffering from ADHD can have other problems which include: chronic forgetfulness and lateness, low self-esteem, poor organizational skills, short temper, employment problems, being unable to complete a task, and restlessness.

Medical assessment primarily focuses on the identification of potential treatable disorders that can be pivotal to the worsening or relieving of signs and symptoms. Assessment must incorporate seeking the historical details of prenatal exposures (e.g.

alcohol, tobacco, drugs), CNS infections, perinatal infections or complications, traumatic brain injury, history of ADHD in a family, picky eating and/or poor appetite, sleep disordered breathing and cardiac disease. Developmental assessment involves the determination of the onset and determining the course of signs and symptoms. The assessment also includes the application of ADHD specific rating scales such as the ADHD rating scale IV, Connors Comprehensive Behavior Rating Scale, Vanderbilt Assessment Scale. Most importantly, other rating scales can be used to diagnose ADHD. Educational assessment involves the documentation of the core signs and symptoms which can involve the use of rating checklists or scales and educational record reviewing. Nevertheless, rating checklists and scales cannot alone, cannot be used to distinguish attention deficit/hyperactivity disorder from other behavioral disorders.

PROGNOSIS

Normally, ADHD has long-lasting and serious impact on an individual's life. It means that ADHD in most people will never go away completely. If a person learns how to properly manage his or her symptoms, the person's quality of life significantly improves. As a result, this translates to increased sense of well-being and motivates a person to pursue a fulfilling and meaningful life. If the ADHD is untreated, it greatly disrupts a person's daily functioning. ADHD tends to negatively affect a person's life at school, or work or home. Traditional academic and classrooms activities mostly worsen the signs and symptoms in individuals with inadequately or untreated ADHD. Emotional and social problems tend to persist for a long time. Loneliness and poor acceptance by others usually increase with the obvious display of symptoms and with age. If the ADHD is not easily identified, drug abuse may result and ADHD may also be inadequately treated because many people with ADHD such as adolescents and adults get the medication under the counter with both illegal substances such as heroin or cocaine and legal substances such as coffee, caffeine. Hyperactivity signs and symptoms usually diminish with age though, adults and adolescents tend to display residual complications of ADHD.

Predictors of poor diagnosis in adolescence and adulthood suffering from ADHD include: parental psychopathology, low intelligence, aggressiveness, social and interpersonal problems. Problems in minors and young adulthood predominantly manifest as problems in learning acceptable social behavior, low self-esteem and academic failure. Adults and adolescents who predominantly have impulsive ADHD can experience an increased incidence of poor social skills, continued display of impulsivity, antisocial behavior, restlessness and personality trait disorders. Individuals with ADHD apparently seem to better adjust to the work routine than to home, academic or training situations, particularly if these individuals are able to secure employment which normally demands less intense concentration to perform.

While a lot of kids diagnosed with ADHD longer display the clinical symptoms in their adolescence years or adulthood period, a large minority still suffer from their ADHD or proceed to develop other mental problems connected to depression, drug and alcohol abuse, and crime. Many with ADHD are

considered to be underachievers when considering their intellectual capacity. However, it must be pointed out that many young individuals with ADHD make fair and satisfactory adjustments when they enter adulthood. Therefore, the prognosis must not be judged prematurely. Regardless, ADHD can be considered barely, a big public health issue during childhood. It demands, therefore, making initiatives in order to reduce the possibility of long-term mental disorders as much as possible and allow people to reach their full potential.

TREATMENT

Restriction and elimination diets are not generally supported as a treatment for all the patients suffering from ADHD. People who consider using restriction and elimination diets needs to be well informed regarding the doubts on ineffectiveness of the diets types used in the ADHD treatment and the risks potential of unguided elimination diets. Other children groups of can be intolerant to certain types of food additives and can benefit from carefully selected exclusion diets. Food sensitivity assessment and the administration of a special dietary regime should be monitored with care and under the supervision of an accredited practicing dietician or a medical specialist. Several of the methods which are recommended for treatment methods are merely based on experience.

There is insufficient investigative data that is available to justify the dietary use of supplementation with essential oils and fatty acids in order to treat ADHD. Individuals who are contemplating the essential fatty acids consumption should be informed on the matters concerning the debate surrounding the effectiveness of essential acids in the treatment of ADHD. The prescription of essential fatty acids in the treatment of ADHD certainly warrants further research in properly controlled random trials and in addition, the dosage levels clarification and the essential fatty acid types.

The pharmacological treatment methods of ADHD all basically optimize catecholamine signaling which occurs in the prefrontal cortex. The action of the mechanisms of the 2 stimulants methylphenidate and amphetamines such as MPH include the blockade of NE DA and SLC6A3/NET transporters, monoamine oxidase inhibition and enhanced catecholamines release. Stimulants are first-line pharmacologic agents for adult ADHD with a long history and moderate to large effect(De Crescenzo, Cortese and Adamo, 2017). Stimulants primarily target both the prefrontal cortex DA and NA. Another non-stimulant drug, Guanfacine targets the postsynaptic alpha – 2A receptors in order to enhance the transmission of NE. The transmission of NE. Therapeutic ability of the DA simulation method is believed to include the weakening of necessary network connections i.e. producing a “noise” decrease whereas the enhanced transmission of NE might function by enhancing necessary connections such as the production of a “signal” increase. Current understanding of neurological mechanisms of ADHD treatments postulates that regardless of some overlaps, medications do show effects e.g. stimulants as a differential and having wide effects on motor symptoms and attention deficits and non-stimulants are likely to be more specific in nature on their action in the brain’s cortex.

The latest research of the therapeutic development of the drugs used to treat ADHD have shown that there is now a wide range of drugs available on the market. Additional research is most likely needed to advance target treatments which are tailored to fit personal symptom patterns, possibly to developmental level and brain maturation status. Improvement tend to occur by adjusting the treatment regime of the patient. Pharmacogenetic research is searching for the genetic factors which are primarily involved in pharmacokinetics and pharmacodynamics of drugs that may be able to explain the inter-individual treatment variability tolerance or treatment. SLC6A3/DAT1 meta-analysis and pharmacogenetic research has shown a notable link between ten genotype of 40 bp variable repeats of nucleotide tandem and MPH low rate response. Recently, a carboxylesterase 1 variant, the main enzyme which metabolize MPH was found to be linked with the treatment dosages that were needed to obtain a therapeutic response. In addition to the clinical response to pharmacogenetics, brain functioning imaging and pharmacological interventions are likely to improve our understanding of ADHD and its treatment.

No treatment of ADHD have been yet found to cure this medical complication, yet there are several treatments in existence which effectively can assist in this disorder management. Among the treatment method is the school staff education about the disorder management in those cases in which the individual is considered to be a minor, the education and counseling of an adult with ADHD as well as his/her family members is needed. In contrast with the treatment method which results in greatest level of symptom improvement. The administration of stimulant medications is overwhelmingly supported for this disorder by using medication such as adderall, dexedrine or d-amphetamine, ritalin or methylphenidate and in rare cases, cylert or pemoline. In particular, research has shown that desipramine (a tricyclic antidepressants) can also be useful in the symptom management of ADHD and co-existing anxiety or mood disorder. This investigation evidence is sadly rather controversial on whether or not the clonidine is of any help when it comes to ADHD symptoms management except from the widely known sedation effects. A small majority of people with attention deficit hyperactivity disorder might require different combination of the medications or others as the management regime of the disorder, particularly, due to the co-existence of ADHD with other mental illnesses.

The methods used to treat ADHD have constantly changed. In certain cases, behavioral therapy and environmental restructuring alone have been shown to be effective. Part of the therapy involves the behavioral classroom management i.e. BCM and BPT i.e. behavioral parent training have proven to be useful. In addition, behavioral psychotherapy is often successful if used together with a medication regimen that is effective. The best choice of medication are stimulants and represent the optimal therapeutic option which should be first-line. Behavioral therapy is usually efficient if is taken at the same time with a medication regimen which is also effective. Modification programs or behavioral therapy can be of help in diminishing expectations which are uncertain and in increasing organization. Ensuring that environments are conducive to attention and focus by working with schools and parents. Atomoxetine i.e. Strattera has now become a second in line

and in certain cases and is one of the recommended drug to use in adults and children with ADHD due to the fact that its classification and efficacy as a non-stimulant. However, research has shown that the effect of atomoxetine, generally, has been less extensive than that of stimulants. bupropion or venlafaxine also may be effective treatment options of ADHD. The amount of dosage is the just the same as that one used for depression treatment. Tricyclic antidepressants such as desipramine, imipramine and nortriptyline have been shown to be effective in children suffering from ADHD. However, due to the dangerous side effects, the antidepressants are used rarely for the ADHD treatment. Should these agents be used, a baseline ECG should be obtained since these agents could affect the functioning of the heart.

A low number of sudden deaths have been reported in boys using desipramine. Regardless, the definite cause of mortality was not clear and this still remains a topic that is subject to controversy and might probably not related to the use of desipramine. Alone, stimulant drugs used for school aged children are more effective than behavioral therapy alone, but combination or behavioral therapy is highly recommended for less mature individuals. Even though the correlation of underlying neurophysiologic variations of ADHD patients cannot occur when a patient is treated with drug therapy. Drugs are quite effective in the alleviation of the symptoms of ADHD and allows the participation in duties and activities that were inaccessible previously because of impulsivity and poor attention. Drugs normally disturb the cycle of inappropriate and abnormal behavior, thereby enhancing academic and behavioral interventions, self-esteem and motivation.

The ADHD treatment in adults should follow the same principles, yet, drug selection and dosage are based on a sorely individual basis and being dependent, primarily, on other medical evaluations. Stimulant drugs: stimulant drugs that include, among others, methylphenidate or amphetamine salts are used predominantly and their response greatly differs and the daily dosage depends on the patient ability to tolerate the medication and the severity or degree of the behavior. Because stimulant medication effects are seen immediately, trials of different doses of stimulants can be accomplished in a relatively short time period. Stimulant medications can be effectively titrated on a 3 to 7-day basis (Jensen, Hinshaw and Swanson, 2001).The adjustment of the dosing amount and frequency should be maintained until there is an achievement of an optimum response. National medical assessment guidelines warn that stimulants taken in high doses may increase aggressiveness and risk taking, and people on such medications should be cautioned accordingly. Regardless, when stimulants are used in doses that are prescribed sorely for people with ADHD normally do not pose a problem (Australia. Sydney Austroads Inc, 2006). Usually, methylphenidate is started at immediate release form 0.3 mg/kg, once every 24 hours and the frequency increased on a weekly basis, normally, to probably once every 8 hours or a smaller dose every hour. If the patient response is deemed inadequate but the medication tolerated, then the dose may be increased. Many people find an acceptable balance between the adverse effects and benefits of personal doses that range between dosages of 0.3 and 0.6 mg/kg. Dextro isomer of the compound of methylphenidate has the moiety that is active

and is available at 1 and half dose by prescription.

Methylphenidate, rarely, may cause painful and prolonged and painful erections and this is called priapism. Priapism tends to cause permanent penis damage and patients using methylphenidate who experience a penis erection which last for a longer period of time have to seek medical attention immediately. Dextroamphetamine is normally started usually in combination with racemic amphetamine and the daily dosage of 0.15 to 0.3 mg/kg and the dosage can be then increased from 2 to 3 times every single day or each and every 4 hours. Usually effective, are personal doses that are in the range of between 0.15 – 0.4 mg/kg. The titration of dose has to balance the effectiveness versus the adverse effects of the medication. The doses of methylphenidate are approximately a third of dextroamphetamine doses. Dextroamphetamine is the only medication approved by the FDA for use in children younger than 6 years of age. This approval, however, was based on less stringent criteria in force when the drug was rather approved based on the experimental evidence of its efficacy and safety in this certain age group.

Most of the evidence for the safety and efficacy of treating preschool-aged children with stimulant medications has been from methylphenidate (Greenhill, Kollins,Abikoff, McCracken, Riddle,Swanson, 2016) For dextroamphetamine or methylphenidate, as soon as an optimal dosage is achieved, a same dosage of any of these same medication in a sustained release form is normally substituted in order to prevent the administration of the drug in school. Long acting preparations also include biphasic capsules which contains an equivalent of two doses, transdermal patches which provides as great as 12 hours of coverage and tablets of wax matrix slow release form. These form of drugs that are short and long acting and in liquid form and are now readily available. Preparations of pure dextro such as dextromethylphenidate are used usually to reduce the adverse effects of the drug e.g. the doses and anxiety are occasionally 50 percent of the mixed preparations. Preparations which are prodrug are used as well due to their longer action duration, smoother release, lower abuse risk and fewer adverse reactions.

The academic ability tends to improve by doses that are very small. Nevertheless, behavior improvement demands higher doses. The dosing procedures of stimulants may be adjusted in order to cover certain times and times such as doing homework and school period. Drug holidays can be tried during weekends, summer vacations or holidays. Placebo periods normally run for 5-10 school days in order to maintain that the observations are reliable and highly recommended and to determine if the medications are needed still. The common side effects of stimulant also include depression, headache, sleep disturbance such as insomnia, appetite suppression, stomachache, elevated blood pressure and heart rate.

Some research results have revealed there was slowed growth in people who use stimulant drugs, but these results were in inconsistent and it is still unclear whether the symptoms can persist for a protracted period of time. Other patients who seem to be very sensitive to the stimulant drugs appear dulled or over-focused. Reduced the dosage of the stimulant drug or attempting a drug that is

different can be helpful. The selective norepinephrine reuptake inhibitor called atomoxetine is also used. Even though the data regarding atomoxetine efficacy are mixed with respect to the stimulants. Other people suffer from tantrums, sedation, irritability and nausea; rarely, suicidal ideation and toxicity occur. Typically, the initial dose is 0.5 mg per day then titrated every week to 1.2-1.4 mg per kg, once per 24 hours. The long half- life permits a dosage of 60 mg every 24 hours but continuously requires the effective use of the drug. The recommended daily dose of atomoxetine is 100 milligrams. The antidepressants like alpha-2 agonists, bupropion such as guanfacine, other psychoactive medication and clonidine are used sometimes in cases of unacceptable side effects or stimulant drugs ineffectiveness, but as first line drugs, are not recommended and are highly ineffective. These mentioned drugs are sometimes used with the stimulants for synergistic effects. It is very important to be observant and careful when prescribing these drugs because there can be adverse side effects. Guanfacine and clonidine have mixed efficacy reports when used on ADHD patients.

There have been reports of sudden deaths in minors taking methylphenidate with clonidine at bedtime. The exact etiology of these sudden death is not yet clear and is also still a matter of controversy. The drug agencies of some countries approved the use of clonidine extended-release i.e. as a ADHD treatment, mono or adjunctive therapy can be used. Provigil i.e. modafinil is a medication that has the potential of being used either as a third or fourth line treatment and there is placebo controlled evidence which supports its effectiveness as an ADHD treatment in children. Magnesium pemoline had been used rarely as medication due to concerns of potentially, rare fatal hepatotoxicity. Liver function monitoring is warranted since magnesium pemoline is closely associated with hepatotoxicity. Prescreening for arrhythmias, CAD and cardiomyopathy before the prescription of pemoline. Toxicity and overdose might precipitate mania. No significant side effect has been demonstrated on the potential of growth and when the medication is properly prescribed and the effect of substance abuse is insignificant.

Counseling that includes cognitive behavioral therapy such as role playing, modeling, self- monitoring, goal setting and is mostly effective and assists people in understanding ADHD. A structured therapy is very essential. Behavior under an academic setting is normally improved by the environmental governance of visual noise simulation, teacher proximity, coaching, novelty and normal task length. Metacognitive therapy enhances time management by involving the techniques and principles of behavioral and cognitive therapies. In doing this, these therapeutic aspects have actually made the adult patients suffering from ADHD able to better counter the depressive and anxiety symptoms they do experience during the performance of task. Metacognitive therapy has been shown to be a better option of ADHD treatment than many of the treatment methods. This therapeutic approach has been shown to be viable in ADHD therapy. At home, if ADHD difficulties persist, then parents must be encouraged to seek further help in the form of professional help and training in the techniques of behavioral management. Education of parents is an important component in the chronic illness model to ensure their cooperation in efforts to reach appropriate titration (remembering that the parents themselves might be challenged

significantly by ADHD (Bodenheimer, Wagner and Grumbach, 2002). Adding token rewards and incentives bolsters the management of behavior and is usually effective. Poor impulse control and hyperactivity are usually experienced in a home environment where there are proper or defined limits of structured parenting are presented.

Research has also demonstrated how having ADHD may help a parent to understand their child with ADHD. A study that explored whether similarity between mothers and children with ADHD would help or hinder parenting found that maternal ADHD symptoms appeared to ameliorate the negative effects of child ADHD symptoms on parenting (Psychogiou, Daley, Thompson, Sonuga-Barke, 2008).Least consistent effects have been observed in megavitamin treatments, biochemical and nutritional interventions, treatment with antioxidants or other compounds and elimination diets. Biofeedback may be useful in certain cases, however, routine use of these treatment options is not recommended because there is a lack of evidence of the sustained benefit.

CONCLUSION

The purpose of this study was to thoroughly review and investigate the disorder commonly known as Attention Deficit Hyperactivity Disorder by primarily focusing on the presentation, pathophysiology and treatment of ADHD. Based on this research, it is very clear that ADHD can negatively affect many aspects of a person's life. A very careful and considerate assessment of ADHD is highly critical during when the accurately diagnosing and managing this relatively misunderstood disorder. There is growing evidence which fairly supports the legitimacy of the ADHD diagnosis and the most useful diagnostic procedures and criteria needed in order to establish a ADHD diagnosis, to correctly identify other related disorders and ultimately manage effectively ADHD by using interventions that are both pharmacologic and behavioral in nature. What still remains a challenge, are the correct steps needed to maintain a treatment regime that is effective in the long-run.

To date, completely addressing the ADHD issues and causes of ADHD is still very challenging indeed because of complexities which generally exist in understanding ADHD, the general disagreement between academics working on ADHD. Regardless, the current recommendations encourage the early ADHD identification despite the lack of consistent ADHD data. Specialists who work in a community based environment such as schools and primary care institution must be immediately alerted about the requirement for screening of people with learning, behavior and attention problems. Further ADHD research needs to explore, in particular, the feelings and attitudes of patients who received a formal diagnosis and a follow up investigation would be valuable in deciphering the experience of receiving the ADHD diagnosis in the post teenage period. Adults with ADHD are now very common and yet, there are poorly represented in the field of neuroscience. An efficient, effective and feasible ADHD service program is required for the purpose of reducing the health disparities encountered during the management of ADHD. It is very sad indeed that the modern research has predominantly ignored the fact

that ADHD is primarily a developmental disorder which begins early in life to adulthood and therefore, should not only focus on children but adult people as well.

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APPENDIX

Annex A:

six or more inattention symptoms persists for at least half a year to a degree which is inconsistent and maladaptive with the developmental level. The symptoms include a person: failing to pay attention to detailed information or making mistakes that are very careless in work, schoolwork, or other activities; often experiencing difficulty in sustaining close attention in play activities or performing tasks; often not listening when directly spoken to; has often no ability to follow instructions and is unable to finish duties or chores in the place of work; constantly dislikes, reluctant or avoids engaging in tasks which demands sustained mental ability i.e. homework or schoolwork; often losing objects that are necessary in performing activities or tasks such as tools, books, pencils, school assignments or toys; easily and constantly distracted by outside stimuli; constantly forgets to perform daily activities.

Annex B:

six or more hyperactivity-impulsivity symptoms persists for six months, at least, to a degree which is inconsistent and maladaptive with the developmental level and includes an individual: often fidgeting

with feet or hands or squirming in a seating position; often leaving seat in a meeting or in similar situations that remaining in a seating position is requested; often running about or excessively climbing in instances that are considered not appropriate and in adults or adolescence, it can be limited to the subjective restlessness feelings; often talking excessively; often experiences problems awaiting turn; intruding or interrupting on others.