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Review Article

Diagnosing, Managing and Understanding the Impact of Co-Occurring Conditions in Autism Spectrum Disorder on Quality of Life

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ABSTRACT

Autism Spectrum Disorder (ASD) is a multifaceted neurodevelopmental disorder characterized by difficulties in social interaction, restricted interests and repetitive behaviors. It frequently coexists with a variety of other medical, psychiatric and developmental conditions, such as anxiety, ADHD, epilepsy, gastrointestinal problems and sleep disturbances. These co-occurring conditions can greatly affect the quality of life for individuals with ASD, adding complexity to diagnosis and treatment. Successfully managing ASD and its associated conditions requires a comprehensive, multidisciplinary approach, incorporating behavioral therapies, pharmacological treatments and personalized support systems. A deep understanding of how these conditions interact and influence overall functioning in individuals with ASD is essential for improving outcomes. This paper investigates the relationship between ASD and its commonly co-occurring conditions, their effect on quality of life and the importance of timely and holistic management. It also explores the role of family and community support, as well as future research directions aimed at developing more effective treatments and interventions.

Keywords: Autism Spectrum Disorder (ASD), Co-occurring conditions, Neurodevelopmental disorders, Pharmacological treatment and Future research in ASD treatment.

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INTRODUCTION

Autism Spectrum Disorder (ASD) is a complex neurobehavioral condition marked by difficulties in social interactions, delayed speech development, communication challenges and repetitive or restrictive behaviors.[1] Autism is a lifelong neurodevelopmental condition that can result in differences in how people on the autism spectrum engage with their environment, which may present certain challenges.[2] Restrictive, repetitive and stereotyped behaviors are common among people with autism. Instead of engaging with others, autistic individuals may, for instance, habitually handle and play with toys like vehicles.[3] The Diagnostic and Statistical Manual of Mental Disorders lists three of the five pervasive developmental disorders under the term ASDs.[4] The DSM-5 introduced a diagnosis known as "spectrum" for Autism Spectrum Disorder (ASD), which combined the various Pervasive Developmental Disorder (PDD) categories found in the DSM-IV, including autism disorder, Asperger's disorder, childhood disintegrative disorder and Pervasive Developmental Disorder Not Otherwise Specified (PDD-NOS), into a single, comprehensive diagnosis.[5] Ase term "spectrum" signifies the wide variety of symptoms, strengths and levels of difficulty that individuals with ASD may experience.[6] Although ASD develops severity. Life, it can affect a person throughout their lifetime.[7] Increasingly, individuals with the condition can speak, read and engage in community life rather than being confined to institutions and some may show considerable reduction in symptoms by adulthood. Nevertheless, most will still struggle with full-time employment or independent living. Although genetics and neuroscience have uncovered intriguing risk patterns, they have yet to offer significant practical advantages.[8] People with ASD frequently have comorbidities, including depression, anxiety, Attention Deficit Hyperactivity Disorder (ADHD) and epilepsy.[9]

Autism spectrum disorders

Definition

A common neurodevelopmental issue in children is Autism Spectrum Disorder (ASD). It is typified by repetitive behaviors and trouble communicating socially, but age is not a reliable indicator. This illness is thought to result from brain malfunction

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brought on by a complex interplay between environmental, genetic and epigenetic variables.[9]

Epidemiology

Autism Spectrum Disorder (ASD) affects 52 million people globally, with 7.7 million disability-adjusted life years (DALYs) recorded in 2010.[10] Prevalence rates are typically 1% in Asia, Europe and North America. In the U.S., ASD prevalence among 8-year-olds was 1 in 54 in 2016, while Italy reported 11.15% in children aged 7-9. In Asia, ASD rates reach 3.9%, with Arab Gulf countries showing a range of 0.14% to 2.9%.[11]

Etiology

The etiology of Autism Spectrum Disorder (ASD) is primarily driven by genetic factors affecting neurodevelopment, brain communication and social interaction. Epigenetic variables like histone modifications, noncoding RNA and DNA methylation also play a significant role. ASD is highly heritable, with most cases linked to multiple gene interactions, while certain genetic syndromes (e.g., Rett syndrome, fragile X syndrome) increase ASD risk. These conditions result from mutations in single genes that affect brain development and function, contributing to ASD's phenotype.[12-14]

Pathophysiology

Mechanism of autism spectrum disorder shown in the Figures 1 to 3.

Diagnosis

The Childhood Autism Rating Scale (CARS), the Autism Diagnostic Observation Schedule (ADOS) and the Autism Diagnostic Interview-Revised (ADI-R) are among the diagnostic instruments for Autism Spectrum Disorder (ASD). Key ASD characteristics, including trouble with social communication and repetitive hobbies or behaviours, are targeted by these tools.[14] Despite not having a formal test, the DSM-5 is the primary diagnostic guide for Autism Spectrum Disorder (ASD). It lays out diagnostic criteria based on symptoms. As a result, several diagnostic instruments, such as clinical evaluations, interviews, parental surveys and direct observations, have been created. When it comes to diagnosing ASD, the Autism Diagnostic Observation Schedule (ADOS) and the Autism Diagnostic Interview-Revised (ADI-R) are regarded as the gold standards. Autism Spectrum Disorder (ASD) diagnostic techniques have inherent limits, especially when it comes to the minimal age at which a diagnosis can be made. These limitations stem from three factors: (1) a number of social and communication skills mature beyond the first year of life, which establishes a cutoff age for identifying deficiencies; (2) some behaviours are normal in the early stages of infancy and are only cause for concern if they continue later; and (3) some abnormal behaviours, like repetitive actions, may manifest later on once the disorder is well founded. As a result, the minimal age at which these diagnostic instruments may correctly diagnose ASD is set.[15] Two other notable changes include the inclusion of sensory symptoms (both hypo- and hyper-reactivity) in the category of restricted and repetitive behaviours and the implementation of a severity scale (Levels 1-3) that measures the level of support required for daily functioning in individuals with autism.[16]

Management

Rehabilitative and behavioral therapy

An extensively accepted evidence-based method is Applied Behaviour Analysis (ABA). By dissecting particular tasks or abilities into smaller, more manageable pieces and teaching them methodically through reward, it focuses on changing behaviour. IQ, academic performance and language development have all significantly improved as a result of ABA. Discrete Trial Training (DTT), Verbal Behaviour Intervention (VBI), Pivotal Response Training (PRT) and Early Intensive Behavioural Interventions (EIBI) are a few ABA techniques. For example, DTT is usually applied in a classroom environment to preschool-aged children (3-5 years old). For the treatment of the primary symptoms of Autism Spectrum Disorder (ASD), Pivotal Response Treatment (PRT) is a promising technique. Using a naturalistic behavioural approach, it addresses motivational factors as well as skill-specific aspects. Whole-body exercises that make use of a variety of sensory stimuli, such as tactile, proprioceptive, gravitational, auditory, visual and vestibular inputs, are part of the treatment. Children are exposed to music with altered volume and pitch as part of auditory integration treatment, which aims to address linguistic challenges and sensory concerns frequently associated with auditory disorders. The foundation of this therapy is the idea that continuous exposure to these modified sounds can change language and behaviour as well as central auditory processing.[17] Early children's language, cognitive and functional skills have been improved through comprehensive treatment approaches that target the central symptoms of Autism Spectrum Disorder (ASD). These tactics entail extensive, multidisciplinary, intense techniques used in naturalistic environments.[18]

Pharmacotherapy

For kids with regular development and those with ASD, the psychopharmacological management strategy is the same. However, prescribers need to be aware that kids with ASD can be more sensitive to drugs and more likely to experience side effects.[18] The main symptoms of autism cannot be effectively treated with medication; instead, it is usually used to treat associated symptoms. Irritability, violence, self-harming behaviours, anxiety, hyperactivity, impulsivity, inattention and insomnia are a few of these symptoms.[17] Pharmacotherapies are Serotoninergic Medications, Atypical Antipsychotics, Stimulant Medications, Alpha-2-adrenergic Agonists, Melatonin,

Table 1: Pharmacotherapy in Autism Spectrum Disorder.[19-36]

Class	Dose	Advantages
Serotoninergic medications (atypical antipsychotics): Sertraline.	Increase to 2 mg/kg from 0.5 mg/kg. Over 6 years, begin with 25 mg and rise to 50 mg after a week, then 25 mg every month. A limit of 200 mg per day for those aged 6 to 18.[19]	Serotonin levels are increased in autistic individuals and there is a suggestion that serotonin dysregulation may be connected to common autistic symptoms, including anxiety and repetitive behaviours.[20] Adults with autism experience more severe repetitive behaviours and increased irritation when they eat a diet deficient in tryptophan, a precursor to serotonin. They also show changes in brain activity in areas related to processing faces, which implies that serotonin influences social behaviour.[21] Atypical antipsychotics are now a vital part of the therapy arsenal for a wide range of autistic symptoms. Frequently, they are employed to address irritability and related behaviours such as violence and self-harm. Additionally, they might effectively treat stereotyped behaviour and hyperactivity.[22]
Fluoxetine	Increase from 0.5 mg/kg to 1 mg/kg. For 7-12 years, the average dosage is 20-30 mg per day. Up to 60 mg may be required for individuals 12 years of age and older who suffer from obsessive-compulsive disorder or eating disorders. 40 mg per day is the maximal dosage for various diagnoses. For children under 12, start with 5 mg and increase by 5 mg per month, up to a maximum of 30 mg. Ages 12 and up: the maximum dosage is 60 mg for obsessive-compulsive disorder and 40 mg for serious depression.[19]	
Risperidone	For those aged 5 and under 20 kg, take 0.25 mg once day for three days, then up to 0.5 mg daily. Elevate by 0.25 mg every two weeks if needed. Daily range: 0.5-1.5 mg. When you are over 20 kg and 5 years old, take 0.5 mg once a day for three days before increasing to 1 mg daily. Every two weeks, increase the daily dosage by 0.5 mg if required. A daily maximum of 3 mg, with a typical range of 1-2.5 mg.[19]	
Aripiprazole	2.5 mg once daily for one week, followed by 5 mg once daily for those aged 6 to 18. If required, raise the dosage once a day by up to 15 mg in 5 mg increments spaced at least one week apart.[19]	
Stimulant medications:	Methylenephenidate Equivalent Units (MEUs) were used to convert each stimulant's dosage. The following was the conversion: 20 mg methylphenidate=10 mg dextroamphetamine=56.25 mg pemoline=10 mg methamphetamine=10 mg levoamphetamine plus dextroamphetamine combination (mixed amphetamine salts).[23]	With several formulations available for addressing ADHD symptoms, methylphenidate and amphetamine-based stimulants are among the most commonly recommended drugs for ADHD in children.[24]

Class	Dose	Advantages
Alpha-2-adrenergic agonists:	Clonidine (Extended-Release Tablets) Initial Dose for Children 6 years and older: 0.1 mg once daily, typically at bedtime.[25] Guanfacine (Extended-Release Tablets) Initial Dose for Adults and Children 6 years and older: 1 mg once daily, taken at the same time each day (either morning or evening). Dose Adjustment: The dose can be increased by increments of up to 1 mg per week. Recommended Dose Range: 0.05-0.12 mg/kg/day, with an upper limit of 4 mg/day for children aged 6-12 years and 7 mg/day for adolescents aged 13-17 years.[25]	Alpha-2 agonists and other noradrenergic system-targeting drugs are being administered more frequently to treat ADHD. Guanfacine and clonidine are two examples of these drugs. Children with ADHD benefit from these medications because they precisely target Alpha-2 adrenergic receptors in the brain, which improves attention and lessens impulsive and hyperactive symptoms. Clinical studies have shown that alpha-2 agonists are useful in reducing children's ADHD symptoms of impulsivity, hyperactivity and inattention. Clinical studies have shown that alpha-2 agonists can successfully lessen impulsivity, hyperactivity and inattention symptoms in kids with ADHD.[26]
Melatonin:	During the first week of treatment at the effective level, most children showed improvement in sleep latency in response to a dose of 1 mg or 3 mg given 30 min before bedtime.[27]	The melatonin system involves a variety of neurotransmitters in different ways. Upstream neurotransmitters that emphasise the significance of anomalies in melatonin production in ASD include serotonin (5-HT) and other associated proteases. By reducing the disorder's associated inflammation and nitrosative stress, melatonin receptor agonists can significantly improve behavioural problems and insomnia in individuals with ASD.[28]
N-acetylcysteine:	Taking 800 mg of oral N-acetylcysteine daily in three separate doses significantly reduced the symptoms of the autistic child.[29]	It has been demonstrated that N-Acetylcysteine (NAC) enhances social interactions, lessens anxiety-like symptoms in autism and lessens irritability and self-harming behaviour.[30]
Dietary supplements:		It seems that nutritional supplements, such as those containing amino acids, fatty acids, vitamins and minerals, can be used as additional therapy to help people with ASD communicate better, manage their sensory sensitivity and become more socially independent. Research indicates that eating disorders are common in children with ASD and their nutritional levels appear to be out of balance. Their food intake or absorption may be hampered by their finicky eating habits and increased risk of behavioural and gastrointestinal issues. Changes in amino acid levels and vitamin or mineral deficits may result from this. It's critical to take nutritional supplements to keep them healthy.[31]
Oxytocin:	Initially, 24 IU (4 puffs per nostril, each containing 3 IU of oxytocin) or 18 IU (3 puffs per nostril, each containing 3 IU of oxytocin) of intranasal oxytocin were given to examine the impact of a single dosage on emotion detection in young individuals with ASD.[32]	A placebo-controlled trial of intranasal oxytocin therapy for children and adolescents with autism spectrum disorder did not reveal any significant differences between groups in the least-squares mean change from baseline in social or cognitive functioning over 24 weeks. Experimental studies and small clinical trials suggest that intranasal oxytocin treatment might help alleviate social impairments in individuals with autism spectrum disorder.[33]

Class	Dose	Advantages
Bumetanide:	The youngsters weighed less than 25 kg and the dosage of bumetanide was 0.5 mg twice day or 0.02 mg/kg body weight. In patients weighing 25 kg or more, 0.5 mg of bumetanide was administered twice a day. Two daily dosages of 1 mg were administered to an 80 kg youngster.[29]	Across a range of clinical trials, including double-blind placebo-controlled trials and pilot studies, bumetanide has been shown to reduce the severity of ASD. Children with ASD now have better social connections, less agitation and a stronger sense of participation as a result.[34]
Metformin		Since autism is thought to be a hyperandrogenic disorder, it makes sense to look at the effects of metformin on steroid hormones and autism spectrum symptoms. It is widely acknowledged that steroid hormones mediate various aspects of social behaviour.[35] It has been demonstrated that the antidiabetic drug metformin blocks melanocortin receptors, hence inhibiting the synthesis of adrenergic hormone particularly androgens. In some cases of autism, it is also used in conjunction with antipsychotics to assist control of weight.[36]

N-acetylcysteine and Dietary Supplements. Emerging Targeted Treatments with a Possible Role in ASD, Oxytocin, Bumetanide, Metformin, Lovastatin, Cannabidiol, Arbaclofen, Trofinetide, Phosphodiesterase 4D Inhibitors, Anavex 2-73 and Gene Therapy.[18]

Co-occurring conditions in autism spectrum disorders

Additional psychiatric problems are more common in people with Autism Spectrum Disorders (ASD). These co-occurring conditions usually result in additional impairment and distress.[37] The investigation concentrated on the effects of three commonly co-occurring illnesses on those expenses: epilepsy, Attention Deficit/Hyperactivity Disorder (ADHD) and Intellectual Disability (ID).[38] Young children may exhibit moderate-to-severe learning deficits and current moderate-to-severe developmental delays. They may also have a history of moderate-to-severe anxiety, speech issues and hearing loss. In adolescents, the relevant history includes moderate-to-severe anxiety, mild seizures or epilepsy and hearing loss.[39] The most frequently observed co-occurring conditions were developmental coordination disorder, sleep-wake issues, gastrointestinal problems, ADHD, anxiety disorders, overweight/obesity, feeding and eating disorders, elimination disorders, disruptive behavior and somatic symptoms and related disorders.[40] It might be challenging to identify comorbidities in ASD since they can present with odd symptoms and appearances. Nonetheless, population-based research has demonstrated the significant reported burden of comorbidities in ASD. Finding favorable associations between specific exposures and comorbidities can help with comorbidity early detection and treatment. Furthermore, analyzing the distribution of exposures and comorbidity patterns in people with ASD may help to clarify the heterogeneity of the illness and provide a means of grouping people for more accurate diagnosis and study.[41]

It's critical to take into account the larger effects of comorbid illnesses including anxiety, depression, ADHD and sleep problems on the lives of individuals with ASD, as these individuals frequently experience these problems. The person's behavior and mood may suffer as a result of these comorbidities. Regular discussions regarding feelings, behavioral changes and suicidal or self-harming thoughts should be had by caregivers and individuals with ASD. The well-being of the caregiver may also be impacted by these difficulties.[42] Furthermore, almost two-thirds of people who receive an adult diagnosis of ASD have previously received a diagnosis for one or more other psychiatric disorders. Moreover, even after being diagnosed with ASD, half of these people still fit the criteria for their previous diagnoses.[43]

Attention Deficit Hyperactivity Disorder (ADHD)

Over the past ten years, there has been an increase in interest in the overlap between Attention-Deficit/Hyperactivity Disorder (ADHD) and Autism Spectrum Disorder (ASD). Studies conducted on clinical populations' reveal that characteristics of ASD, like difficulties with social communication, are frequently observed in those with ADHD and characteristics of ADHD, like hyperactivity, are frequently found in people with ASD.[44]

Anxiety Disorders

As several anxiety disorders frequently co-occur, anxiety in people with autism is frequently complex. These illnesses can have symptoms that are connected as well as additive.[45]

Epilepsy

The most commonly mentioned risk factor for seizures in people with autism is cognitive impairment or intellectual disability. There was insufficient and inconsistent evidence for other potentially important factors, which emphasizes the need for more study.[46]

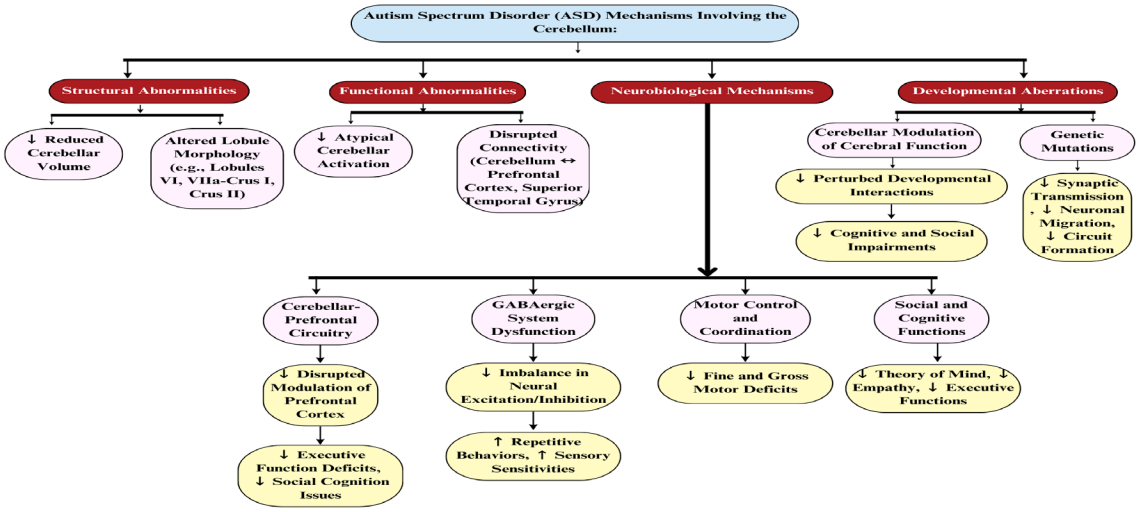

Figure 1: Autism Spectrum Disorder-Mechanism involving the cerebellum.

Learning Disabilities

According to Tureck *et al.* (2014), autistic people who also have co-occurring Intellectual Disability (ID) typically struggle more with verbal and nonverbal communication, exhibit more persistent problematic behaviors and are more likely to engage in repetitive, stereotypical and self-harming behaviors. Furthermore, compared to children with autism or ID alone, children with both conditions experience noticeably more challenges in learning, interpreting, communicating and controlling their behavior.[47]

Dyslexia, Dyscalculia and Dyspraxia

Among them, dyslexia, dyspraxia, Attention Deficit Hyperactivity Disorder (ADHD), specific language impairment and dyscalculia are the most prevalent. Particularly in terms of symptom overlap, dyslexia and ADHD are classified as developmental disorders by psychiatric classification systems, just like autism. (World Health Organization, 1992; American Psychiatric Association, 2000).[48]

Management strategies for Autism and Co-occurring conditions

Pharmacological Intervention

The main symptoms of ADHD, such as impulsivity, hyperactivity and inattention, can be effectively treated with pharmaceuticals in both adults and children. As an example, only two FDA-approved drugs for treating irritability—risperidone and aripiprazole-are available for treating aggression. In contrast, treatments for Autism Spectrum Disorder (ASD) primarily address comorbid symptoms, including irritability and aggression. Although their effectiveness is typically limited, several drugs may offer some assistance in regulating repetitive behaviors in individuals with ASD. Targeting social deficits, new research is looking into potential treatments including intranasal oxytocin. To control the symptoms of ADHD, people with ASD have been using more drugs recently, especially ADHD therapies.[49]

Psychostimulant Medications

The efficacy and safety of psychostimulants, especially methylphenidate, in treating individuals with both ADHD and ASD are less well-established, despite their significant research in this area. According to early research, children with both problems experienced more negative effects, such as irritation and self-injury, with these drugs than they did advantages. A more thorough study conducted by the Research Units on Paediatric Psychopharmacology Autism Network, however, discovered that methylphenidate assisted in reducing impulsivity and hyperactivity in roughly 50% of children diagnosed with ASD. This response rate was less than the 70-80% observed in cases of ADHD alone. Children with ASD also often tolerated smaller doses and side effects were more prevalent. It is advised to use lower doses and to closely monitor for side effects in children who have both ASD and ADHD.[49]

Non-stimulant Medications

To treat co-occurring ASD and ADHD, non-stimulants such as guanfacine and atomoxetine have been studied due to the uneven outcomes of stimulant drugs. While atomoxetine has a modest effect on inattention, it is often more well-tolerated and effective in lowering impulsivity and hyperactivity. When used to children with ASD who have stronger cognitive capacities (IQ>70), it usually works better. Alpha-2 adrenergic agonist guanfacine has been demonstrated to reduce hyperactivity and inattention, especially in children with ASD who operate intellectually at a higher level. Guanfacine is helpful in research, particularly in cases where stimulants such as methylphenidate are ineffective.[49]

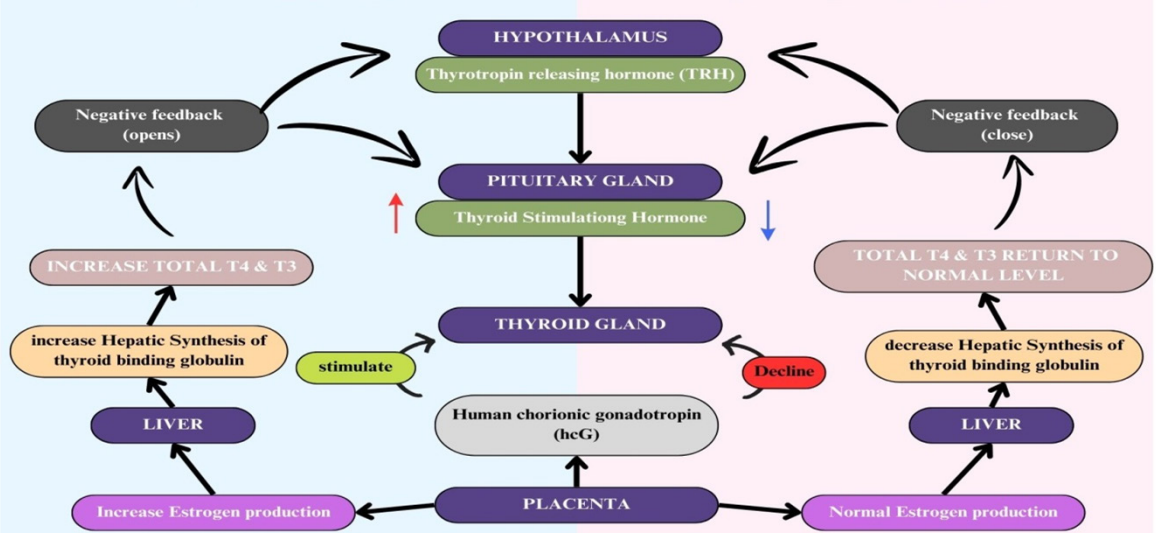

Figure 2: Thyroid regulation during pregnancy.

While drugs are generally used to treat co-occurring diseases, behavioral treatments are the main focus of the current evidence-based care of ASD in children. While psychopharmacological treatments are commonly employed in clinical settings for children diagnosed with autism spectrum disorders, there is a paucity of strong evidence concerning their efficacy and tolerability. Risperidone and aripiprazole are effective treatments for aggressiveness and irritability, according to the strongest available data. Other antipsychotic drug use, however, is not well supported by research and is frequently limited by possible adverse effects, the most prevalent of which is metabolic disruption.[50]

Impact on quality of life

When evaluating the impact of stress, parents of children with ASD were more likely to fall into the high aggravation category than parents of children with developmental challenges, those with special health care needs but no developmental issues and those without special health care needs.[50] Research has shown that parents of children with ASD face mental health challenges, including anxiety and depression.[51] In addition, there are social impacts, including increased social isolation and financial pressures.[52] Co-occurring conditions and behavioral issues in children with disabilities, including ASD, can greatly affect their families.[53] The impact of these co-occurring conditions on the family varies based on their type, severity, frequency and number. For instance, a child with anxiety might avoid social interactions and withdraw from family activities, leading to social isolation for the family or the need to hire respite care, potentially causing financial strain. Likewise, a child with attention or hyperactivity issues may exhibit disruptive behaviors that interfere with the family's daily routines, creating challenges in managing frustration and requiring extra patience and understanding.[54] Co-occurring conditions related to the ASD phenotype can place as much, if not more, stress on family members of a child with ASD than the core symptoms of ASD itself.[55] The level of burden on the family, which can impact a parent's coping abilities, has been shown to rise based on (a) the severity of the co-occurring condition and (b) how often or frequently the child displays these behaviors.[56]

Support system and resources

Therapeutic interventions

Pharmacological treatments for ASD include psychostimulants, atypical antipsychotics, antidepressants and alpha-2 adrenergic receptor agonists. Psychostimulants help with ADHD symptoms but may cause irritability. Atypical antipsychotics like risperidone and aripiprazole manage irritability and aggression, though they can lead to weight gain. Antidepressants, especially SSRIs, are used for anxiety and repetitive behaviors, but their benefits for core ASD symptoms are unclear. Alpha-2 adrenergic agonists like clonidine and guanfacine help with hyperactivity and sleep problems, though side effects like drowsiness are common.[57]

Mental and health services

While the mental health needs of adults with ASD vary, research shows that adults with ASD have notably higher rates of mental health issues, including mood disorders, anxiety, ADHD and psychotic disorders. Moreover, these co-occurring mental health challenges continue from childhood into adulthood and affect both males and females with ASD.[58]

Social skill training

Social Skills Training (SST) for children with Autism Spectrum Disorders (ASD) is an intervention aimed at enhancing their ability to engage in social interactions. The training helps children with ASD to understand social cues, communicate effectively and form friendships. It teaches them to recognize and interpret facial expressions, body language and social norms, which are

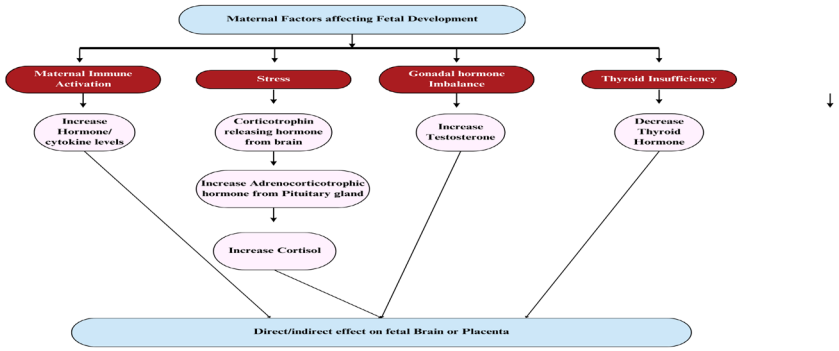

Figure 3: Maternal Factors Affecting Fetal Development.

keys to building relationships. SST usually involves structured activities like roleplaying, social stories, group exercises and peer modeling, giving children the opportunity to practice new skills in a supportive environment. The training also covers emotional regulation and conflict resolution to help children better understand and express their emotions in social situations. Regular practice can lead to increased confidence, greater social participation and improved social skills, ultimately enhancing their quality of life. SST has proven to be highly effective in improving social adjustment and interactions for children with ASD.[59,60]

Social and educational integration

Educational integration for children with ASD involves including them in mainstream education with individualized learning plans and adaptive teaching strategies to support their unique needs. This approach fosters social inclusion, helping them develop communication and social skills alongside their peers. Schools provide specialized services like speech therapy and behavioral interventions to ensure their academic and social progress. Inclusion benefits both children with ASD and their peers by promoting understanding and diversity.[61] For adults with ASD, social integration focuses on overcoming challenges in relationships, community involvement and employment. Efforts include creating inclusive workplaces, offering flexible work environments and providing vocational training programs tailored to their strengths. These initiatives aim to help adults with ASD achieve independence and improve their quality of life, though continued societal awareness and support are necessary for success.[62]

Future directions in research

Use of precision medicine in the management of ASD

Precision medicine in ASD treatment focuses on creating personalized plans based on each individual's genetic makeup, biomarkers, environmental exposures and lifestyle factors. Since ASD varies greatly between individuals, treatments must be tailored to specific causes and symptoms.[63] By analysing a patient's genome, doctors can target treatments, such as adjusting metabolic pathways through diet, supplements, or medications. Precision medicine also considers environmental and behavioural factors to ensure the treatment is effective and fits the patient's lifestyle. Though still in its early stages, this approach holds promise for improving outcomes and quality of life for those with ASD.[64]

The future of developing biotechnologies

Emerging biotechnologies are transforming the understanding and treatment of Autism Spectrum Disorder (ASD). Gene editing tools like CRISPR-Cas9 allow precise modification of genetic variants linked to ASD, which may lead to targeted therapies.[65] Stem cell therapies use a patient's induced Pluripotent Stem Cells (iPSCs) to model ASD in the lab and explore new treatments. Biomarkers help with early diagnosis and personalized treatment plans. Additionally, iPSC-derived brain organoids recreate key aspects of brain development, aiding in the study of ASD's underlying mechanisms and enabling personalized drug testing. Though these technologies are still in research, they offer promising prospects for improving ASD treatment and management in the future.[66]

Relationship between research on asd and social policy

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DISCUSSION

Autism Spectrum Disorder (ASD) often occurs alongside conditions such as anxiety, ADHD, epilepsy, gastrointestinal issues and sleep problems, making diagnosis and treatment more challenging. These co-occurring conditions can have a significant impact on an individual's quality of life, increasing functional difficulties and necessitating more specialized care. Management of both ASD and its co-occurring conditions requires a comprehensive, multidisciplinary approach, combining behavioral therapies, medications and strong family support. Interventions like Applied Behavior Analysis (ABA) and Cognitive Behavioral Therapy (CBT) are useful, along with medications, to manage issues like anxiety and seizures. The effect on quality of life is considerable, as these co-occurring conditions can exacerbate social isolation, functional challenges and stress for caregivers. Family and community support systems play an essential role in alleviating these issues and creating a more positive environment. Future research should focus on understanding the underlying causes of co-occurring conditions in ASD, refining personalized treatment approaches and ensuring better access to care, particularly for underserved groups. With improved support and treatment strategies, individuals with ASD can achieve greater independence and a better quality of life.

CONCLUSION

Co-occurring conditions are common in individuals with Autism Spectrum Disorder (ASD) and can intensify the challenges they face, further impacting their quality of life. The complex relationship between ASD and these conditions necessitates a personalized and comprehensive approach to diagnosis and treatment. Effective interventions should not only address the core features of ASD but also target the associated conditions that hinder overall well-being. Family involvement, community support and customized therapeutic plans are vital for enhancing outcomes and improving quality of life. Future research should focus on uncovering the mechanisms that drive co-occurring conditions in ASD and developing more accurate, individualized treatment approaches that address both ASD and related disorders. With increased understanding and targeted care, the potential to significantly improve the life course of individuals with ASD is substantial.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

ASD: Autism spectrum disorder; **ABA:** Applied Behavior Analysis; **ADOS:** Autism Diagnostic Observation Schedule; **ADI-R:** Autism Diagnostic Interview-Revised; **ADHD:** Attention Deficit Hyperactivity Disorder; **CARS:** Childhood Autism Rating Scale; **CBT:** Cognitive Behavioral Therapy; **DALY:** Disability-Adjusted Life Years; **DTT:** Discrete Trial Training; **EIBI:** Early Intensive Behavioural Interventions; **hsG:** Human Chorionic gonadotropin; **ID:** Intellectual Disability; **iPSCs:** induced Pluripotent Stem Cells; **MEUs:** Methyl enephenidate Equivalent Units; **NAC:** N-Acetylcysteine; **PDD:** Pervasive Developmental Disorder; **PDD-NOS:** Pervasive Developmental Disorder Not Otherwise Specified; **PRT:** Pivotal Response Treatment; **SST:** Social Skills Training; **TRH:** Thyroid Stimulating Hormone; **US:** United state; **VBI:** Verbal Behaviour Intervention.

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