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Autism: Current Findings

Charushila Biswas

VIT University, Vellore, Tamil Nadu, India

Commentary

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*For Correspondence
Charushila Biswas, VIT University, Vellore, Tamil Nadu, India, Tel: +91 8374178728; E-mail: charushilabiswas8@gmail.com

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INTRODUCTION

Autism or Autism Spectrum Disorder (ASD) is a neurological disorder that effects the normal functioning of the brain. This affects the development of communication and social interaction skills. Leo Kanner first described autism after observing a group of patients with similar impairments [1]. People with ASD tend to resist any sudden changes in their daily activities. The symptoms of Autism are different in affected people ranging from severe to mild. The patients often find it difficult to make any eye contact or making any physical contact with relatives such as hugging. They are taciturn, unable to understand other's feelings and finds sudden loud noise, smell or light to

There are four main types of Autism [3]:

• Autistic Disorder or autism, childhood autism, early infantile autism, Kanner's syndrome or infantile psychosis.

• Asperger Syndrome or Asperger's disorder.

• Childhood Disintegrative Disorder (CDD), dementia infantalis, disintegrative psychosis or Heller's syndrome.

• Pervasive Developmental Disorder (Not Otherwise Specified) or PDD (NOS) or atypical autism.

Though what exactly causes ASD is not clear, scientists agree that genes and environment play a major role. Abnormal level of serotonin and other neurotransmitters in the brain which is caused by abnormal gene expression or suppression during early fetal development by defective genes is one of the causes. The most robust neurological finding to account for autism is greater brain volume. The early brain overgrowth is most strongly evident in the prefrontal cortex, temporal cortex and amygdala. This leads to abnormal inhibitory control of motor and general cognitive skills. ASD patients also have difficulty recognizing faces. This impairment is explained by connectivity between the frontal lobe and striatum, including basal ganglia, and between the temporal cortex and amygdala. Other regions of the brain which is implicated in social processing include fusiform gyrus, medial prefrontal cortex, and insula [4]. However, a recent study by Isomura et al. have found that angry schematic faces were detected more quickly than happy schematic faces by children with ASD [5].

A recent study has found that approximately 500 genetic loci are associated with ASD [6] and a clear link to a subtype of autism and a specific genetic mutation in the CHD8 gene has been shown [7]. Scientists have also found evidence that the complement system results in the pathogenesis of ASDs. Studies have found that complement protein C1q plays a role in microglia-mediated synaptic pruning in a typical developing human brain. C1q activates the complement cascade and produces C3/CR3 signaling resulting in the activation of microglia phagocytosis [8]. Mutations in tumor suppressor genes may link cancers with ASDs; mutations in tumor suppressor genes and its inclination toward cancers and ASDs may requiresome "triggers", such as environmental pollutants [9]. Researchers have found two positive associations of polymorphisms in OXTR with autism in boys, namely markers rs2270465 and rs237851. [10]. ASD patients have higher levels of Delta (δ) waves and less levels of Alpha (α) and Beta (β) waves in

their brain activity. Study conducted to show the use of sonified Neurofeedback produced by a two channel EEG device headband and the Brain Music System (BMS), can successfully suppress the δ waves while at the same time promote α and β waves resulted in relevant δ wave suppression clearly indicating that ASD patients made significant progress in managing symptoms associated with ASD [11]. Improvement in ASD patients has also been recorded by transplanting with autologous bone marrow derived mononuclear cells [12].

Rubella virus has been found to be one of the causes of Autism in another study [13]. Food scientists have hypothesized that autism can also be caused by abnormal omega-3 fatty acid metabolism and docosahexaenoic acid (DHA) production. Studies have shown that autism can be partially prevented by treating high risk individuals with healthier diets containing fish, fish oil, fruits and green leafy vegetables [14]. Potential future probiotics (beneficial bacteria: lactic acid-producing bacteria and bifidobacteria) and prebiotics (non-digestible oligosaccharides) have been found to enhance gut good bacteria against abnormal colonizing bacteria, in this way alleviating autistic symptoms [15]. It has also been found that the –omics tool can be a winning strategy to monitor impaired metabolic redox states, networks and patterns in complex, chronic and invalidating human diseases as ASD, schizophrenia and fibromyalgia, even coupled to specific S metabolism evaluations [16]. Recently a relation between addiction and ASD has also been established which is important for clinicians to assess the patients with addiction or ASD [17]. Shortened period of neuroplasticity, which normally extends to adolescence, may result in a shortened period of development, forcing the brain to rely on underdeveloped structures [18]. Autism patients with epilepsy have shown to have low intelligence quotient [19]. It has also been found that nearly 70% of individuals with ASD score below-average IQ [20]. Many individuals with ASD have not received adequate education and treatment that they require to meet the basic WHO sexual health guidelines [21].Three additional mechanisms may also contribute to autism: (1) evolution of the size of cerebrum and cerebellar (2) imbalance in the excitatory/inhibitory ratio and (3) the hormonal effects of the male genotype [22]. It has been found that DHA supplementation in autistic patients may improve impaired social interaction via activation of the signaling pathway and possibly through increased antioxidant capacity [23].

Environmental factors such as exposure to certain pesticides or long term exposure to toxic chemicals, increases the risk for autism along with the autism related genes [24]. Impaired detoxification mechanisms and increased toxicant also contributes to autism phenotypes [25]. Researchers have found that autistic children respond better to skilled staff in therapeutic classroom in Intensive Day treatment. It reduces the impairing behaviors of these children, allowing families and schools to manage autistic children better [26]. A program designed to teach social skills to middle school ASD children was successfully demonstrated by scientists. The ASD children acquired and performed well in social skills in the settings beyond the training site. Positive reports were documented both by the parents and teachers of these children [27]. If parents of ASD children are university educated and had a good income, it means that children are more likely to receive interventions, and well supported and in good educational placements in families that valued education [28]. It is also speculated that there is a possibility of hidden population of Autistic adults [29]. Scientists have concluded that after undergoing 12-week RBP group therapy, children with HFASD showed improvement in social skills, mood and emotion regulation[30]. A study hypothesized that patterned, tempo-based, rhythm interventions, at 60-beats per minute (pbm), can regulate and induce systemic pacing, reduce repetitive anxiety behaviors and enable focus and calm in persons with ASD [31]. In another recent study, proper regulation of the Edndocannabinoid (EC) System and its receptor has shown to down-regulate Autism symptoms [32]. Another study found that synthetic hormone ethinylestradiol (EE2) is an endocrine disrupting chemical capable of adversely affecting sensitive hormonal pathways that regulate reproductive function and harmfully affecting offspring, linking COC with ASD [33]. The ethical issues associated with scientific findings on autism should be carefully checked and implemented, as they have enormous implications for public health, for biomedical ethics, for the children, adults, and families affected by the disorders [34].

CONCLUSION

Evaluation, diagnosis and treatment of patients with ASD is not only mere science but is also the skill and test of perseverance of the close relatives, teachers and clinicians. Individuals who want to serve ASD patients need to increase their work experience, as well as learn more about test

administration, and should be an expert in interpreting the test results for accurate diagnoses and appropriate treatment strategies [35]. Robotcists and researchers in human-robot interaction for the use of robots with ASD children is a very powerful tool for ASD patients for developing a very wide range of skills [36]. Educational programs to increase awareness and acceptance of ASD by neurotypical children may also counteract bullying of Autistic children [37]. Schools or institutions also play a major role. The statistical difference in the numbers of ASD children with verbal communication assisted in special schools, special schools with clinic, regular schools with inclusion classes and day-care institutions, where SLT services are provided depends on the type of institution [38]. Melodic Based Communication Therapy has also been found to improve social skills in ASD children [39]. Though stem cell therapy seems promising, more investigation on stem cell biology is required before stem cell therapies can become a successful for treating ASD [40]. As mentioned before, individual patient is unique and most often does not present with behaviors like other patients. This makes the decision for diagnosis and treatment most difficult and challenging. Therefore, it is highly recommended that a team of professional assesses individual patients' skills in language, play, and sensory motor. School psychologists and preschool teachers play an important role as well, in identification and intervention, support, information, consultation, and recommendations to teachers, school personnel, administration, and families of Autistic patients [41,42]. Parents also need to participate in the assessment to understanding the home routines; how the child functions socially; and how the child interacts with peers, family members, and teachers. Genes may play a part in ASD but nothing can beat proper care, treatment and understanding the fact that all Autistic patients show different symptoms and will respond differently to treatment.

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