

Review Article

Vaccination and autism: a new perspective

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Abstract

Autism Spectrum Disorder (ASD), a rare neurodegenerative disease, affecting 1 in 100 people worldwide, 1 in 68 in US, and is often referred as the hidden epidemic. India has over 10 million autistic people. The number is steadily increasing each year, and in US alone 20% rise was recorded in the last two years. Several factors including genetic, environmental, and psychological, seem to be involved, and an individual's genetic make-up susceptible to any external stimuli may lead to autism. Several reports indicated that MMR (Measles, Mumps, and Rubella) vaccine may act as a trigger for autism. In MMR, the rubella vaccine is actually a live-attenuated RNA virus. Studies indicated that the live-attenuated RNA virus may become virulent as RNA viruses with reverse transcriptase have a higher mutation rate and can cause viral attack. The aim of this review is to find out a possible link between the rubella vaccine and ASD.

Key Words: Autism, Vaccine, Rubella, Immunity.

Introduction

In an overpopulated and developing country like India, importance of a disease or disorder largely depends on its outcome, for example life-threatening diseases are more important as the value of human life depends on the quantity rather than the quality. This is evident from the research funding, public awareness and government policies on health care. There is often a pronounced misconception about some diseases and disorders, which deteriorate the quality of lives of individuals and their families. Mental disorders specifically fall into this category. Autism Spectrum Disorders (ASD) or Autism is a group of developmental disorders that pose threat to the society because it affects the children, the future of any society, and thus called as a 'curse of civilization' or hidden epidemic. In modern days ASD is spreading like cancer.

Autism Spectrum Disorder or ASD is the collective term for neurodevelopmental disorders where a person has impairment in social interaction, communication, with limited activities and interest.¹ It includes autistic disorder, pervasive developmental disorder (PDD), Apergers syndrome, Rett syndrome etc.² There is a growing concern about ASD in developed countries, including US, UK, Canada and Australia as the incidence of ASD is alarmingly increasing day by day. In US 1 out of 68 children are diagnosed with ASD in 2013; which was 1 in 110 in 2010; while in India over 10 million people are affected.³

Types and cause of ASD:

ASD is broadly classified into innate and acquired form. When an individual is autistic right from infancy is called innate; while in acquired autism the individual develops ASD traits later in his life, now known as regressive autism.⁴ As ASD has a strong genetic background, every ASD can be treated as innate. Till date the cause of ASD is unknown. It is primarily an autoimmune disorder/disease where considerable neurodegeneration results in impairment of social and verbal communication. However, some risk factors may induce ASD in genetically predisposed individuals.⁵

Risk factors and remedy:

Available internet database of any widely used search engine will blame almost everything and nothing to be the cause of ASD. Some valid findings have marked certain risk factors that might induce or trigger ASD. Of these, maternal infection (viral and bacterial), fragile-X, severe fungal diarrhoea, vaccination are important risk factors for ASD.⁶ Till date there is no remedy or medicine that can be used for curing ASD. Since a multitude of factors are responsible for this disorder, there cannot be one single solution to correct it. Medicines, however, can reduce certain behavioural conditions. Psychological therapies, early intervention, behaviour therapy, special education etc may help the autistic individual to some extent.⁷

Rubella or German measles is an air borne viral disease that may cause the congenital rubella syndrome (CRS) in infants. Infection during pregnancy, especially within the first 20 weeks, by Rubella virus can be serious and may lead to the birth of child with CRS⁸. German measles caused by the rubella virus can occur in school going children also.⁸

Symptoms and CRS:

The symptoms of German measles are similar to flu, and the most common symptom is the appearance of rash, followed by fever, swollen glands, joint pains, headache and conjunctivitis⁹; while the CRS causes severe damage to the brain. Extensive degenerative changes in leptomeningeal and intrinsic blood vessels of cerebrum, deep white matter and gray nuclei occur due to necrosis. Retarded myelinisation also occurred in some infants.¹⁰ Rubella causes significant loss of executive functioning in children at school going age.

Vaccines and types:

Immunization or vaccination is an effective way to reduce or control many infectious diseases. Vaccines are primarily of three types: (i) antigenic preparation of live attenuated strains of disease producing organisms, e.g. measles, mumps, rubella, typhoid; (ii) killed preparations like anthrax, cholera, hepatitis-A; and (iii) antitoxin or toxoid preparations like tetanus and diphtheria.

Constituents of Rubella vaccine:

Rubella vaccine is a live attenuated vaccine which is often administered as a combination vaccine with measles and mumps, known as MMR. This vaccine is reported to contain a mercurious compound thimerosal, but FDA recently stopped the use of this compound as a constituent.¹¹

Risks of live attenuated viral vaccine:

The live attenuated viruses are known to retain the ability to replicate within the host body without causing any illness. This method of immunization is very effective in building up immunity against many life threatening infectious diseases. However, recently a group of researchers have expressed concern over the fact that attenuated viruses, particularly RNA viruses are able to cause virulence in host body after administration of the vaccine; as RNA virus can undergo antigenic change and become infectious, particularly in immune-compromised people and infants.¹²

Immunity and Autism

ASD is a condition often with dysfunctional immune system and the affected individuals often show abnormal immune responses.¹³ The autistic individuals have low levels of immunoglobulins (Ig), and it was evident that higher severity of the disorder correlates with

lower level of immunoglobulins.¹⁴ A recent study¹⁵ on the plasma of 99 children, aged between 5 and 10 years, with autism showed significantly lower levels of eight cytokines, compared with that of 40 unrelated healthy siblings without AD, under the same conditions. Three of the cytokines are known to be involved with hematopoiesis and five with attraction of T-cells, natural killer cells and monocytes. This necessitate further study to confirm immunological role in hematopoiesis and antibody production in the children with AD along with the linking genes that encode immune related proteins and cytokines for their impact on critical periods of brain development and function¹⁵.

Autism and Rubella

Rubella is a major contributor of multisensory impairment (MSI), and in autistic people MSI is a common occurrence. Many children have shown complete or partial autism when infected with rubella.¹⁶

Discussion

From the analysis of the available data so far, it can be concluded that ASD individuals have low levels of several cytokines and immunoglobulins that makes them prone to infections. On the other hand, the vaccines although immunize against many diseases, including the live attenuated rubella in MMR, may increase the virulence of the live virus in host body by antigenic alterations. So, when a child is genetically vulnerable to ASD, MMR or rubella vaccine can cause infection, since, the child would be immunocompromised. Hence, it is pertinent that the immunoglobulin levels of infants should be checked before administering the vaccines like MMR, and the children with lower levels of Ig should further be tested for ASD. As time ticks by, the current data from Centre for Disease Control, US, shows more than 1% of the world population is affected by some form of autism¹⁷, hence, it is of grave concern and a massive awareness and research drive is to be initiated at the very basic level.

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