Exploring the association between breastfeeding and the risk of developing autism spectrum disorder

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Abstract

Autism spectrum disorder (ASD) is a complex neurodevelopmental condition with rising prevalence globally, including Pakistan. While genetic factors substantially contribute to ASD risk, environmental and early-life nutritional factors are also being investigated. One such factor is infant feeding practices specifically breastfeeding, its duration and exclusivity. Human breast milk provides comprehensive protection via providing essential nutrients with immune defence and neurobiological regulation supporting optimal brain development. Despite these benefits, breastfeeding rates in Pakistan remain low. This mini-review explores the existing literature on the potential link between breastfeeding and ASD with a focus on epidemiological evidence and underlying biological mechanisms. While some studies suggest that breastfeeding may reduce the risk of ASD, the evidence is inconclusive due to methodological differences, recall bias, and cultural factors. Data from low- and middle-income countries is lacking and call for an urgent need for robust longitudinal research in Pakistan to better study this association and guide cost-effective public health strategies.

Keywords: Autism, Childhood disability, Pakistan, breastfeeding practices, developmental delay, developing countries, LMIC

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Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by deficits in social communication and restricted interests and repetitive behaviours.[1] It is frequently accompanied by other behavioural and psychiatric conditions, including anxiety and attention deficit/hyperactivity disorder (ADHD). Estimates suggest that 25% to 81% of individuals with ASD also meet criteria for ADHD.[2] The rising interest in ASD is due to its growing prevalence worldwide over past few decades. The World Health Organization estimates that autism affects 0.76% of children globally, with higher incidence rates among males and in developed countries.[3] The prevalence of ASD in the USA is reported to be 18.5 per 1,000 children under 8 years of age. The majority of countries have reported an increase in the number of ASD cases over the past decades. In Southeast Asia, approximately six per 1,000 individuals are affected with ASD.[4] While Pakistan is included in the broader regional grouping (i.e., Southeast Asia) in this global burden of disease, a specific, high quality national prevalence estimate for ASD in Pakistan are not available in the published data. Pakistan Autism Society recently estimated that around 350,000 children in Pakistan have been diagnosed with ASD.[3]

The exact causes of ASD are unclear. Growing research suggests that its origins lie in a complex interplay between genetic predispositions and environmental influences.[4] Genetic factors appear to play a central role involving both rare, high-impact mutations (such as those found in CHD8, SHANK3, and MECP2) and numerous common variants that subtly influence neural and chromatin-related pathways.[5,6] Large-scale genomic studies further reveal that ASD shares considerable genetic overlap with other neuropsychiatric disorders, reflecting its intricate and deeply polygenic nature. Together, these findings suggest that ASD cannot be traced to a single cause, but rather emerges from a dynamic convergence of biological and environmental factors.[7]

Alongside genetic factors, increasing attention is being given to non-genetic environmental conditions, which may shape the likelihood or expression of ASD. Some of the risk factors associated with ASD include lack of breastfeeding, late initiation of breastfeeding, advanced paternal age, foetal distress or birth asphyxia, delayed birth cry at birth, gestational respiratory infections, labour complications, preterm birth, neonatal jaundice, and consanguinity.[8]

Importance of breast feeding

Human milk is considered the optimal food for infants, as it provides nutritional, immunologic, and developmental advantages crucial for development in early childhood and into adulthood.[9] Lack of breastfeeding, especially in the first six months of life, can deprive children of these critical benefits and may increase the risk of developmental delays,

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including ASD.[9] It has been reported that only 48% of infants in Pakistan are exclusively breastfed for six months.[10]

Considerable efforts have been made to explore the association between various risk factors and the development of ASD. Some aspects of breastfeeding practices, including rates, timing, or optimality, have been suggested as a possible environmental risk factor for autism. However, existing studies show conflicting evidence and remains inconclusive to establish a clear relationship between ASD and breastfeeding.[11]

Biological benefits of breast milk

Research suggests that breastfeeding during the first six months supports neurocognitive development. This effect is linked to nutrients such as omega-3 and omega-6 fatty acids, which are essential for brain growth. These essential fatty acids are widely recognized for their critical involvement in the cognitive, social, and language development of children between the ages of 6 months and 3.5 years. Deficiencies in these nutrients have been observed in individuals with ASD which supports a possible link between breastfeeding and ASD risk or outcomes. In addition to essential fatty acids, breast milk provides a wide range of biologically active components, including vitamin A, immunoglobulin A , the peptide β-casomorphin-7, insulin-like growth factors I and II, basic fibroblast growth factor, epidermal growth factor, and antioxidants such as glutathione .[9]

Evidence from literature

A recent study by Ghozy et al.[12] demonstrated a significant inverse association between breastfeeding and the risk of developing ASD. The findings suggested that individuals who were ever breastfed had a 58% lower risk of ASD, while exclusive breastfeeding was associated with a 76% reduction in risk. A meta-analysis showed that breastfeeding for 12 to 24 months was linked to the most substantial risk reduction, with an odds ratio of 0.23 (95% CI: 0.14–0.36). This inverse relationship highlights the potential protective effect of breastfeeding against ASD.[1] There are few studies on infant feeding methods in relation to ASD. Two case-control studies found that the absence or late initiation of breastfeeding was significantly associated with ASD or autism.[13] However, some conflicting studies dismiss the contribution of initiation or duration of breastfeeding to the prevention of clinical severity of ASD.[14]

Early brain development during infancy is a critical period characterized by rapid neurological growth and the attainment of fundamental neurocognitive milestones. Maternal presence is essential during early infancy. Exclusive breastfeeding for the first six months, followed by continued breastfeeding up to two years, can play a vital supportive role in child development. This practice offers dual advantages. First, it potentially reduces the risk of developing ASD, and second, provide the benefits for maternal health, including improved mood regulation and support for postpartum weight management. These findings highlight the importance of promoting sustained breastfeeding as a public health priority.

Evidence from Pakistan:

As a developing country facing significant challenges related to rapid population growth, Pakistan must prioritize the promotion of healthy lifestyles. It is imperative that the medical community, in collaboration with social support networks, places particular emphasis on child health and behavioural development to foster long-term societal well-being. It is important to closely monitor children for developmental concerns; While excessive screen time, poor sleep, and unhealthy diets may affect behaviour, these are not established causes of ASD.

Integrating Breastfeeding and ASD Awareness

Addressing ASD in Pakistan requires a holistic, preventive, and community-based public health approach that links early childhood nutrition, maternal education, and developmental screening. Breastfeeding has already been recognized as a cornerstone of infant survival and neurodevelopment. We recommend few suggestions to raise the awareness in this regard.

1. Including Breastfeeding Education in Maternal and Child Health Programmes

   Breastfeeding promotion and support should be embedded within all maternal, newborn, and child health initiatives. It may include:

- Maternal counselling and support postpartum to encourage breast feeding
- Providing education on cultural misconceptions about milk insufficiency
- Avoiding early introduction of formula or animal milk
- Enhancing workplace support for lactating mothers

Health education campaigns should go beyond nutrition messaging to emphasize neurodevelopmental benefits of breastfeeding, including the role of breast milk in brain maturation, immunity, and mother infant bonding. Integrating such education into antenatal and postnatal visits, community outreach, and mass media campaigns could enhance maternal motivation and understanding of how early feeding influences developmental outcomes,

including ASD-related risks.

2. Training Healthcare Workers for Developmental Screening During Routine Infant Visits

Pakistan's primary health system includes an extensive network of Lady Health Workers and Basic Health Units, This can be leveraged to detect early developmental deviations. This can be done by training these frontline health care workers to counsel mothers on optimal breastfeeding practices. They can also screen children with suspected ASD with simple developmental screening tools like Ages and Stages questionnaire. during routine immunization visits, which would create an integrated system of nutrition and neurodevelopmental surveillance.

3. Raising Public Awareness on Breastfeeding and Early Developmental Monitoring

Broad-based public awareness campaigns through mass media, schools, religious institutions, and community gatherings can play a transformative role in reshaping social attitudes. These campaigns should:

- Highlight the link between early nutrition, breastfeeding, and brain development
- Address myths about breastfeeding and child behaviour
- Encourage fathers' involvement and family support for mothers
- Normalize discussions about developmental milestones and ASD

4. Conducting Local Research on Breastfeeding and Neurodevelopment

There is an urgent need for conducting local research in Pakistan examining how breastfeeding practices duration, exclusivity, maternal nutrition, and psychosocial factors relate to child neurodevelopment and ASD prevalence.

Key research directions include:

- Epidemiological studies comparing breastfeeding patterns among children with and without ASD
- Maternal knowledge and attitudes toward breastfeeding and early child development
- Biological studies on nutritional deficiencies (e.g., omega-3 fatty acids, vitamin D) that may mediate neurodevelopmental risk
- Evaluation of community-based interventions that integrate breastfeeding promotion with developmental screening.

Generating local evidence will strengthen health policy, inform culturally appropriate health education materials, and guide the design of ASD-preventive public health frameworks.

5. Policy Integration and Multi-sectoral Collaboration

Integrating breastfeeding and ASD awareness requires coordination across health, education, and social welfare sectors. The Ministry of Health, the Pakistan Paediatric Association, and NGOs such as UNICEF and Autism Resource Centers could collaborate to:

- Include ASD risk and breastfeeding modules in MCH training curricula
- Develop national guidelines linking early nutrition and neurodevelopment
- Support pilot programmes demonstrating the feasibility of combining infant feeding education with developmental monitoring.

Such efforts can gradually build a sustainable, preventive model where breastfeeding promotion and ASD awareness reinforce each other addressing both child survival and neurodevelopmental well-being

Conclusion:

Optimal breastfeeding practices may offer a protective effect against ASD, contributing to improved child mental health, reduced parental stress, and a decreased burden on healthcare systems. In the context of Pakistan, integrating breastfeeding promotion with early ASD awareness initiatives presents an opportunity to bridge critical gaps between nutrition, maternal health education, and developmental screening. To support evidence-based policy and intervention design, there is an urgent need for well-structured, prospective longitudinal studies that investigate the prevalence, risk factors, and contextual determinants of ASD within the Pakistani population. Such research could pave the way for timely, culturally sensitive strategies that enhance early detection, intervention, and overall child development outcomes.

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