

# Early intervention of Autism Spectrum Disorder: Translating Research into Practice

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### ABSTRACT:

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder, with increasing prevalence globally. Early intervention has been shown to improve the core deficits and result in a favorable outcome in children with ASD. Various interventional methods, novel mechanisms, and approaches are being widely researched. Though accelerating interventional research in ASD is observed globally, evidence from Indian setting is sparse. Given the uniqueness of cultural, socio-economic conditions, population statistics, existing health care and referral system, it is pivotal to develop and test interventional methods that are applicable and acceptable to the indigenous population. This paper reviews the currently available evidence-based treatment modalities in the Indian settings, with a specific focus on the behavioral interventions. Unfortunately, early diagnosis seldom seems to translate into early intervention. In the background of the existing challenges, strategies to increase the awareness amongst parents & other stake holders, role of health policy makers, need for liaison between experts, capacity building, and developing sustainable models for service delivery in the Indian context are discussed.

**Keywords:** autism, ASD, early intervention, research, India

### INTRODUCTION:

Early detection and intervention of Autism Spectrum Disorder have received increased attention globally as it results in a favorable outcome in young children with this neurodevelopmental disorder.<sup>1</sup> In a young child 'at risk' for autism, early intervention provides an opportunity for optimized development before faulty neural circuitry is established.<sup>2</sup> Early intervention is based on evidence from extensive neuroscience research on postnatal brain development, brain plasticity and the importance of environmental stimulation conducted over the past few decades.<sup>2,3,4</sup>

This article will focus on briefly reviewing the current evidence-based early interventions available in the Indian setting, with a specific attention to translation of behavioral interventions into practice, considering the unique challenges huge population and the overburdened health care systems.

### International scenario:

Given the rising prevalence and the enduring disabilities associated with ASD, there is an increasing interest to develop and study the efficacy of potential interventional methods.<sup>5,6</sup> Varying range of therapeutic options including developmental, pharmacological, dietary interventions, complementary and alternative methods have been researched extensively.

Systematic reviews of studies on dietary interventions like gluten and casein free diets, combined vitamin B6- magnesium supplementation, as well as complementary and alternative therapies for children with ASD, did not yield promising results.<sup>7,8,9</sup> Novel pharmacotherapeutics like intravenous secretin, chelation therapy raise concerns regarding potential risks over expected benefits.<sup>10,11</sup> Of the available treatment modalities, developmental and behavioral interventions are found to have the highest evidence base.<sup>12</sup>

The concept of 'optimal outcome' in the context of ASD is an interesting aspect. Optimal outcome is defined as "losing all symptoms of ASD in addition to the diagnosis, and functioning within the non-autistic range of social interaction and communication".<sup>13</sup> A subset of children with earlier parental concerns, prompt referral to specialists and interventions at a younger age were found to achieve optimal outcome with developmental interventions and were functioning

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comparable to typically developing children.<sup>14</sup> While Early Intensive Behavioural Intervention (EIBI) continues to have the best evidence, alternate strategies such as parent-mediated interventions and task-shifting to non-specialists have been tested to improve feasibility and accessibility.<sup>15,16</sup> The utility of pharmacotherapy is circumscribed to symptomatic management of aggression, sleep difficulties and comorbid medical and neurodevelopmental disorders.

### Indian scenario

Autism research in India is still sparse. A recent community study found a prevalence of 0.15% using 2-stage evaluation to ascertain diagnosis.<sup>17</sup> Another community study from south India found 5.5% of toddlers 'at risk' for Autism.<sup>18</sup> In a clinic-based study, 9.42 % screened positive for ASD.<sup>19</sup>

Studies have shown that there is an average of 2-year delay from the age at first consultation to initiation of ASD specific treatment.<sup>20,21</sup> Studies on narrative experiences of parents of children with ASD found that the delay in diagnosis and treatment initiation was predominantly due to cultural beliefs and perceptions.<sup>20,22</sup>

Autism interventional research is relatively less in the Indian settings. Applicability of the western interventional modules is limited by the diversity of the culture, socioeconomic, educational as well as health-care standards.<sup>6</sup> WHO UNICEF reports that predominant part of world's child population is living in the low-and-middle-income countries. Given the increasing prevalence, developing and testing interventions which are applicable, affordable and feasible is the need of the hour. Evidence from currently available interventional studies conducted across various settings in India is summarized below and Table 1.

### Evidence from Indian studies:

An early intervention program, developed and manualized by the ComDEALL trust, was efficacious in improving developmental skills and behavioral issues in children with ASD at the end of 8 months of regular center-based interventions.<sup>23</sup> While the western modules predominantly focused on joint attentional skills, ComDEALL model, in addition, has intervention targets as motor and language skills and activities of daily living. This is one of the earliest intervention modules developed and tested in Indian children. Follow up studies on children who underwent the 1-2 year early intervention program showed that around 75% of children were integrated into mainstream schools.<sup>24</sup>

In an interventional study conducted at CMC Vellore, children underwent comprehensive 12-week inpatient centre-based training, followed by regular home-based interventions. Improvement was noted in perceptual, motor, cognitive and verbal domains. The gains were attained equally across the severity spectrum.<sup>25</sup>

Another study from Kerala focused on home-based interventions for toddlers with mild to severe autism. Parents were trained on intervention techniques

by developmental therapists and intervention kits were made from locally available inexpensive materials tailored to the developmental needs of the child. Home-based interventions were facilitated by regular clinic visits. Significant improvement in severity of autism, social and language skills was observed 6 months post-intervention.<sup>26</sup>

A similar study in a different setting also found significant improvement after 6 months of parent-delivered interventions in naturalistic home settings.<sup>27</sup> An integrated intervention program comprising of special education, speech and occupational therapy found positive outcomes at the end of 3 years. Younger age at intervention, duration of therapy and baseline symptom severity were found to have a positive correlation with the effectiveness of therapy.<sup>28</sup>

A study conducted at the NIMHANS Child Psychiatry Centre assessed the effectiveness of a 2-3 week intensive inpatient parent training program for home-based interventions.<sup>29</sup> Daily individualized intervention sessions (6 days per week), focused on psycho-education, inputs to improve parent-child interactions, skill development and management of co-morbidity during the inpatient admission. The study highlights the feasibility of inpatient parent training in ensuring home-based intervention practices and the intervention was effective in improving developmental gains, reduction in autism severity and a proportional decrease in parental stress. This study has come out with a manual to facilitate post-graduate training in behavioral intervention.

A study conducted at JIPMER Child Guidance Clinic, assessed the efficacy of a brief parent-mediated intervention module, in the early phase of diagnosis in a randomized controlled design.<sup>30</sup> It aimed at addressing parental stress and coping from a cultural perspective in the initial sessions and delivering early parent-mediated intervention focusing on joint attention, imitation, social and adaptive skills. To suit primary care and outpatient settings, it was structured to be delivered within a frame of 5 sessions over 12 weeks. The intervention group had significant reduction in autism severity and parental stress, with improvement in parental understanding and competence, compared to the control group receiving treatment as usual. One year follow-up of the patients showed maintenance of gains.<sup>31</sup>

Table 1: Indian studies on ASD interventions.

This table summarizes the design, intervention and major findings of ASD interventional studies in the Indian settings.

No	Study	Design	Study Population	Intervention	Control	Duration	Main findings
1	Juneja et al., 2012 New Delhi	Retrospective review	16 children with ASD, undergoing interventions	Parent-mediated, non-structured, individualized manner (naturalistic)	(-)	At least 6 months	Significant improvement in the development quotient, social quotient, expressive language quotient, autism severity and behavioural problems
2	Karanth P et al., 2012, 2013 ComDEALL, Bangalore	Non-controlled	102 children with ASD, Age <6 years	Centre-based interventions on core deficits in ASD, motor, language and adaptive skills	(-)	8 months	Improvement in developmental skills and behavioural issues. At 1 year follow up, 75% children – integrated into mainstream schools
3	Nair et al., 2014 CDC, Kerala	Non-controlled	52 children with ASD, Age <6 years	Home based interventions, parents trained by developmental therapists	(-)	6 months	Significant improvement in severity of autism, social and language skills was observed.
4	Mukherjee et al., 2014 Mumbai	Non-controlled	18 children aged 4-15 years	Integrated therapy (special education, speech and occupational therapy)	(-)	3 years	Positive outcomes with therapy was associated with younger age, duration of therapy and lesser baseline symptom severity
5	Patra et al., 2016	Non-controlled	18 parents of 12 children with ASD	Psychoeducational intervention module developed based on parental felt needs	(-)	Over 12 sessions, delivered fortnightly	Significant change in total perceived stress (emotional and social stress, in specific), and parental knowledge post intervention.
6	Rahman et al., 2016 Goa, Rawalpindi	RCT (Single blind)	2-9 yrs children with ASD	12 sessions of PASS (plus TAU) (n=32) – Parent mediated interventions delivered by non-specialist health workers	Treatment as usual	BL and 8 months	Parental synchrony, initiation of communication by the child improved.
7	Raman Krishnan et al., 2016 CMC, Vellore	Retrospective chart review	77 children with ASD	Completed 12 week centre-based intervention followed by home-based training	(-)	At least 12 weeks	Improvement noted in developmental age, perception, fine motor, gross motor, eye-hand coordination, cognitive performance and verbal domain. No difference in intervention effects between the groups (based on autism severity).
8	Panchal P et al., 2017 NIMHANS, Bangalore	Non-controlled	Children with ASD, aged 2 – 10 years and their primary caregivers	Intensive parent training on home based training	(-)	2-3 weeks inpatient training	Feasibility of inpatient parent training. Improvement in developmental gains, reduction in autism severity and parental stress.
9	Manohar H et al., 2017 JIPMER, Puducherry	RCT	50 children with ASD and their families. Age 2-6 yrs	Parent-mediated intervention. Addressing parental stress from a cultural perspective	Treatment as usual	5 sessions delivered over 12 weeks on OPD basis	All children had improvement in autism severity. Improvement in autism severity, parental knowledge, understanding and competence was significantly better in the intervention group.

While on the one hand, there is a quest to develop indigenous interventions suitable to the local population and available health care resources, on the other hand, adapting existing western intervention modules to our settings is proven to be efficacious. Parent mediated intervention for Autism Spectrum disorders in South Asia (PASS) intervention program has attempted to adapt, Preschool autism communication trial (PACT) intervention model, developed and tested in the west, predominantly focusing on communication.<sup>16</sup> Non-specialist health workers were used to train parents on intervention techniques and delivery. At the end of 8 months, parent-child interaction and child's communication initiation was found to be improved.<sup>16</sup>

Apart from child-related improvement, studies have also focused on parental knowledge and perception. A psychoeducation intervention module, developed based on parental felt needs found significant improvement in perceived stress, emotional and social stress in specific, and knowledge about the disorder, post-intervention.<sup>32</sup>

### **Pharmacotherapy – current status:**

While developmental interventions are recommended as the pivotal and the core treatment modality, pharmacotherapy has its role for specific behavioral difficulties and comorbidities. Risperidone and aripiprazole have been proven to improve stereotypic behaviors, and aggression in children with ASD.<sup>33-35</sup> Sleep-related difficulties have been consistently demonstrated in children with ASD. Melatonin is efficacious in improving various sleep parameters, with minimal to no side effects.<sup>36</sup>

The prevalence of comorbid psychiatric disorders such as ADHD, intellectual disability, anxiety and mood disorders range from 46% to 70%.<sup>30,37</sup> The recent change in DSM-5 allows and emphasizes the diagnosis of comorbid neurodevelopmental disorders in children with ASD.<sup>38</sup> Treatment of comorbid ADHD in ASD is vital as improvement in ADHD symptoms can, in turn, improve engagement in ASD-specific interventions.<sup>39</sup> Methylphenidate, which is the first line treatment in ADHD, is shown to have lesser efficacy and lead to more side effects in children with comorbid ASD.<sup>40</sup> Atomoxetine is found to be effective in improving ADHD as well as social withdrawal across studies.<sup>41</sup> Clonidine is found to be effective in reducing ADHD symptoms, sleep disturbances, and is safer in children with comorbid epilepsy.<sup>42</sup>

Epilepsy is commonly comorbid with autism and is found in more than 50% of children with ASD.<sup>43</sup> In addition to epilepsy, the presence of isolated epileptiform discharges without seizures are found in 12 – 42% of children with ASD.<sup>44, 45</sup> While optimal treatment of epilepsy is shown to improve behavioral disturbances associated with ASD, pharmacotherapy for isolated epileptiform discharges is an ongoing debate.<sup>46</sup>

Recognition and effective intervention for the comorbid disorder may be pivotal in improving the overall outcome in a child with ASD. Recent promising

research has investigated the role of rapamycin, folinic acid in fragile-X syndrome, intranasal oxytocin and NMDA receptor antagonists in children with ASD.<sup>47</sup> Most evidence on pharmacotherapy in ASD is available from international studies. There is a need for systematic and methodologically rigorous studies from our setting.

### **Translating research into practice:**

#### Early diagnosis to early intervention:

In our cultural setting, lack of awareness and stigma continues to play an important factor, and psychiatrists and child psychiatrists are often not the first contact physicians for children with ASD. Pediatricians play an important role in early developmental screening and serve as the most preferred consultants for families with children with developmental difficulties.<sup>21</sup> While progress is being made in early diagnosis and intervention, it is still not encouraging.<sup>21</sup> Further early detection does not necessarily translate into early intervention.

The child guidance centers with an active liaison between pediatricians and psychiatrists exist in most secondary care and the tertiary care academic institutions. This can be strengthened for early detection and treatment. A graded transfer from the hands of the pediatrician to the psychiatrist can be effectively executed and provide scope for early detection and initiation of interventions in very young children.<sup>19</sup>

One of the unique strengths that psychiatrists and child psychiatrists have is their professional knowledge and strength in identifying and addressing parental stress and grief that families undergo while receiving a diagnosis of a neurodevelopmental disorder. Most families need handholding at this point to address their stress. Psycho-educating and empowering parents with simple home-based interventions is essential at this phase.<sup>48</sup> This can help them appreciate the child's strengths and overcome deficit skills using principles of learning and reinforcement. This ray of hope prepares them to understand and engage in behavioral interventions, speech and language and occupational therapy as indicated in the short and long term.

#### Delivering early intervention:

It is an enormous challenge to provide structured interventions in a health system where is paucity of specialists. Some of the interventional programs ideal for delivery in primary care setting can help non-specialists to provide early intervention,<sup>16,30</sup> while center-based/inpatient interventional programs can help address the need for a more comprehensive care that can be effectively delivered at secondary and tertiary care hospitals.<sup>25,29</sup>

It is also important to raise awareness to the fact that it takes expert knowledge of typical development, neurodevelopmental factors, neurobiology of learning, genetic and metabolic disorders, medical and psychiatric comorbidities, parental stress and psychopathology to plan comprehensive intervention for

children with autism spectrum disorder. A psychiatrist or pediatrician trained in child psychiatry can therefore not only plan individualized interventions based on age, severity, and comorbidity for the given child but periodically review progress, coordinate and prioritize interventions provided by various therapists. It is not uncommon to see families spending more time on a particular therapy over others missing critical developmental periods, particularly in the language domain, compromising the long-term outcome.

#### Capacity building:

The establishment of district early intervention centers can be resourceful in the provision of ongoing interventions, especially for children from rural areas. Necessary collaboration and support of these centers by the district medical college and tertiary care hospitals can enhance the utility of these centers and ensure long-term care for children.

Encouraging efforts are being made under the National Mental Health Program to train district mental health psychiatrists and psychologists to offer child mental health services. Tertiary care centers can provide hands-on training through workshops. With the availability of telemedicine units, ongoing clinical support to primary care and early intervention centers can contribute both to service delivery and capacity building. Video group discussion and webinars can help address complex case scenarios and provide scientific updates; similar models have been productive and in place for de-addiction services.<sup>49</sup>

Interventional models with a manual for post-graduate resident training can help in addressing the current lack of trained professionals.<sup>29</sup> More centers with specialist training in the field of child psychiatry are warranted considering the prevalence of child psychiatric disorders at large and ASD in particular.

#### Practice informed research:

The number that we see in our clinical setting could still reflect only the tip of the iceberg. The window of opportunity for early interventions with young children is narrow. Therefore, wide dissemination of information using technology-assisted delivery of existing evidence-based interventions can be a huge boon in the current scenario. Novel service delivery and research methodologies, e.g., testing audio-video aids and smart phone based applications that can assist peripheral early intervention centers can facilitate delivery of evidence-based early interventions for children in rural areas. While this cannot substitute a more comprehensive center-based intervention, it can address the current need for access to early intervention and prevent delay in initiation of interventions and secondary complications resulting from it. Short and long-term outcome studies examining the developmental profile of children with autism availing these services, is also essential to improve the currently available programs.

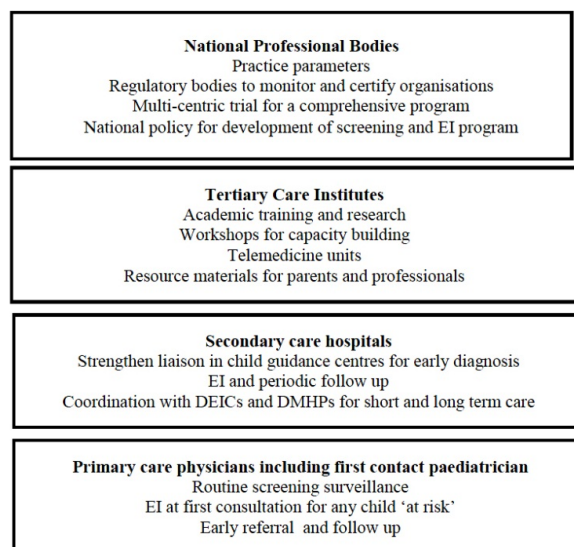


Figure 1: Proposed theory of change

\*Early intervention, <sup>a</sup>District Early Intervention Centres, <sup>b</sup>District Mental Health Psychiatrists

Etiological research examining both biological and environmental factors relevant to our setting will provide valuable insights into possible preventive strategies to address the rising prevalence. Early social and language stimulation being an essential part of this cultural milieu, preventive interventions focusing on environmental stimulation can be feasible for dissemination in the broader context.

Practice informed interventional research to bring out culturally relevant models using high-quality research, is the way to address this growing concern using a scientific approach.

#### **FUTURE DIRECTIONS:**

As a state, Tamil Nadu has had the advantage of having pioneers in child psychiatry who have inspired a generation of child psychiatrists. Undoubtedly, it is one of the states with substantial number of experienced and qualified child psychiatrists. However, the number still seems grossly insufficient.

This brief review has focused on some of the evidence-based interventional modules available in the Indian setting. It also highlights the need for a multi-centric interventional research that brings out a comprehensive model incorporating the strengths of the existing models. This can help inform policymakers as well as practicing clinicians across settings, in ensuring a favourable outcome in children with Autism spectrum disorder. This requires coordinated efforts of many regional centers in India.

Early intervention of Autism spectrum disorder requires greater awareness among parents, medical and paramedical professionals and greater involvement of psychiatrist and child psychiatrist in ensuring delivery of evidence-based interventions for children. While ongoing research is indicated, scaling up the service delivery of existing effective interventions within the

available health system is a challenge that we need to address at the earliest.

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