PREDICTIVE ROLE OF DEVELOPMENTAL DEMOGRAPHIC FACTORS IN THE ONSET OF AUTISM SPECTRUM DISORDER (ASD)

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ABSTRACT

The prevalence of Autism Spectrum Disorder (ASD) was determined to be 1.23%, with 88.5% having at least one other comorbid Neurodevelopmental Disorder (NDD). To date, the prevalence rate has been gradually growing, and the cause of ASD has not been determined. As a result, the current study is designed to better understand the developmental demographic factors related with the onset of ASD. Purposive sampling was used to perform a cross-sectional study among parents of children with ASD (N = 100) and parents of children with neurotypical development (N = 50). Comparing both groups, the risk estimates for family history of mental illness (OR = 1.5; CI: 0.612-1.03, $p < 0.05$), maternal infection (OR = 1.5; CI: 0.26-8.60, $p < 0.05$), fetal distress (OR = 2.17; CI: 0.90-5.25, $p < 0.05$), absence of immediate birth (OR = 1.6; CI: 0.67-3.8, $p < 0.05$), and meconium aspiration (OR = 2.5; CI: 0.84-7.45, $p < 0.05$) are associated with the risk of ASD. The findings suggest that both prenatal and perinatal factors, such as fetal distress and meconium aspiration, can predict ASD. Furthermore, the findings demonstrate that early screen time exposure is substantially associated with the likelihood of increasing the severity of ASD.

Key words: *Autism Spectrum Disorder (ASD), developmental demographic factors, prenatal, perinatal and postnatal factors and screen time exposure.*

CHAPTER I

INTRODUCTION

INTRODUCTION

1. NEURODEVELOPMENTAL DISORDERS (NDD)

A group of conditions congenitically present that result from inadequate developmental process especially brain development is known as neurodevelopmental disorders.

A group of conditions known as neurodevelopmental disorders appear early in a person's developmental process. It is characterized by one or more deficits in cognitive, executive, behavioural, motor, language, and speech functions, as well as other neurological functions, which may lead to deficits in a person's personal, social, academic, or occupational functioning. The different types of neurodevelopmental disorders are divided into the following categories by DSM-5:

1. Intellectual Disability (ID),
2. Communication disorders,
3. Autism Spectrum Disorders (ASD),
4. Attention Deficit Hyperactivity Disorders (ADHD),
5. Neurodevelopmental motor disorders and
6. Specific Learning Disorder (SLD). (DSM 5)

In Indian children (aged 2 to 9 years), the prevalence of NDD was found to be 12%; this included 0.63% of ID, 11% of ADHD, 3% of ASD, 10% of SLD,

3.42% of communication disorders, and 17% of motor disorders. 21.7% of these children with NDD were with more than one NDD. According to the data, nearly one-fifth of the children diagnosed with NDD were diagnosed with one or more co-morbid NDD (Arora et al. 2018). According to a systematic review by Francés et al. published in 2022, children with ASD, Cerebral Palsy, ID, and epilepsy were more likely to be diagnosed with other co-morbid NDD.

The cause of NDD cannot be attributed to a single risk factor. Numerous combinations of genetic, biological, psychosocial, and environmental risk factors contributed to the development of NDD. Certain disorders, such as ID, are caused by a particular gene, and genetic factors heavily influence those disorders. According to Arora et al. (2018), perinatal asphyxia, neonatal illness, neurological or brain infections, low birth weight, and premature delivery comprise a few of the risk factors for NDD.

1.1. AUTISM SPECTRUM DISORDER (ASD)

“Autism spectrum disorder” means a neuro-developmental condition typically appearing in the first three years of life that significantly affects a person's ability to communicate, understand relationships and relate to others, and is frequently associated with unusual or stereotypical rituals or behaviours (RPWD, 2016).

The WHO also said in 2023 that the prevalence of autism was determined to be 1 in per 100 children globally. The article also focused on services to be provided for the unmet health care needs of people with autism, which resulted in a resolution being adopted in the 67th World Health Assembly. It was titled as "Comprehensive and coordinated efforts for the management of autism spectrum disorders," which had been welcomed by over 60 countries. The resolution encourages Member States and partner organisations to work together to build national capacity to address ASD and other developmental disorders.

According to the DSM-5, ASD is characterised by ongoing difficulties with social interaction and communication as well as the presence of repetitive or restricted patterns of behaviour. ASD was referred to as Pervasive Developmental Disorder (PDD) in ICD 10, which includes a number of disorders including

- Childhood autism,
- Atypical autism,
- Rett's syndrome,
- Other childhood disintegrative disorder,
- Overactive disorder associated with mental retardation and stereotyped movements,
- Asperger's syndrome,
- Other pervasive developmental disorders and
- Pervasive developmental disorder, unspecified.

The prevalence of ASD was found to be 1.23%, and gender differences revealed a 4.5:1 ratio between male and female children with ASD. As of this study's conclusion, 88.5% of the children with ASD were with a minimum of one comorbid NDD and 11.5% were with no other comorbid NDDs (Francés et al., 2022). In a study conducted in 2018 by Arora et al., 44 cases were examined. Of these cases, 52.3% of children were with Autism, 38% were with pervasive developmental disorder not otherwise specified (PDD-NOS), 7.1% were with childhood disintegrative disorders and 2.3% were with Asperger's,

1.1.1. TYPES

According to ICD 10, the classification of Autism Spectrum Disorder (ASD) is explained below:

1.1.1.1. Childhood Autism

It is distinguished by deficits in social communication and interaction, as well as restricted, repetitive behaviours that appear before the age of three and result in developmental impairment. It is more common in boys than in girls.

1.1.1.2. Atypical autism

It differs from childhood autism in terms of onset and deficits in functional areas. It is also distinguished by deficits in communication, interaction, and restricted, repetitive behaviours. However, the deficits do not reach the level of

Childhood autism, and the deficits would be in one or more of the previously mentioned areas. These developmental delays appear after the age of three.

1.1.1.3. Asperger's syndrome

It shares many of the same characteristics as autism, such as difficulties in social communication and interaction, as well as confined, repetitive behaviour, but it differs from autism in that there is no global delay in language or cognitive development. Individuals with Asperger's syndrome are generally intelligent. Gender differences suggest that males are more vulnerable than females in this situation as well.

1.1.1.4. Rett's syndrome

It is distinguished by the partial or complete loss of acquired hand skills and speech, as well as a slowing of head growth, and appears between the ages of 7 months and 2 years. It also involves developmental impairment in socialisation and play between the ages of 2 and 3, but the child's development in social interest remains normal. The cause of this condition is unknown, and it has only been reported in girls so far.

1.1.1.5. Other childhood disintegrative disorder

It is a pervasive developmental disorder that differs from autism in that it is characterised by the loss of previously acquired skills in various areas of development, as well as abnormalities in social, communicative, and behavioural functioning such as irritability, anxiousness, restlessness, and overactivity. There is a normal period of development before the onset, and later there is a loss of speech with behavioural disintegration that declines over time.

1.1.1.6. Overactive disorder associated with mental retardation and stereotyped movements

This is typified by stereotyped behaviours, inattention, and hyperactivity in children with moderate to severe intellectual impairment. In the adolescent period, this overactivity would be substituted with underactivity. It is commonly connected with a wide range of developmental delays.

1.1.2. ETIOLOGY

ASD cannot be linked to a single source; it is the result of a mix of risk factors such as heredity, neurobiological variables, prenatal, perinatal, and postnatal problems, and other psychosocial risk factors.

1.1.2.1. GENETICAL RISK FACTORS

Autism is highly heritable, ranging from 50% to 90%, according to research findings by Hallmayer et al. (2011) and Tick et al. (2015). More than 100 genes and genomic areas have been linked to the cause of ASD, and more than 800 genes play a significant role in ASD (Morris-Rosendahl, and Crocq 2020). Twin studies revealed that more than 60% of monozygotic twins were genetically sensitive to ASD (Hallmayer, 2011; Colvert, 2015).

Some linkage studies (Sakurai et al. 2011; Szatmari et al. 2007) found that ASD was caused by genes at numerous loci, particularly on chromosomes 7q, 15q, and 16p. The majority of recent investigations (O'Roak et al. 2011) concentrated on rare de novo mutations connected to autism.

The C677T polymorphism and mutant alleles of rs237889, rs2056202, and rs2292813 were found to be linked with the risk of ASD. ASD has also been linked to CNTNAP2, a synaptic protein involved in neural development. MTHFR is also linked to ASD, which lowers enzymatic activity and leads to impaired fetal brain development. Vitamin D, transport and binding genes have also been related to ASD, which plays an important role in neurodevelopment and immunological regulation (Qiu et al., 2022).

1.1.2.2. BIOLOGICAL RISK FACTORS

1.1.2.2.1. Prenatal risk factors

One of the main prenatal risk factors for ASD is advanced parental and maternal age (Gardener et al., 2009; Atladottir et al., 2015; Carlsson et al., 2021; Qui et al., 2022). The reason for the increased risk of ASD in advanced maternal age is due to the increased age of the ova, which results in chromosomal abnormalities (Kolevson, 2007), and the reason for the increased risk of ASD in advanced paternal age is due to imprinted genes and de novo spontaneous mutations, which accumulate with advancement of age in spermatogonia (Reichenberg et al., 2006).

Maternal viral and bacterial infections raise the likelihood of neuropsychiatric disorders, including autism spectrum disorder (Ornoy et al., 2015). Specifically, women who experienced viral infections in their first trimester and bacterial infections in their second trimester, which both have an impact on fetal brain development (Bulent, 2021).

ASD is also related with gestational diabetes (Atladottir et al., 2015; Alim et al., 2023). Pre-gestational diabetes mellitus increases the risk of congenital abnormalities, which typically appear in the second trimester of pregnancy, causing hormonal and metabolic abnormalities as well as oxidative stress (Haroush et al., 2004; Biri et al., 2006), affecting fetal well-being and growth (Ornoy et al., 2015).

The offspring of mothers who live abroad during and after pregnancy have an elevated risk of ASD (Atladottir et al., 2015). When there is an absence of

vaccination against prevalent infectious agents in that country, both the mother and offspring are more susceptible to illnesses, which can contribute to ASD (Gillberg et al., 1995). It can also be related to maternal stress caused by the demands of a new domicile, a lack of social support, and other economic and social issues (Gardener et al., 2009).

Hypertension (Qui et al., 2022; Gorman et al., 2018), maternal thyroid dysfunction (Roman et al., 2013; Anderson et al., 2014; Getahun et al., 2018; Rotem et al., 2020; Alim et al., 2023), maternal prenatal medications (Gardener et al., 2009), and maternal gestational bleeding (Gardener et al., 2009; Atladottir et al.,2015) were also associated with the risk of developing ASD.

1.1.2.2.2. Perinatal risk factors

In a systematic review (Carlsson et al., 2021), it was clear that low birth weight, low Apgar score, meconium aspiration, hyperbilirubinemia, ABO or Rh incompatibility, perinatal hypoxia, and respiratory stress were strongly associated with the risk of ASD. Other research confirmed the above findings (Gardener et al., 2009; Atladottir et al., 2015).

Maternal bleeding is linked to an increased risk of hypoxia, which can result in brain abnormalities due to a lack of oxygen flow to the brain. Hypoxia is also responsible for an increase in dopaminergic activity, which is linked to dopamine overactivity in people with ASD (Gardener et al., 2009).

1.1.2.2.3. Postnatal risk factors

One of the most prominent postnatal risk factors connected with the risk of ASD is postnatal jaundice. There are two events that occur during the disease. The first is a low hepatic excretory capacity, and the second is a high bilirubin level (Mahboub et al., 2023). Hyperbilirubinemia, in turn, causes anomalies in the key two brain regions, the basal ganglia and cerebellum, both of which play important roles in the development of ASD (Guinchat et al., 2012).

Another risk factor is newborn seizures, which have a stronger influence on brain development and can result in brain injury during the developmental period. This, in turn, may result in hypoxia and increase the risk of developing ASD. (Gorman et al., 2018).

1.1.2.3. GADGET EXPOSURE

According to studies, children who spend more than 3 hours per day on screens may develop ASD-like symptoms (Alrahili et al., 2021; Dikkala et al., 2022). Early exposure to screen time during the developmental period can result in ASD-like symptoms (Heffler et al., 2020), which leads to less social leisure time (Slobodin et al., 2019), less social interaction and imaginative play (Dikkala et al., 2022), and a preference for the social network for social engagement (MacMullin et al., 2016).

Many cases of atypical sensory reactivity and vulnerability to developmental delay, particularly in the area of language function, have been described, with the severity of ASD linked to increasing screen time exposure (Alrahili et al., 2021). Screen time exposure impairs the development of sensory awareness that would otherwise be available through play and nature (Dikkala et al., 2022). Screen time exposure, along with decreased parent-child connection, was also linked to an increased risk of ASD-like symptoms (Heffler et al., 2016).

CHAPTER II

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Brustyn, Sithole, & Zwaigenbaum (2010) investigated the obstetric problems associated with ASD. The data demonstrate that advanced mother's ages, as well as difficulties during pregnancy and at birth, are associated with a higher risk of ASD. Low birth weight, breech birth, gestational diabetes, a mother who was underweight during pregnancy, pre-eclampsia, and urbanisation were all linked to an increased risk of ASD. They also discovered no link between preterm delivery and maternal smoking and the development of ASD.

Gardener, Spiegelman, and Buka (2011) conducted a meta-analysis on prenatal problems linked to autism risk. The researchers discovered that advanced parental age, bleeding during pregnancy, gestational diabetes, drugs during pregnancy, and maternal immigration were all linked to an increased risk of autism in this study. In addition, maternal preeclampsia, miscarriage, proteinuria, maternal hypertension, and swelling during pregnancy were revealed to be substantially linked with the incidence of autism. There was also no evidence for a single prenatal risk factor being connected with autism. However, some research suggests that common prenatal problems may raise the chance of autism.

Gardener, Spiegelman, & Buka (2011) conducted a further meta-analysis on the relationship between perinatal and neonatal factors and the risk of developing Autism. The results suggest that the majority of the prenatal and neonatal risk variables investigated were inconsistent, and the results were not statistically significant. Although some risk variables, including fetal distress, atypical fetal presentation, umbilical cord problems, birth trauma during delivery, bleeding during pregnancy, meconium aspiration, and hyperbilirubinemia were substantially linked to the likelihood of autism. The researchers also discovered other risk factors such as postnatal anemia, ABO or Rh incompatibility, being born in the summer, low birth weight, being born with a deformity, low Apgar score, and feeding difficulties. The study revealed that other critical risk variables, such as oxygen resuscitation and respiratory issues at birth, were not addressed in previous studies. It was proposed that the risk factors connected with autism can have a substantial influence on the risk of developing autism, either alone or in combination with other factors, or that they only affect individuals who are genetically predisposed to autism. It is extremely difficult for researchers to identify factors that are directly associated with the risk of Autism.

Getahun et al. (2011) studied the association between maternal hypothyroidism and the risk of ASD. According to the findings, the prevalence of ASD was higher in children whose mothers had been diagnosed with hypothyroidism before or during pregnancy, particularly during the first trimester, regardless of their hormone level. It was also discovered that offspring of women

who acquired hypothyroidism as well as hypothroxinemia have a higher risk of ASD. The study also discovered that characteristics including gestational age, race or ethnicity, and gender had no effect on the development of hypothyroidism. Although there is a clear link between ASD risk and maternal hypothyroidism, the researchers claim that the risk of ASD can be lowered by managing thyroid hormone levels during pregnancy.

Guinchat et al. (2011) carried out a meta-analysis to assess the prenatal, perinatal, and neonatal risk factors for PDD. The study showed that there is no single factor that causes autism. There are numerous potential risk factors for the development of autism. Prenatal risk factors include paternal age, migration, gestational bleeding, pre-eclampsia, and being small for gestational age, as well as perinatal and neonatal risk factors such as breech position, premature delivery, low apgar score, hyperbillirubinemia, low birth weight, encephalopathy, and malformations, all of which are strongly linked to the risk of ASD. According to the study, excluding certain criteria, such as co-morbid genetic and neurodevelopmental problems, may result in insufficient knowledge on the origin of autism in a few children.

Anderson, Laurberg, Wu, and Olsen (2014) conducted a study to determine the link between maternal and paternal hyperthyroidism and children at risk of ADHD and ASD. The researchers came to the conclusion that paternal

hyperthyroidism and hypothyroidism had no effect on the development of ADHD or ASD. Furthermore, maternal hyperthyroidism was associated to the chance of ADHD, while maternal hypothyroidism was linked to the risk of ASD. The researchers concluded that these correlations were not induced by a hereditary element. In this study, there is a link between hypothyroidism and ADHD, as well as hyperthyroidism and ASD, however it is not statistically significant.

Khanom et al. (2015) conducted a study in the Bangladeshi community to determine the association between gestational diabetes and ASD. According to the study, there is a gender difference in ASD. Male children were diagnosed with ASD at a higher rate than female children. Furthermore, the majority of ASD children have co-morbid conditions such as Intellectual Disability (ID), behavioural issues, learning impairments, and Attention Deficit Hyperactivity Disorder (ADHD). The study found a link between gestational diabetes and autism spectrum disorder. Diabetes mellitus in the family, maternal advanced age, and hypertension during pregnancy were all revealed to be statistically significant predictors of ASD.

Chen (2016) carried out a meta-analysis to investigate the link between ASD risk and maternal autoimmunity. The findings revealed a link between the risk of ASD and maternal autoimmunity. Maternal autoimmunity, such as thyroid dysfunction, contributes significantly to the risk of ASD. Inflammatory Bowel Disease (IBD), Idiopathic Thrombocytopenic Purpura (ITP), psoriasis, and

rheumatoid arthritis were not linked to an increased risk of ASD in this meta-analysis. Furthermore, autoimmune illnesses in the mother prior to conception were not associated with the impact of ASD in the offspring.

Gorman et al. (2018) conducted a study to assess the prenatal, perinatal, and neonatal variables studied in the previous study and associated with the development of ASD. Maternal variables including as hypertension, asthma, mental health issues, substance abuse, polycystic ovarian syndrome, hyperemesis gravidarum, and Assisted Reproductive Technologies (ART) have all been related to an increased risk of ASD. The odds ratio reveals that infections, diabetes, neonatal epilepsy, hypothyroidism, autoimmune illness, maternal age, obesity, multiple gestations, preterm delivery, low birth weight, and hypoxia all have a substantial influence in the likelihood of ASD. The study also looked into drugs for prenatal disease that were linked to an increased risk of ASD rather than the underlying maternal illness. The study also discovered that labour problems might cause brain injury, and neonatal seizures which can cause hypoxia, and impacts the child's neurodevelopment.

Alrahili et al. (2021) conducted a study on children to determine the relationship between exposure to screen time and the development of social skills. The results were found to be substantially related to the amount of hours spent on screens per day and social skill development, implying that excessive use of gadgets

may be one of the potential risks for the development of ASD-like symptoms. Children who use electronic gadgets for more than three hours per day, in particular, can develop ASD-like symptoms. The study also looked into whether those children struggled with social talk, nonverbal communication, peer relationships, active communication, and facial expression. In addition, these children exhibited uncomfortable communication styles, used self-created words during communication, and engaged in linguistic rituals.

Dikkala et al. (2022) did a study to investigate the relationship between screen time and the presence of autism-like symptoms in toddlers. The researchers discovered that 60% of toddlers were actively using their devices while also watching their care giver's devices, indicating an increase in multiple screen usage among toddlers. The majority of the toddlers utilised smart phones, with a handful using televisions and tablets. The findings suggest that toddlers who are exposed to screen time for more than three hours per day are more likely to acquire autism-like symptoms. The study also discovered that toddlers under the age of one year were at a significant risk of acquiring autism and autism-like symptoms. According to the study, there is a favourable association between screen time and the likelihood of ASD. It was also mentioned that the rise in screen time usage could have an impact on the toddler's development.

Alim, Hossain, Ahmed, Jasrin, Ashaduzzaman, and Kamrujjaman (2023) did a study to investigate the risk variables associated with the development of ASD during pregnancy. In this study, factors such as fetal anoxia and thyroid dysfunction are mostly identified as prenatal risk factors for ASD. Aside from them, genetic diseases, gestational diabetes, consanguinity, erythroblastosis, and epilepsy during pregnancy were all linked to an increased risk of ASD. The researcher also emphasised the importance of maternal mental health during pregnancy in lowering the incidence of ASD.

Faruk et al. (2023) did a study in the Bangladeshi community to assess the risk factors for ASD in the neonatal, paternal, and socioeconomic factors. Birth asphyxia, psychological stress, birth order, paternal age, and premature birth have all been linked to an increased risk of ASD. According to this study, second- and later-born children are more likely to have a severe ASD phenotype. Furthermore, advanced paternal age (more than 40 years) at the time of childbirth was substantially associated with an increase in the incidence of ASD. Simultaneously, certain factors, such as drug use during pregnancy, poor nutrition, mineral deficiencies, and maternal illness during pregnancy, were connected to the likelihood of ASD in the infant. In this group, factors such as birth weight and socioeconomic level are not related with the risk of ASD.

Mahboub, Suhaibani, Ellatif, and Elkholi (2023) investigated the elements that contribute to the development of autism. The study discovered a high risk for ASD that was linked to both maternal and child-related variables. Maternal risk factors for ASD include the mother having any ailment during pregnancy, gestational diabetes, and type 2 diabetes. The cord around the neck, fetal discomfort, injury during delivery, and low birth weight are all child-related variables that play a crucial impact in the development of ASD. The researchers also looked that there were child-related characteristics that were more strongly correlated with the likelihood of ASD than maternal variables. Premature birth, C-section, Rh incompatibility, aberrant fetal position, and excessive bilirubin levels were also found to be unrelated to the incidence of ASD in this study.

Vui et al. (2023) conducted a study to identify the association between prenatal, perinatal, and neonatal factors and the risk of ASD among children in Vietnam. The study found a prevalence of 76 ASD diagnoses per 10,000 children between the age range of 18 and 30 months. This demonstrated that the prevalence of ASD among children in Vietnam is rapidly increasing. Children born to mothers who had a history of miscarriage, abortion, or stillbirth were the most common risk factor for the development of ASD in this study. They also discovered that genetic alterations in children were one of the major risk factors produced by Assisted Reproductive Technology (ART) procedure. Along with these, factors such as gestational hypertension, gestational diabetes, maternal stress, mental illness, and other disorders during pregnancy have been related to the development of ASD.

Other newborn factors, such as neonatal jaundice, neonatal seizures, and neonatal respiratory distress syndrome, can also lead to structural changes in the brain that affect the neurodevelopment of the children. These structural abnormalities in the brain were linked to the development of ASD.

RESEARCH PROBLEM

From the previous literatures, it was clear that maternal illness and birth complications were associated with the risk of ASD. Though various studies have established the risk of ASD associated with the maternal medical illness during pregnancy and other birth complications, other prenatal, perinatal, postnatal risk factors and gadget exposure towards the onset of Autism Spectrum Disorder (ASD), there are only few studies which provide a complete view on risk of developmental factors contributing to the onset of ASD. That too it was limited in Indian context.

NEED FOR THE STUDY

Hence, the present study is framed to understand the developmental variables associated with the onset of ASD. Therefore, by identifying the developmental risk variables, we can understand the developmental risk factors in the onset of ASD which can help in prevention. And also helps in early identification of ASD which helps in providing appropriate therapeutic alliances.

CHAPTER III

METHOD

METHOD

3.1. AIM

To study the predictive role of developmental demographic factors in the onset of Autism Spectrum Disorder (ASD).

3.2. OBJECTIVES

- To understand the various developmental factors involved in the onset of ASD.
- To understand the risk ratio of the developmental factors in the onset of ASD.
- To understand the relationship between the screen time exposure and severity level of ASD.

3.3. HYPOTHESES

1. There will be significant risk ratio for developmental factors in the onset of ASD.
2. There will be prenatal factors which can predict the onset of ASD.
3. There will be perinatal factors which can predict the onset of ASD.
4. There will be postnatal factors which can predict the onset of ASD.

5. There will be a relationship between the screen time exposure and severity level of ASD.

3.4. SAMPLE

Parents of children with ASD and parents of children with neurotypical development.

The methods followed in selecting and assigning the samples of the study were explained in the following subsection.

3.4.1. Sample Estimation Protocol

The prior analysis in G*Power 3.1 was done to estimate the sample size in this study.

z tests – Logistic regression

Options: Large sample z-Test, Demidenko (2007) with var corr

Analysis: A priori: Compute required sample size

Input:		
	Tail(s)	= Two
	Odds ratio	= 2.5
	Pr(Y=1|X=1) H0	= 0.2
	α err prob	= 0.05
	Power (1-β err prob)	= 0.80
	R^2 other X	= 0
	X distribution	= Normal
	X parm μ	= 0

	X parm σ	=	1
Output:	Critical z	=	1.9599640
	Total sample size	=	70
	Actual power	=	0.8028454

Figure 3.1 – Sample Size Estimation in G*Power

3.4.2. Sample size

Based on the sample size estimation protocol, the sample size was found to be 70. From this finding, the sample size for this study was found to be 150 participants.

3.4.3. Sampling Method

The sampling method used in this study was purposive sampling method.

3.4.4. Sampling Criteria

The following sampling criteria were adopted in the present study.

3.4.4.1. Inclusion criteria for participants with children with ASD

- Parents of children who are all with age range between 3 and 10 years.
- Parents of children who must be diagnosed by a clinical psychologist as ASD using a valid tool.
- The parents who know either Tamil or English language.

- Parents of children who are availing services in NIEPMD.
- Parents of children who are all with or without any other disorders or disabilities.

3.4.4.2. Exclusion criteria for participants with children with ASD

- Parents of children who are all with any psychiatric co morbid condition.
- Parents of children with severe to profound developmental delay.
- Parents of children who are all Non-Resident Indians (NRI).

3.4.4.3. Inclusion criteria for parents of children with neurotypical development

- Parents of children who are all with age range between 3 and 10 years.
- Parents of children without any neuro developmental disorder.
- The parents who know either Tamil or English language.

3.4.4.4. Exclusion criteria for parents of children with neurotypical development

- Parents of children who are all with any psychiatric co morbid condition.
- Parents of children who are all Non-resident Indians (NRI).

3.5. RESEARCH DESIGN

The present study follows cross sectional research design.

3.6. VARIABLES

The variables included in the study are as follows:

- Independent variable includes developmental factors such as
  - Prenatal Factors,
  - Perinatal Factors, and
  - Neonatal Factors.
- Dependent variable includes
  - Presence of ASD.

3.7. TOOLS OF ASSESSMENTS

The following subsection involves the description of tools used in the study and its psychometric properties and the scoring method.

1. **Socio-demographic Questionnaire**

   A self-constructed questionnaire is used to collect socio demographic information such as age, gender, schooling, parent marital status, socioeconomic status, family history of medical and mental illness, family history of disability, and other variables of relevance.

2. **Developmental Factors Questionnaire**

A developmental factors questionnaire was created based on previous research reviews. Prenatal factors (parental age, consanguinity, history of abortion, illness during pregnancy, medication during pregnancy, and migration), perinatal factors (foetal distress, immediate birth cry, hypoxia, and meconium aspiration), and postnatal factors (neonatal jaundice, other medical illness, and screen time exposure) are all included in the questionnaire.

3. **INCLEN Diagnostic Tool for Autism Spectrum Disorder (IND-ASD)**

It is a semi-structured scale with 41 items. It can be administered based on the parental report and the behavioural observation by the clinician. It consists of various domains such as social interaction, communication, and restricted interest. It can be used to diagnose ASD, which involves Autism, Asperger's disorder, pervasive developmental disorder (PDD-NOS), Rett's disorder, and childhood disintegrative disorder (CDD). The internal consistency of INDT-ASD was found to be 0.96, indicating an excellent level of reliability.

Scoring method

For the present study, a number of criteria fulfilled for each section: social interaction, communication, and restricted interests are noted, and other

significant developmental histories are collected. From this, the diagnosis of ASD is provided.

4. Indian Scale for Assessment of Autism (ISAA)

It was used to assess the severity of the symptoms of autism in an individual diagnosed with ASD. It is a 40-item scale that can be used to rate the symptoms from 1 to 5, namely, 1- rarely (upto 20%), 2- sometimes (21-40%), 3- frequently (41-60%), 4- mostly (61-80%), and 5- always (81-100%). It consists of six domains, which are: social relationship and reciprocity; emotional responsiveness; speech-language and communication; behaviour patterns; sensory aspects; and cognitive component. The administration is based on the parental report and the behavioural observation by the clinician. It was an Indian standardized test with a good level of validity. The internal consistency of the ISAA was 0.93, which was an excellent level of reliability.

Scoring method

For the present study, the severity of Autism is calculated by summing the scores and interpreted as follows:

Below 70 - No Autism

71 to 106 - Mild Autism

107 to 153 - Moderate Autism

Above 153 - Severe Autism

5. Developmental Screening Test (DST)

It is an 88-item scale that can be administered to children in the age range of birth to 15 years. The assessment was a semi-structured interview schedule that was administered through parental reports and observation by the clinician to examine the Developmental Quotient (DQ). It involves four major areas of functioning, such as motor development, adaptive behaviour, language development, and personal-social behaviour. The criterion validity of the DST was found to be 0.85 with the Seguin Form Board Test (SFBT) and 0.75 with the Columbia Mental Maturity Scale (CMMS).

Scoring method

For the present study, the sums of the months are calculated and Developmental Quotient (DQ) is obtained using the formula:

$$\text{Developmental Quotient (DQ)} = \frac{\text{Developmental Age (DA)}}{\text{Chronological Age (CA)}}$$

3.8. PROCEDURE

The participants in both groups are identified and approached based on the sampling criteria. After getting consent from the respective participants, their children were screened using the INCLEN Diagnostic Tool for Autism Spectrum Disorder (IND-ASD) and the Developmental Screening Test (DST) to check whether they are

fulfilling the sampling criteria. Children with profound and severe developmental delay were excluded from the study. Based on the screening assessments, the participants are assigned to two groups. Following, the participants are interviewed using Socio-demographic Questionnaire, Developmental factors Questionnaire and Indian Scale for Assessment of Autism (ISAA).

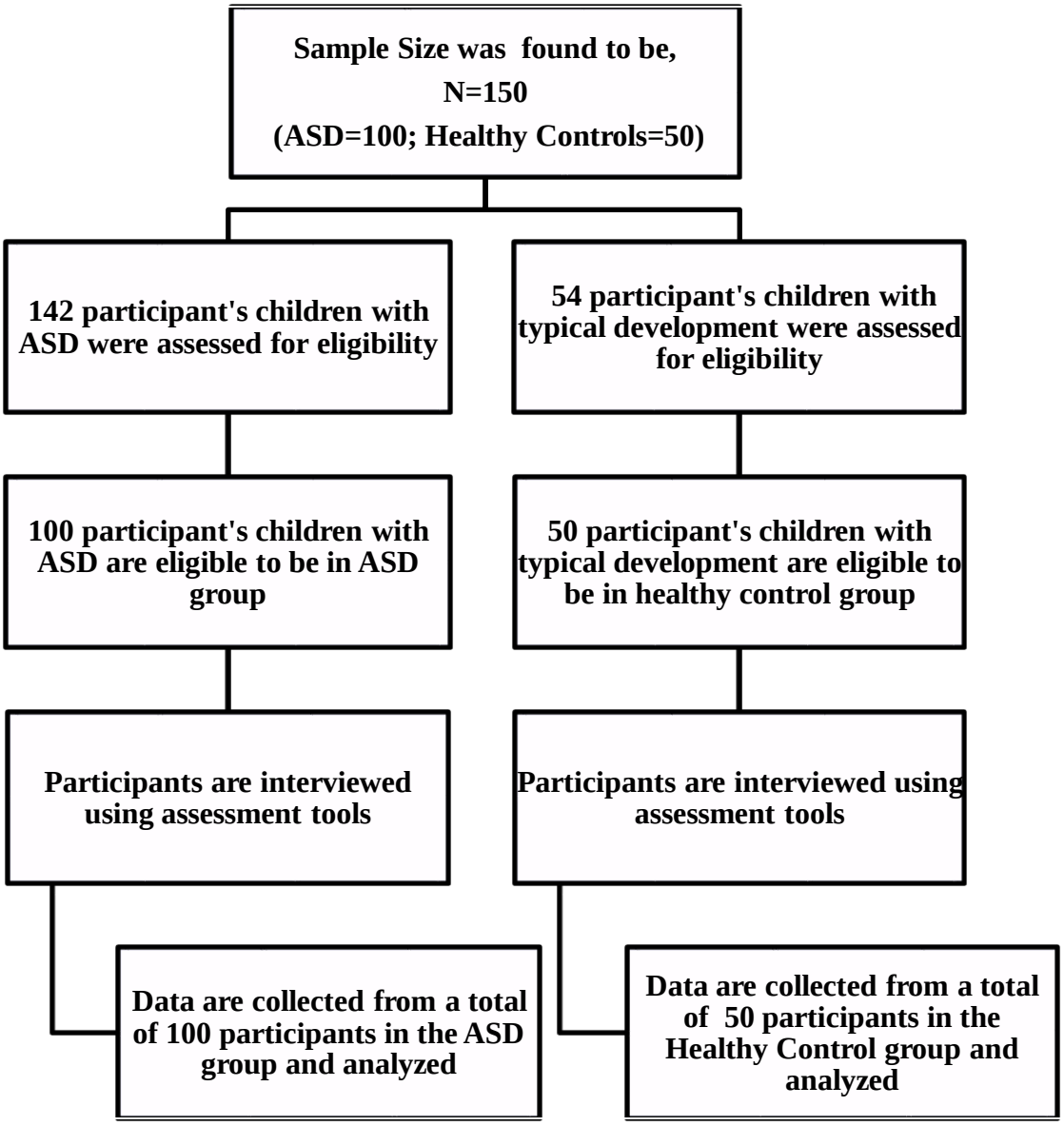

Figure 3.2 – Schema profile of the present study

3.9. ETHICAL CONSIDERATION

- Ethical considerations such as informed consent, issues of concern with deception, debriefing, and withdrawal from the study, confidentiality, anonymity of the participants, and protection from physical or mental harm in the study will be considered during the study.
- Informed consent will be collected from the parents of the children.

3.10. DATA ANALYSIS

The collected data collected are analyzed using IBM SPSS Statistics 25.0. The possible descriptive statistics for the study variables are measured and reported in the upcoming chapter. Inferential statistics such as Risk Estimates, Logistic Regression Models, Pearson Correlation, and Linear Regression Models are used. Risk Estimates are used to predict the Developmental Demographic Factors contribute to the onset of ASD. Pearson Correlation is used to measure the relationship between the severity of Autism and Developmental Demographic Factors involved in the onset of ASD. The data are also analyzed using Regression Models to predict the effects of hypothesized independent variables on the dependent variable.

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS AND DISCUSSION

As proposed in the previous chapter, the aim of the study is to study the predictive role of developmental demographic factors in the onset of Autism Spectrum Disorder (ASD) using two groups: experimental group (parents of children with ASD) and healthy control group (parents of children with typical development). In this chapter, the analysis of the results obtained is discussed. The results of the study are presented in the following sections:

Section I: Shows the characteristics and descriptive statistics of participants and their children.

Section II: Shows the descriptive statistics of the study variables.

Section III: Shows the inferential statistics of the study variables.

4.1 Section I

Table 1

As it is shown in Table 1, out of 150 participants, 66.7% participant's children were diagnosed with Autism Spectrum Disorder (ASD) and other 33.3% participant's children were healthy children. In this study, 25.3% children were female and 74.7% children were male in which 63.3% of children were first born, and added to that, 87.3% belongs to middle socioeconomic status, 46% were residing in an urban area and 67.3% were belongs to nuclear family. The mean age

of the children with ASD was 7.28±2.16 years, whereas the mean age of healthy children was 5.40±1.93 years.

Socio demographic and other characteristics of participant's child

Variables		Group	N	%	Mean±SD
Age of children	i.	ASD	100	66.7	7.28±2.16
	ii.	Healthy Controls	50	33.3	5.40±1.93
	iii.	Combined	150	100	6.34±2.04
Gender of children	i.	Females	38	25.3	-
	ii.	Males	112	74.7	-
Birth order of children	i.	First	95	63.3	-
	ii.	Second	49	32.7	-
	iii.	Third	6	4	-
Socio economic status	iv.	Low	16	10.7	-
	v.	Middle	131	87.3	-
	vi.	Upper	3	2	-
Domicile status	i.	Rural	40	26.7	-
	ii.	Semi-urban	41	27.3	-
	iii.	Urban	69	46	-
Family type	i.	Nuclear Family	104	69.3	-
	ii.	Joint Family	46	30.7	-

4.2 Section II

Table 2

As it is shown in table 2, the mean age of fathers of children with ASD was 33.06±5.21 years whereas the mean age of fathers of healthy children was 30.02±3.35 years. The mean age of mothers of children with ASD was 28.22±5.05 years whereas the mean age of mothers of healthy children was 27±2.84 years. In this, more than 24% of the participants experienced one of the prenatal complications during their pregnancy.

Descriptive Statistics for measures of Prenatal Factors

Measures	Groups		N	%	Mean±SD
Father's Age	i.	ASD	100	66.7	33.06±5.21
	ii.	Healthy Controls	50	33.3	30.02±3.35
	iii.	Combined	150	100	32.05±4.88
Mother's Age	i.	ASD	100	66.7	28.22±5.05
	ii.	Healthy Controls	50	33.3	27±2.84
	iii.	Combined	150	100	27.81±4.46
Parental Consanguinity	i.	Absent	132	88	-
	ii.	Present	18	12	-
Family history of Medical	i.	No	41	27.3	-

illness	ii.	Yes	109	72.7	-
Family history of Mental	i.	No	143	95.3	-
illness	ii.	Yes	7	4.7	-
Family history of	i.	No	107	71.3	-
Disability	ii.	Yes	43	28.7	-
Maternal immigration	i.	Absent	133	88.7	-
	ii.	Present	17	11.3	-
History of Abortion/	i.	Absent	106	70.7	-
Miscarriage	ii.	Present	44	29.3	-
Maternal Hypothyroidism	i.	Absent	121	80.7	-
	ii.	Present	29	19.3	-
Maternal Hypertensive	i.	Absent	135	90	-
disorder	ii.	Present	15	10	-
Gestational Diabetes	i.	Absent	130	86.7	-
	ii.	Present	20	13.3	-
Maternal Infection	i.	Absent	143	95.3	-
	ii.	Present	7	4.7	-
Maternal Stress	i.	Absent	58	38.7	-
	ii.	Present	92	61.3	-
Fetal Distress	i.	Absent	125	83.3	-
	ii.	Present	25	16.7	-

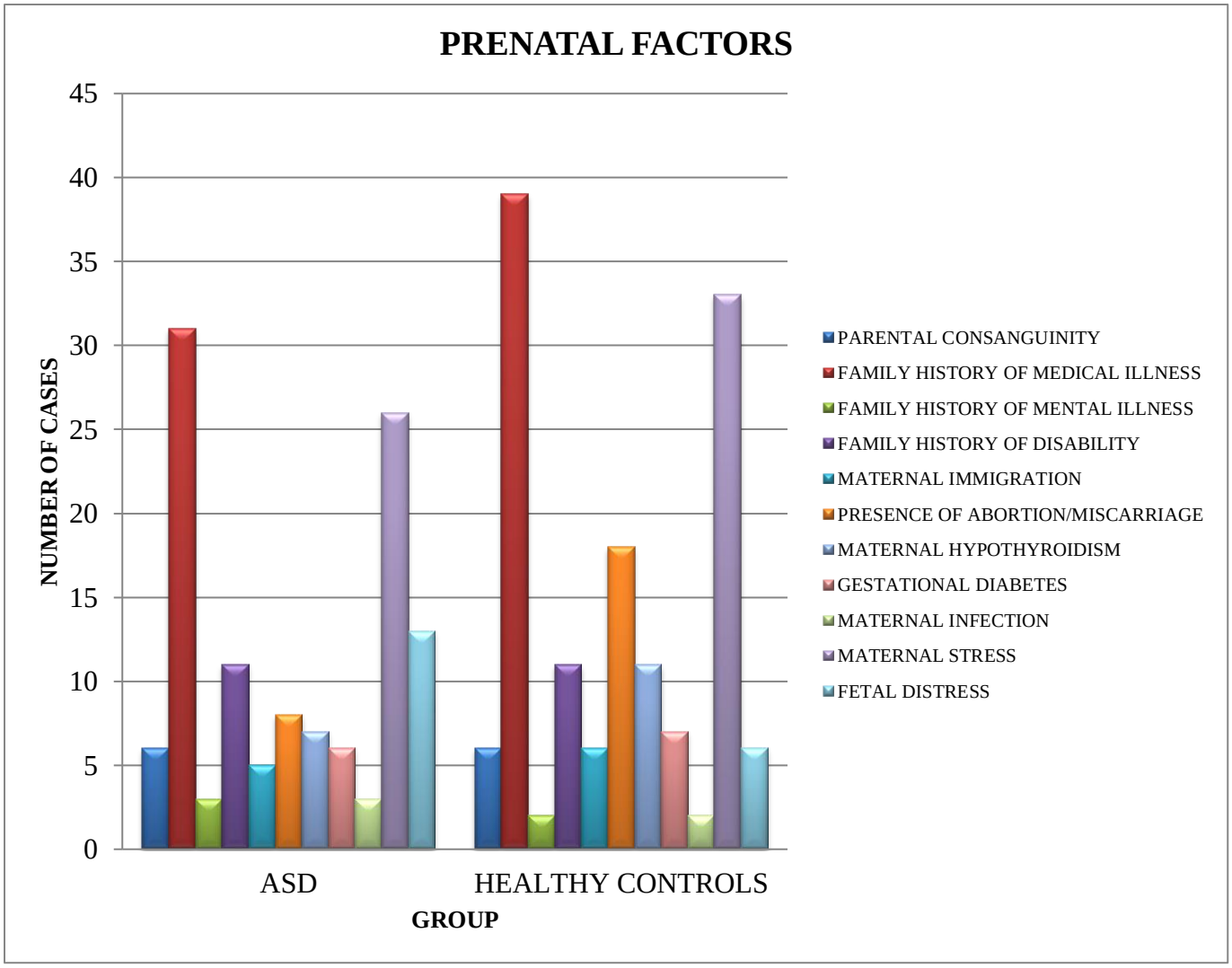

Figure 4.1 Prenatal Factors present in ASD and Healthy Controls Group

Table 3

The Table 3 shows the various perinatal complications experienced by children, involving pre-term delivery (11.3%), absence of immediate birth cry (12%), hypoxia (4.7%) and meconium aspiration (12%) respectively.

Descriptive Statistics for measures of Perinatal Factors

Measures		Groups	N	%
Pre-term Delivery	i.	No	133	88.7
	ii.	Yes	17	11.3
Immediate Birth Cry	i.	Absent	18	12
	ii.	Present	132	88
Hypoxia	i.	Absent	143	95.3
	ii.	Present	7	4.7
Meconium Aspiration	i.	Absent	132	88
	ii.	Present	18	12

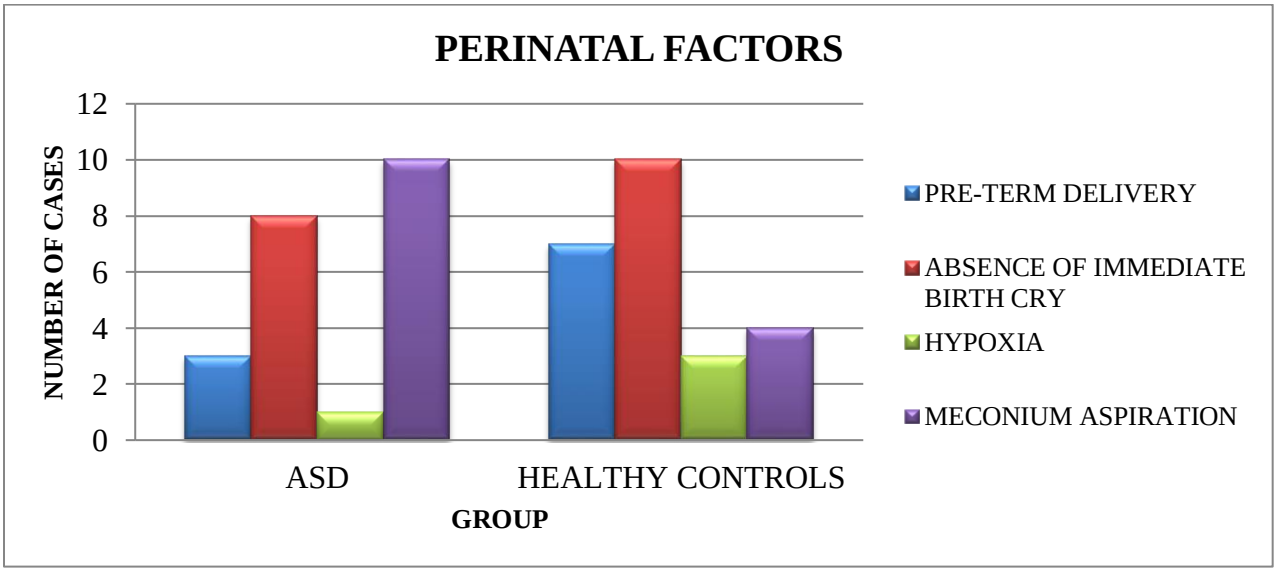

Figure 4.2 Perinatal Factors present in ASD and Healthy Controls Group

Table 4

The Table 4 shows the various neonatal complications experienced by children, involving neonatal jaundice (22%). In this study, most of the children are exposed to the screen time from the age of 1 year. Added to that, 50.7% of the children were exposed to screen time for the past 4 to 6 years and 24% of the children were exposed to screen time for the past 7 to 9 years with minimal duration of 1 to 5 hours a day.

Descriptive Statistics for measures of Postnatal Factors

Measures		Groups	N	%
Neonatal Jaundice	i.	Absent	117	78
	ii.	Present	33	22
Duration of Screen Time Exposure (In years)	i.	1-3	38	25.3
	ii.	4-6	76	50.7
	iii.	7-9	36	24

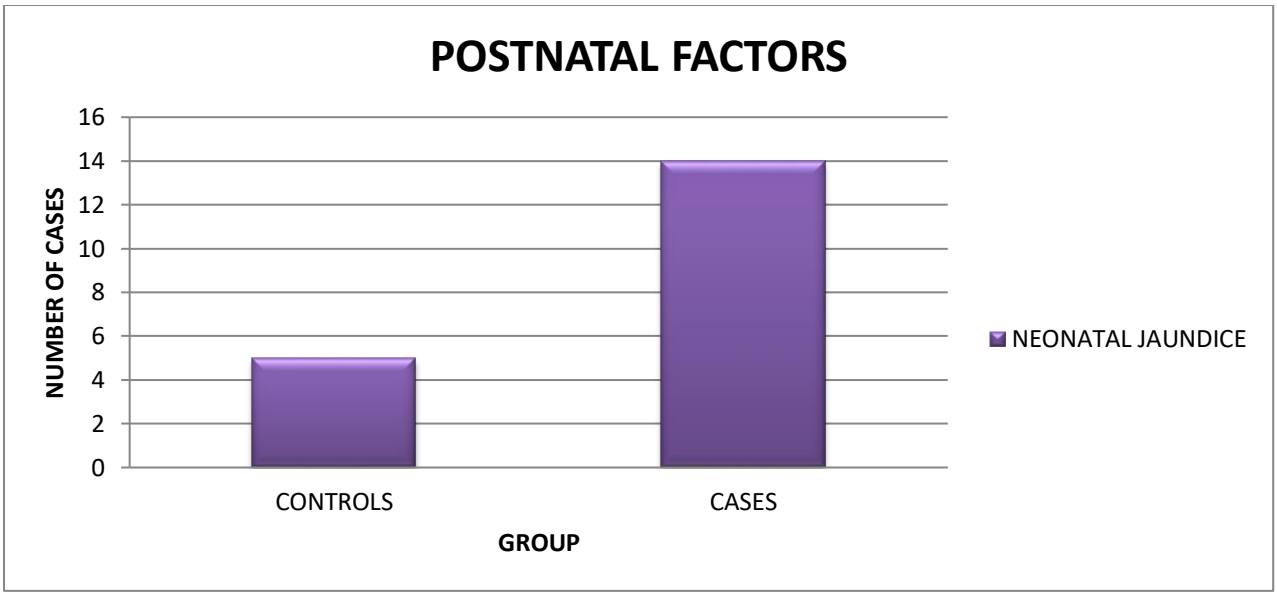

Figure 4.3 Postnatal Factors present in ASD and Healthy Controls Group

Table 5

The Table 5 shows the descriptive statistic for the ISAA score and its domains. The overall mean score of ISAA score in ASD Group was 87.62±10.05; in Healthy Controls was 41.26±1.291. The domain vise mean scores of ISAA were 20.85±9.15 in Social Relationship & Reciprocity, 9.73±4.45 in Emotional Responsiveness, 15.39±4.89 in Speech Language & Communication, 11.62±4.68 in Behaviours Pattern, 8.61±2.48 in Sensory Aspects, and 5.98±1.665 in Cognitive Component.

Descriptive Statistics for measures of severity of Autism (ISAA Score)

Measures		Groups	N	Mean±SD
ISAA Score	i.	ASD	100	87.62±10.05
	ii.	Healthy Controls	50	41.26±1.291
	iii.	Combined	150	72.17±23.42
Social Relationship & Reciprocity	i.	ASD	100	26.62±4.99
	ii.	Healthy Controls	50	9.30±0.46
	iii.	Combined	150	20.85±9.15
Emotional Responsiveness	i.	ASD	100	12.10±3.58
	ii.	Healthy Controls	50	5±0
	iii.	Combined	150	9.73±4.45
Speech Language & Communication	i.	ASD	100	18.42±2.84
	ii.	Healthy Controls	50	9.34±0.48
	iii.	Combined	150	15.39±4.89
Behaviours Pattern	i.	ASD	100	13.84±4.23
	ii.	Healthy Controls	50	7.18±0.48
	iii.	Combined	150	11.62±4.68
Sensory Aspects	i.	ASD	100	9.80±2.184
	ii.	Healthy Controls	50	6.22±0.54
	iii.	Combined	150	8.61±2.48

Cognitive Component	i.	ASD	100	6.84±1.35
	ii.	Healthy Controls	50	4.26±0.44
	iii.	Combined	150	5.98±1.665

4.3 Section III

Table 6

Risk estimates of ASD related to Prenatal Factors

Prenatal Factors	**Controls (N)**	**Cases (N)**	**RR**	**95% of CI**
Parental Consanguinity			1	0.30-3.34
No	44	44	1	0.87-1.16
Yes	6	6	1	0.35-2.90
Family history of Medical Illness			2.17	0.90-5.24
No	19	11	1.73	0.92-3.25
Yes	31	39	0.80	0.612-1.03
Family history of Mental Illness			0.653	0.10-4.09
No	47	48	0.979	0.90-1.07
Yes	3	2	1.500	0.262-8.60

Family history of Disability			1.67	0.68-4.08
No	39	34	1.15	0.90-1.46
Yes	11	11	0.69	0.36-1.33
Maternal immigration			1.22	0.35-4.32
No	45	44	1.02	0.89-1.17
Yes	5	6	0.83	0.27-2.56
History of Abortion/ Miscarriage			2.95	1.14-7.65
No	42	32	1.31	1.03-1.67
Yes	8	18	0.44	0.21-0.93
Maternal Hypothyroidism			1.73	0.61-4.91
No	43	39	1.10	0.91-1.33
Yes	7	11	0.64	0.27-1.50
Maternal Hypertensive disorder			1	0.27-3.70
No	45	45	1	0.88-1.14
Yes	5	5	1	0.30-3.24
Gestational Diabetes			1.19	0.37-3.84
No	44	43	1.02	0.88-1.19
Yes	6	7	0.86	0.31-2.37

Maternal Infection			0.65	0.10-4.09
No	47	48	0.98	0.90-1.07
Yes	3	2	1.5	0.26-8.60
Maternal Stress			1.80	0.8-4.01
No	24	17	1.41	0.87-2.29
Yes	26	33	0.79	0.57-1.1
Fetal Distress			0.39	0.13-1.12
No	37	44	0.84	0.70-1.02
Yes	13	6	2.17	0.90-5.25

The Table 6 shows the risk estimates of ASD related to Prenatal Factors. It was found that family history of mental illness, maternal infection, and fetal distress were significantly associated with risk of developing ASD. Family history of mental illness was associated with 1.5 times risk (CI: 0.612-1.03, $p < 0.05$), maternal infection was associated with 1.5 times risk (CI: 0.26-8.60, $p < 0.05$) and fetal distress was associated with 2.17 times risk (CI: 0.90-5.25, $p < 0.05$) of developing ASD. Neither parental consanguinity nor maternal hypertensive disorders ($p > 0.05$ for both factors) was significantly associated with the risk of developing ASD. Other factors such as family history of medical illness and disability, maternal immigration, miscarriages, abortion, hypothyroidism, gestational diabetes, and maternal stress ($p > 0.05$) were not significantly associated with the risk of developing ASD in this group.

Table 7

Risk estimates for ASD due to Perinatal Factors

Perinatal Factors	Controls (N)	Cases (N)	RR	95% of CI
Pre-term Delivery			2.55	0.62-10.50
No	47	43	1.09	0.96-1.25
Yes	3	7	0.43	0.12-1.56
Immediate Birth Cry			1.71	0.63-4.66
Absent	8	10	1.6	0.67-3.8
Present	42	90	0.93	0.81-1.07
Hypoxia			3.13	0.31-31.14
No	49	47	1.04	0.96-1.13
Yes	1	3	0.33	0.4-3.10
Meconium Aspiration			0.35	0.10-1.19
No	40	46	0.87	0.74-1.02
Yes	10	4	2.5	0.84-7.45

The Table 7 shows the risk estimates of ASD related to Perinatal Factors. It was found that immediate birth cry and meconium aspiration were significantly associated with risk of developing ASD. Absence immediate birth cry was associated with 1.6 times risk (CI: 0.67-3.8, $p < 0.05$), and meconium aspiration was associated with 2.5 times risk (CI: 0.84-7.45, $p < 0.05$) of developing ASD. Neither pre-term delivery nor hypoxia ($p > 0.05$ for both) was significantly associated with the risk of developing ASD in this group.

Table 8

Risk estimates for ASD due to Postnatal Factors

Postnatal Factors	Controls (N)	Cases (N)	RR	95% of CI
Neonatal Jaundice			3.5	1.15-10.63
No	45	36	1.25	1.03-1.52
Yes	5	14	0.36	0.14-0.92

The Table 8 shows the risk estimates of ASD related to Postnatal Factors. It was found that neonatal jaundice (CI: 0.14-0.92, $p > 0.05$) was not significantly associated with the risk of developing ASD in this group.

Table 9A

Logistic Regression Model Summary for Family history of Mental Illness

Model	-2 Log Likelihood	Cox & Snell R^2	Nagelkerke R^2
1	190.67	0.002	0.003

Table 9B

Logistic Regression Coefficients Statistics

Predictor	B	SE	Wald	df	p	Exp(B)	95%
Family History of Mental Illness	-0.43	0.78	0.3	1	0.591	0.65	[0.14,3.04]
Constant	0.71	0.18	16.09	1	0.000	2.04	-

The model summary of the logistic regression (Table 9B) indicated that the variables entered in the model were not significant predictor of ASD. The model was not statistically significant, χ^2 (1, N=150) = 0.289, p = 0.591, suggesting that it could not distinguish between those with and without ASD. The model explained

between 0.2% (Cox & Snell R square) and 0.3% (Nagelkerke R square) of the variance in the dependent variable and 66.7% of cases.

Table 10 A

Logistic Regression Model Summary for Maternal Infection

Model	-2 Log Likelihood	Cox & Snell R^2	Nagelkerke R^2
1	190.67	0.002	0.003

Table 10B

Logistic Regression Coefficients Statistics

Predictor	B	SE	Wald	df	p	Exp(B)	95%
Maternal Infection	-0.43	0.78	0.3	1	0.591	0.65	[0.14,3.04]
Constant	0.71	0.18	16.09	1	0.000	2.04	-

The model summary of the logistic regression (Table 10B) indicated that the variables entered in the model were not significant predictor of ASD. The model was not statistically significant, χ^2 (1, N=150) = 0.289, p = 0.591, suggesting that it

could not distinguish between those with and without ASD. The model explained between 0.2% (Cox & Snell R square) and 0.3% (Nagelkerke R square) of the variance in the dependent variable and 66.7% of cases.

Table 11A

Logistic Regression Model Summary for Fetal Distress

Model	-2 Log Likelihood	Cox & Snell R^2	Nagelkerke R^2
1	186.48	0.03	0.04

Table 11B

Logistic Regression Coefficients Statistics

Predictor	B	SE	Wald	df	p	Exp(B)	95%
Fetal Distress	-0.95	0.45	4.51	1	0.034	0.39	[0.16,0.93]
Constant	0.87	0.2	19.55	1	0.000	2.38	-

The model summary of the logistic regression (Table 11B) indicated that the variables entered in the model were significant predictor of ASD. The model was

statistically significant, χ^2 (1, N=150) = 4.478, p = 0.034, suggesting that it could distinguish between those with and without ASD. The model explained between 3% (Cox & Snell R square) and 4% (Nagelkerke R square) of the variance in the dependent variable and 67.3% of cases.

Table 12A

Logistic Regression Model Summary for Immediate Birth Cry

Model	-2 Log Likelihood	Cox & Snell R^2	Nagelkerke R^2
1	189.86	0.007	0.01

Table 12B

Logistic Regression Coefficients Statistics

Predictor	B	SE	Wald	df	p	Exp(B)	95%
Immediate Birth Cry	0.54	0.51	1.12	1	0.29	1.71	[0.63,4.66]
Constant	0.22	0.47	0.22	1	0.64	1.25	-

The model summary of the logistic regression (Table 12B) indicated that the variables entered in the model were not significant predictor of ASD. The model was statistically not significant, χ^2 (1, N=150) = 1.094, p = 0.296, suggesting that it could not distinguish between those with and without ASD. The model explained between 0.7% (Cox & Snell R square) and 1% (Nagelkerke R square) of the variance in the dependent variable and 66.7% of cases.

Table 13A

Logistic Regression Model Summary for Meconium Aspiration

Model	-2 Log Likelihood	Cox & Snell R^2	Nagelkerke R^2
1	186.67	0.03	0.04

Table 13B

Logistic Regression Coefficients Statistics

Predictor	B	SE	Wald	df	p	Exp(B)	95%
Meconium Aspiration	-1.06	0.51	4.28	1	0.04	0.39	[0.13,0.95]

Constant	0.83	0.19	19.34	1	0.000	2.3	-

The model summary of the logistic regression (Table 13B) indicated that the variables entered in the model were significant predictor of ASD. The model was not statistically significant, χ^2 (1, N=150) = 4.283, p = 0.39, suggesting that it could distinguish between those with and without ASD. The model explained between 3% (Cox & Snell R square) and 4% (Nagelkerke R square) of the variance in the dependent variable and 68% of cases.

Table 14

Pearson correlation statistics for the parental age and ISAA Score

Variables	ISAA Score
ISAA Score	-
Mother's Age	-0.027
Father's Age	0.19

The Table 14 shows the correlation for the parental age and ISAA score. The findings of the analysis revealed that the mother's age had no significant correlation with the ISAA score, $r = -0.027$, $p > 0.05$ and also father's age had no significant correlation with the ISAA score, $r = 0.19$, $p > 0.05$. Therefore, the findings of the analysis revealed that the parental age had no significant correlation with the ISAA score.

Table 15

Pearson correlation statistics for the Duration of Screen Time Exposure (In Years) and ISAA Score and its domains

Variable	ISAA Score	Social Relationship and Reciprocity	Emotional Responsiveness	Speech-Language and Communication	Behaviour Pattern	Sensory Aspects	Cognitive Component
Duration of Screen Time Exposure	0.361**	0.55	0.481**	0.243*	0.16	0.151	-0.44

** Correlation is significant at 0.01 level (2-tailed).

* Correlation is significant at 0.05 level (2-tailed).

The Table 15 shows that for the duration of screen time exposure (In Years) and ISAA score and its domains. The findings show that overall ISAA score and its domains such as Emotional Responsiveness and Speech- Language and Communication had a significant positive correlation with the duration of screen time exposure (In Years). The duration of screen time exposure (In Years) had a significant positive correlation with the ISAA score, $r = 0.361$, $p < 0.01$ and Emotional Responsiveness, $r = 0.481$, $p < 0.01$. also it was found that the duration of screen time exposure (In Years) had also significant positive correlation with Speech- Language and Communication, $r = 0.243$, $p < 0.05$.

Table 16A

Linear Regression Model Summary for ISAA Score

Model	R	R Square	Adjusted R Square	Std. Error of the Estimates	F	Sig.
1	0.361[a]	0.131	0.122	9.421	14.711	0.000[b]

Table 16B

Linear Regression Coefficients Statistics

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error			
1	(Constant)	76.39	3.08		24.84	0.000
	Duration of Screen Time Exposure (In Years)	5.3	1.38	0.36	3.84	0.000

The model summary of the linear regression (Table 16A) indicates that the variable entered in the model was a significant predictor of ISAA score, $F(1,149) = 14.711$, $p < 0.01$. The proportion of variance was estimated to be 13% which was explained by the predictors of the model. In this predictive model, the duration of screen time exposure (In Years) was the significant predictor of the ISAA score. It was interpreted that the ISAA score increased by one unit, the duration of screen time exposure (In years) was increased by 5.3 units.

Table 17A

Linear Regression Model Summary for Emotional Responsiveness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimates	F	Sig.
1	0.481[a]	0.231	0.223	3.156	29.421	0.000[b]

Table 17B

Linear Regression Coefficients Statistics

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error			
1	(Constant)	6.78	1.03		6.58	0.000
	Duration of Screen Time Exposure (In Years)	2.51	0.46	0.48	5.42	0.000

The model summary of the linear regression (Table 17A) indicates that the variable entered in the model was a significant predictor of Emotional Responsiveness, $F(1,149) = 29.421$, $p < 0.01$. The proportion of variance was estimated to be 23% which was explained by the predictors of the model. In this predictive model, the duration of screen time exposure (In Years) was the significant predictor of the Emotional Responsiveness. It was interpreted that the Emotional Responsiveness increased by one unit, the duration of screen time exposure (In years) was increased by 2.51 units.

Table 18A

Linear Regression Model Summary for Speech–Language and Communication

Model	R	R Square	Adjusted R Square	Std. Error of the Estimates	F	Sig.
1	0.243[a]	0.059	0.05	2.772	6.164	0.015[b]

Table 18B

Linear Regression Coefficients Statistics

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error			
1	(Constant)	16.28	0.91		18	0.000
	Duration of Screen Time Exposure (In Years)	1.01	0.41	0.24	2.48	0.015

The model summary of the linear regression (Table 18A) indicates that the variable entered in the model was a significant predictor of Speech–Language and Communication, $F(1,149) = 6.164$, $p < 0.05$. The proportion of variance was estimated to be 6% which was explained by the predictors of the model. In this predictive model, the duration of screen time exposure (In Years) was the significant predictor of the Speech–Language and Communication. It was interpreted that the Speech–Language and Communication increased by one unit, the duration of screen time exposure (In years) was increased by 1.01 units.

DISCUSSION

The objective of this study was to understand more about the impact of developmental demographic factors such as prenatal, perinatal, and postnatal factors in the onset of Autism Spectrum Disorder (ASD). The current investigation yielded a few noteworthy conclusions.

First, the findings of this study support the hypothesis that there will be a significant risk ratio for developmental factors at the onset of ASD. This pattern of findings is similar with prior work by Kolevson and Reichenberg (2007), Atladottir et al. (2015), and Hadjkacem et al. (2016). The findings strongly suggest that factors such as a family history of mental illness, maternal infection, fetal distress, immediate birth cry, and meconium aspiration are strongly related to the chance of developing ASD. The current findings are also consistent with the studies of Carlsson et al., (2021) and Kara (2021) on prenatal, perinatal, and postnatal variables.

Second, the results of the present study support the hypothesis that there will be prenatal factors that can predict the onset of ASD. According to the findings of the study, among prenatal variables, fetal distress was a major predictor of ASD. Despite the fact that both family history of mental illness and maternal infection were strongly related with the probability of developing ASD, none was a major predictor of ASD. Previously, researchers discovered that mood disorders (Smalley et al., 1995), anxiety disorders (Mazefsky, Folstein, and Lainhart, 2008), and a

family history of mental illnesses (Daniels et al., 2008; Yu, Chang, & Kuo, 2022) enhanced the likelihood of ASD.

Previous research has related ASD to maternal infections such as bacterial infections (Atladottir et al., 2010), viral infections (Hadjkacem et al., 2016), and cervical-vaginal infections (Joseph et al., 2017). These pathogenic pathogens penetrate the placenta and fetal environment directly or indirectly through the activation of the maternal immune system, affecting brain neurodevelopment (Zebro et al., 2015). Infections can sometimes cause inflammation, which makes the brain more sensitive to other challenges (Hagberg et al., 2015) and can even cause cerebral damage (Joseph et al., 2017). This can also be explained by the production of cytokines that alter brain cell proliferation, differentiation, transmitters, and neurotrophins (Depino, 2006). These deficits are common in people with ASD (Ashwood et al., 2011).

Previous research, such as Hadjkacem et al. (2016), Mahboub et al. (2023), and Kolevson and Reichenberg (2007), offered support for fetal distress as a risk factor for developing ASD. A stressful environment for the newborn during the perinatal or prenatal phase will create distress, which is closely linked to the chance of developing ASD. Perinatal problems increase the vulnerability of abnormal brain structures such as the basal ganglia, hippocampus, and lateral ventricles. Hippocampal abnormalities (Kemper and Bauman, 1998) and larger lateral ventricles (Piven et al., 1995) were also discovered to be more common among people with Autism than in the neurotypical group (Kolevson and Reichenberg, 2007).

Third, the results of the present study support the hypothesis that there will be perinatal factors that can predict the onset of ASD. According to the findings of the study, meconium aspiration was a strong predictor of ASD among perinatal variables. The likelihood of developing ASD was observed to be connected with immediate birth cry, although it was not a significant predictor of ASD. Mamidala et al. (2013) conducted a study that supports the findings that delayed birth cry is connected with the likelihood of developing ASD. It was also shown that delayed birth cry might cause hypoxia, which can lead to adverse brain reactions.

Whereas previous studies (Matsuishi et al., 1999; Beligere and Rao, 2008; Dhawan et al., 2014; Miller, 2017) discovered that meconium aspiration is one of the most common obstetrical problems in people with ASD. Meconium aspiration is a tar-like substance excreted during delivery that is made up of non-digested waste products. Secondary problems such as placental insufficiency, hypoxia, and newborn asphyxia have been reported (Miller et al., 2017).

Fourth, the results of the present study did not support the hypothesis that there will be postnatal factors that can predict the onset of ASD. According to the findings of the study, postnatal variables did not significantly predict the onset of ASD. These findings support the claim that neonatal variables are not strongly linked to the chance of developing ASD (Bilder et al., 2009).

Finally, the findings of this study lend credence to the hypothesis that there will be a relationship between screen time exposure and the severity level of ASD. According to the findings of the study, there is a positive association between

screen time exposure and the ISAA score and its areas such as Emotional Responsiveness and Speech-Language and Communication. Screen time exposure was also revealed to be a significant predictor of the ISAA score and related domains, such as Emotional Responsiveness and Speech-Language and Communication. The results are consistent with the previous literature, such as Madigan et al., 2020; Heffler et al., 2020; Chen et al., 2021; and Brieger et al., 2022. Children who spend more than 3 hours per day in the presence of a screen are more likely to develop ASD-like symptoms (Alrahili et al., 2021). Some variables, such as the increasing demand for social engagement over social networking (MacMullin, Lunsky, and Weiss, 2016), less social leisure (Slobodin, Heffler, and Davidovitch, 2019), and less parent-child interaction (Heffler et al., 2020), have contributed to the increasing use of gadget exposure currently. Madigan et al. (2020) and Brieger et al. (2022) discovered that early screen time exposure can cause developmental delays, particularly in the language domain, as well as increase the intensity of symptoms of abnormal sensory response.

CHAPTER V

SUMMARY AND CONCLUSION

SUMMARY AND CONCLUSION

The current study sought to determine the predictive impact of developmental demographic factors such as prenatal, perinatal, and postnatal factors in the onset of Autism Spectrum Disorder (ASD). The current study's findings provided supporting data for a better understanding of the numerous risk factors in the development of ASD.

The primary objective of this research was to gain an understanding of the numerous developmental variables involved in the onset of ASD and their predictive function in ASD. According to the analysis, prenatal and perinatal variables can predict ASD. Prenatal factors such as a family history of mental illness, maternal infections, and fetal distress are linked to an increased risk of developing ASD, but only fetal distress can predict ASD. Perinatal variables such as immediate birth cry and meconium aspiration have been linked to an increased risk of ASD. At the same time, factors such as Meconium Aspiration can predict the ASD. It was also discovered that the prenatal and perinatal periods are extremely important and susceptible times for brain growth and development. Postnatal variables were not found to be strongly linked with the likelihood of developing ASD in this study.

Early screen time exposure was found to be strongly related with the risk of ASD-like symptoms, as well as an increase in the severity of the symptoms and developmental delay, particularly in the language areas.

Finally, the data adds support to the idea that ASD is caused by a combination of factors. A single factor may increase the risk of ASD, however such exposure cannot indicate the cause of ASD.

IMPLICATIONS

The present research discovered that prenatal, perinatal, and early screen time exposure can each predict the likelihood of ASD. It also implies that early exposure to screen time will result in poor language abilities and ASD-like symptoms. This study may aid in the early detection of ASD by identifying difficulties that happened during the infant's brain development, and early intervention may improve the disorder's prognosis. This can be utilized to raise awareness among the population that is predisposed to ASD.

LIMITATIONS AND FUTURE DIRECTIONS

The effect of socio-demographic characteristics on the study variables was not considered in the study. Further research into the influence of socio-demographic data on study variables can be proposed. Another significant restriction is that the information gathered is based on parental reports, which might lead to reporting bias. For part of the clinical data, the data collection relied on verbal information provided by the parents during the interview session. Documentation pertaining to clinical data, on the other hand, might be employed

during data collecting. Due to the presence of many factors, the current study's scope was limited in terms of collecting in-depth information about the study variables. More research can be conducted to investigate the in-depth nature of the significant variables in a broad population. The current study only looked at developmental demographic characteristics as a predictor of Autism Spectrum Disorder (ASD). In addition, genetic variables can be investigated in future studies.

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APPENDICES

Appendix A

INFORMED CONSENT- EXPERIMENTAL GROUP

National Institute for Empowerment of Persons with Multiple Disabilities (Divyangjan) (NIEPMD)

Department of Empowerment of Persons with Disabilities (Divyangjan)

Ministry of Social Justice and Empowerment, Govt. of. India

PREDICTIVE ROLE OF DEVELOPMENTAL DEMOGRAPHIC FACTORS IN THE ONSET OF AUTISM SPECTRUM DISORDERS

Researcher: Ms. ARUNA S **Under the Guidance**: Mr. JOHNY. E. V

STUDY INFORMATION SHEET

I am ARUNA S, II Year M. Phil. Clinical Psychology scholar at NIEPMD. As a part of my course, I am doing research entitled "***Predictive role of developmental demographic factors in the onset of Autism Spectrum Disorders***". In this research, I have planned to identify the various developmental risk factors in the onset of Autism Spectrum Disorders (ASD) which might help us to prevent ASD. It is important to identify the risk factors of ASD for early identification and intervention.

Who will be the participants?

Parents of children with ASD.

Does this study involve any expenses?

No, it does not have any fees.

Is it legally enforceable?

No, this is not a legally binding document. It is a research document.

Will there be any negative consequences if I participate?

No, this study procedure will not have any negative effects for the participant. If there are any emotional/psychological repercussions followed by the session, psychological help will be ensured.

Is it compulsory for me to participate?

No. Your participation in this study is completely voluntary and you can refuse to be a part of this process.

Can I withdraw from the study if I'm not comfortable with the process?

You are free to choose whether you want to be a part of this study. Saying "NO" will not affect your relationship with the researcher or the institute. This study does not involve any laboratory tests or any invasive procedure. If you feel any uneasiness during the process, it can be rescheduled.

Can you ensure the confidentiality of the data?

The personal information given by you will be kept confidential. Only members of the research team will know your name and details. Your name will not appear in any report or publication. However, the overall results of the study will be published in the research journals.

Undertaking by the researcher

Your consent to participate in the above research by Ms. ARUNA S, M. Phil. Clinical Psychology scholar, NIEPMD, Chennai is sought. You have the right to refuse consent or withdraw the same during any part of the research without giving any reason. If you have any doubts about the research, please feel free to clarify the same. Even during the research, you are free to contact the researcher (Ms. ARUNA S) for clarification if you desire (Mobile no.: 9865621405).

The information provided by you will be kept strictly confidential.

Consent to participate in research study

	YES/NO
I confirm that I have had adequate explanation and have clearly understood the information sheet of the study and have had the opportunity to ask questions.	
I understand that my participation is voluntary and that I am free to withdraw from the study at any time without giving a reason.	
I understand that all personal information I share will be kept confidential and will not be shared with anyone other than those involved in the research study.	

Name of the Participant: Name of the researcher:

Signature with date: Signature with date:

Appendix B

ஒன்றுக்கு மேற்பட்ட ஊனமுற்றோரின் மேம்பாட்டிற்கான தேசிய நிறுவனம் (என்.ஐ.இ.பி.எம்.டி)

சமூக நீதி மற்றும் அதிகாரமளித்தல் அமைச்சகம், அரசு. இந்தியா

புற உலகச் சிந்தனைக் குறைபாட்டின் தொடக்கத்திலுள்ள வளர்ச்சி காரணிகளின் முன்கணிப்பு பங்கு

ஆராய்ச்சியாளர்: செல்வி அருணா செ

வழிகாட்டுதல்: திரு. ஜானி ஈ.வி.

<u>ஆய்வுத் தகவல் தாள்</u>

நான், அருணா செ, இரண்டாம் ஆண்டு எம்.பில். மருத்துவ உளவியல் அறிஞராக என்.ஐ.இ.பி.எம்.டி.யில் படிக்கிறேன். எனது பாடத்திட்டத்தின் ஒரு பகுதியாக, " ***புற உலகச் சிந்தனைக் குறைபாட்டின் தொடக்கத்திலுள்ள வளர்ச்சி காரணிகளின் முன்கணிப்பு பங்கு"*** என்ற தலைப்பில் ஆராய்ச்சி செய்கிறேன். இந்த ஆராய்ச்சியில், புற உலகச் சிந்தனைக் குறைபாட்டின் ஆரம்பத்திலுள்ள பல்வேறு வளர்ச்சி ஆபத்து காரணிகளை

அடையாளம் காண திட்டமிட்டுள்ளேன், இது புற உலகச் சிந்தனைக் குறைபாட்டைத் தடுக்க உதவக்கூடும். ஆரம்பகால அடையாளம் மற்றும் தலையீட்டிற்கு புற உலகச் சிந்தனைக் குறைபாட்டின் ஆபத்து காரணிகளை அடையாளம் காண்பது முக்கியம்.

இதில் பங்கேற்பவர்கள் யார்?

புற உலகச் சிந்தனைக் குறைபாடு உள்ள குழந்தைகளின் பெற்றோர்கள்.

இந்த ஆய்வில் ஏதேனும் செலவுகள் உள்ளதா?

இல்லை, இதற்கு எந்த கட்டணமும் இல்லை.

இது சட்டரீதியாக அமல்படுத்தப்படக் கூடியதா?

இல்லை, இது சட்டரீதியாக பிணைக்கப்பட்ட ஆவணம் அல்ல. இது ஒரு ஆராய்ச்சி ஆவணம்.

நான் பங்கேற்றால் எதிர்மறையான விளைவுகள் ஏற்படுமா?

இல்லை, இந்த ஆய்வு செயல்முறை பங்கேற்பாளருக்கு எந்த எதிர்மறையான விளைவுகளையும் ஏற்படுத்தாது. அமர்வைத் தொடர்ந்து ஏதேனும் உணர்ச்சி / உளவியல் விளைவுகள் ஏற்பட்டால், உளவியல் உதவி உறுதி செய்யப்படும்.

நான் பங்கேற்பது கட்டாயமா?

இல்லை. இந்த ஆய்வில் நீங்கள் பங்கேற்பது முற்றிலும் தன்னிச்சையானது மற்றும் இந்த செயல்முறையின் ஒரு பகுதியாக இருக்க நீங்கள் மறுக்கலாம்.

இந்த செயல்முறையுடன் எனக்கு வசதியாக இல்லையென்றால் நான் ஆய்விலிருந்து விலகலாமா?

நீங்கள் இந்த ஆய்வின் ஒரு பகுதியாக இருக்க விரும்புகிறீர்களா என்பதைத் தேர்வுசெய்ய உங்களுக்கு சுதந்திரம் உள்ளது. "இல்லை" என்று சொல்வது, ஆராய்ச்சியாளர் அல்லது நிறுவனத்துடனான உங்கள் உறவை பாதிக்காது. இந்த ஆய்வில் எவ்வித ஆய்வக சோதனைகள் அல்லது எவ்வித ஆக்கிரமிப்பு செயல்முறையும் இல்லை. செயல்பாட்டின் போது உங்களுக்கு ஏதேனும் அசௌகரியம் ஏற்பட்டால், அது மறுசீரமைக்கப்படலாம்.

தரவின் ரகசியத்தன்மையை உறுதி செய்ய முடியுமா?

நீங்கள் கொடுக்கும் தனிப்பட்ட தகவல்கள் ரகசியமாக வைக்கப்படும். ஆராய்ச்சிக் குழுவின் உறுப்பினர்களுக்கு மட்டுமே உங்கள் பெயர் மற்றும் விவரங்கள் தெரியும். ஆய்வின் ஒட்டுமொத்த முடிவுகள் ஆராய்ச்சி இதழ்களில் வெளியிடப்படும். உங்கள் பெயர் எந்த அறிக்கை அல்லது வெளியீட்டிலும் இடம்பெறாது.

ஆராய்ச்சியாளரின் உறுதிமொழி

மேற்கண்ட ஆராய்ச்சியில் பங்கேற்க செல்வி அருணா செ, எம்.பில். மருத்துவ உளவியல் அறிஞர், என்.ஐ.இ.பி.எம்.டி, சென்னை ஆகியோரின் ஒப்புதல் கோரப்படுகிறது. ஆராய்ச்சியின் எந்தப் பகுதியிலும் எந்தக் காரணமும் கூறாமல் ஒப்புதலை மறுக்க அல்லது திரும்பப் பெற உங்களுக்கு உரிமை உண்டு. ஆராய்ச்சி பற்றி உங்களுக்கு ஏதேனும் சந்தேகங்கள் இருந்தால், தயவுசெய்து அதை தெளிவுபடுத்த தயங்காதீர்கள். ஆராய்ச்சியின் போது கூட, நீங்கள் விரும்பினால் விளக்கத்திற்காக ஆராய்ச்சியாளரை (செல்வி அருணா செ) தொடர்பு கொள்ளலாம் (கைபேசி எண்: 9865621405).

நீங்கள் வழங்கும் தகவல்கள் மிகவும் ரகசியமாக வைக்கப்படும்.

ஆராய்ச்சி ஆய்வில் பங்கேற்க ஒப்புதல்

	ஆம்/இல்லை
நான் போதுமான விளக்கத்தைப் பெற்றுள்ளேன் மற்றும் ஆய்வின் தகவல் தாளை தெளிவாகப் புரிந்துகொண்டேன் மற்றும் கேள்விகளைக் கேட்க எனக்கு வாய்ப்பு கிடைத்தது என்பதை நான் உறுதிப்படுத்துகிறேன்.	

எனது பங்கேற்பு தன்னிச்சையானது என்பதையும், எந்தக் காரணத்தையும் கூறாமல் எந்த நேரத்திலும் ஆய்விலிருந்து விலக எனக்கு சுதந்திரம் உண்டு என்பதையும் நான் புரிந்துகொண்டேன்.	
நான் பகிரும் அனைத்து தனிப்பட்ட தகவல்களும் ரகசியமாக வைக்கப்படும் என்பதையும், ஆராய்ச்சி ஆய்வில் ஈடுபட்டுள்ளவர்களைத் தவிர வேறு யாருடனும் பகிர்ந்து கொள்ளப்படாது என்பதையும் நான் புரிந்துகொள்கிறேன்.	

பங்கேற்பாளரின் பெயர்: ஆராய்ச்சியாளரின் பெயர்:

கையொப்பம் தேதியுடன்: கையொப்பம் தேதியுடன்:

Appendix C

INFORMED CONSENT- CONTROL GROUP

National Institute for Empowerment of Persons with Multiple Disabilities (Divyangjan) (NIEPMD)

Department of Empowerment of Persons with Disabilities (Divyangjan)

Ministry of Social Justice and Empowerment, Govt. of. India

PREDICTIVE ROLE OF DEVELOPMENTAL DEMOGRAPHIC FACTORS IN THE ONSET OF AUTISM SPECTRUM DISORDERS

Researcher: Ms. ARUNA S **Under the Guidance**: Mr. JOHNY. E. V

STUDY INFORMATION SHEET

I am ARUNA S, II Year M. Phil. Clinical Psychology scholar at NIEPMD. As a part of my course, I am doing research entitled "***Predictive role of developmental demographic factors in the onset of Autism Spectrum Disorders***". In this research, I have planned to identify the various developmental risk factors in the onset of Autism Spectrum Disorders (ASD) which might help us to prevent ASD. It is important to identify the risk factors of ASD for early identification and intervention.

Who will be the participants?

Parents of children with neurotypical development.

Does this study involve any expenses?

No, it does not have any fees.

Is it legally enforceable?

No, this is not a legally binding document. It is a research document.

Will there be any negative consequences if I participate?

No, this study procedure will not have any negative effects for the participant. If there are any emotional/psychological repercussions followed by the session, psychological help will be ensured.

Is it compulsory for me to participate?

No. Your participation in this study is completely voluntary and you can refuse to be a part of this process.

Can I withdraw from the study if I'm not comfortable with the process?

You are free to choose whether you want to be a part of this study. Saying "NO" will not affect your relationship with the researcher or the institute. This study does not involve any laboratory tests or any invasive procedure. If you feel any uneasiness during the process, it can be rescheduled.

Can you ensure the confidentiality of the data?

The personal information given by you will be kept confidential. Only members of the research team will know your name and details. Your name will not appear in any report or publication. However, the overall results of the study will be published in the research journals.

Undertaking by the researcher

Your consent to participate in the above research by Ms. ARUNA S, M. Phil. Clinical Psychology scholar, NIEPMD, Chennai is sought. You have the right to refuse consent or withdraw the same during any part of the research without giving any reason. If you have any doubts about the research, please feel free to clarify the same. Even during the research, you are free to contact the researcher (Ms. ARUNA S) for clarification if you desire (Mobile no.: 9865621405).

The information provided by you will be kept strictly confidential.

Consent to participate in research study

	YES/NO
I confirm that I have had adequate explanation and have clearly understood the information sheet of the study and have had the opportunity to ask questions.	
I understand that my participation is voluntary and that I am free to withdraw from the study at any time without giving a reason.	
I understand that all personal information I share will be kept confidential and will not be shared with anyone other than those involved in the research study.	

Name of the Participant: Name of the researcher:

Signature with date: Signature with date:

Appendix D

ஒன்றுக்கு மேற்பட்ட ஊனமுற்றோரின் மேம்பாட்டிற்கான தேசிய நிறுவனம் (என்.ஐ.இ.பி.எம்.டி)

சமூக நீதி மற்றும் அதிகாரமளித்தல் அமைச்சகம், அரசு. இந்தியா

புற உலகச் சிந்தனைக் குறைபாட்டின் தொடக்கத்திலுள்ள வளர்ச்சி காரணிகளின் முன்கணிப்பு பங்கு

ஆராய்ச்சியாளர்: செல்வி அருணா செ

வழிகாட்டுதல்: திரு. ஜானி ஈ.வி.

ஆய்வுத் தகவல் தாள்

நான், அருணா செ, இரண்டாம் ஆண்டு எம்.பில். மருத்துவ உளவியல் அறிஞராக என்.ஐ.இ.பி.எம்.டி.யில் படிக்கிறேன். எனது பாடத்திட்டத்தின் ஒரு பகுதியாக, " ***புற உலகச் சிந்தனைக் குறைபாட்டின் தொடக்கத்திலுள்ள வளர்ச்சி காரணிகளின் முன்கணிப்பு பங்கு"*** என்ற தலைப்பில் ஆராய்ச்சி செய்கிறேன். இந்த ஆராய்ச்சியில், புற உலகச் சிந்தனைக் குறைபாட்டின்

ஆரம்பத்திலுள்ள பல்வேறு வளர்ச்சி ஆபத்து காரணிகளை அடையாளம் காண திட்டமிட்டுள்ளேன், இது புற உலகச் சிந்தனைக் குறைபாட்டைத் தடுக்க உதவக்கூடும். ஆரம்பகால அடையாளம் மற்றும் தலையீட்டிற்கு புற உலகச் சிந்தனைக் குறைபாட்டின் ஆபத்து காரணிகளை அடையாளம் காண்பது முக்கியம்.

இதில் பங்கேற்பவர்கள் யார்?

நரம்பியல் வளர்ச்சி உள்ள குழந்தைகளின் பெற்றோர்கள்.

இந்த ஆய்வில் ஏதேனும் செலவுகள் உள்ளதா?

இல்லை, இதற்கு எந்த கட்டணமும் இல்லை.

இது சட்டரீதியாக அமல்படுத்தப்படக் கூடியதா?

இல்லை, இது சட்டரீதியாக பிணைக்கப்பட்ட ஆவணம் அல்ல. இது ஒரு ஆராய்ச்சி ஆவணம்.

நான் பங்கேற்றால் எதிர்மறையான விளைவுகள் ஏற்படுமா?

இல்லை, இந்த ஆய்வு செயல்முறை பங்கேற்பாளருக்கு எந்த எதிர்மறையான விளைவுகளையும் ஏற்படுத்தாது. அமர்வைத் தொடர்ந்து ஏதேனும் உணர்ச்சி / உளவியல் விளைவுகள் ஏற்பட்டால், உளவியல் உதவி உறுதி செய்யப்படும்.

நான் பங்கேற்பது கட்டாயமா?

இல்லை. இந்த ஆய்வில் நீங்கள் பங்கேற்பது முற்றிலும் தன்னிச்சையானது மற்றும் இந்த செயல்முறையின் ஒரு பகுதியாக இருக்க நீங்கள் மறுக்கலாம்.

இந்த செயல்முறையுடன் எனக்கு வசதியாக இல்லையென்றால் நான் ஆய்விலிருந்து விலகலாமா?

நீங்கள் இந்த ஆய்வின் ஒரு பகுதியாக இருக்க விரும்புகிறீர்களா என்பதைத் தேர்வுசெய்ய உங்களுக்கு சுதந்திரம் உள்ளது. "இல்லை" என்று சொல்வது, ஆராய்ச்சியாளர் அல்லது நிறுவனத்துடனான உங்கள் உறவை பாதிக்காது. இந்த ஆய்வில் எவ்வித ஆய்வக சோதனைகள் அல்லது எவ்வித ஆக்கிரமிப்பு செயல்முறையும் இல்லை. செயல்பாட்டின் போது உங்களுக்கு ஏதேனும் அசௌகரியம் ஏற்பட்டால், அது மறுசீரமைக்கப்படலாம்.

தரவின் ரகசியத்தன்மையை உறுதி செய்ய முடியுமா?

நீங்கள் கொடுக்கும் தனிப்பட்ட தகவல்கள் ரகசியமாக வைக்கப்படும். ஆராய்ச்சிக் குழுவின் உறுப்பினர்களுக்கு மட்டுமே உங்கள் பெயர் மற்றும் விவரங்கள் தெரியும். ஆய்வின் ஒட்டுமொத்த முடிவுகள் ஆராய்ச்சி இதழ்களில் வெளியிடப்படும். உங்கள் பெயர் எந்த அறிக்கை அல்லது வெளியீட்டிலும் இடம்பெறாது.

ஆராய்ச்சியாளரின் உறுதிமொழி

மேற்கண்ட ஆராய்ச்சியில் பங்கேற்க செல்வி அருணா செ, எம்.பில். மருத்துவ உளவியல் அறிஞர், என்.ஐ.இ.பி.எம்.டி, சென்னை ஆகியோரின் ஒப்புதல் கோரப்படுகிறது. ஆராய்ச்சியின் எந்தப் பகுதியிலும் எந்தக் காரணமும் கூறாமல் ஒப்புதலை மறுக்க அல்லது திரும்பப் பெற உங்களுக்கு உரிமை உண்டு. ஆராய்ச்சி பற்றி உங்களுக்கு ஏதேனும் சந்தேகங்கள் இருந்தால், தயவுசெய்து அதை தெளிவுபடுத்த தயங்காதீர்கள். ஆராய்ச்சியின் போது கூட, நீங்கள் விரும்பினால் விளக்கத்திற்காக ஆராய்ச்சியாளரை (செல்வி அருணா செ) தொடர்பு கொள்ளலாம் (கைபேசி எண்: 9865621405).

நீங்கள் வழங்கும் தகவல்கள் மிகவும் ரகசியமாக வைக்கப்படும்.

ஆராய்ச்சி ஆய்வில் பங்கேற்க ஒப்புதல்

	ஆம்/இல்லை
நான் போதுமான விளக்கத்தைப் பெற்றுள்ளேன் மற்றும் ஆய்வின் தகவல் தாளை தெளிவாகப் புரிந்துகொண்டேன் மற்றும் கேள்விகளைக் கேட்க எனக்கு வாய்ப்பு கிடைத்தது என்பதை நான் உறுதிப்படுத்துகிறேன்.	

எனது பங்கேற்பு தன்னிச்சையானது என்பதையும், எந்தக் காரணத்தையும் கூறாமல் எந்த நேரத்திலும் ஆய்விலிருந்து விலக எனக்கு சுதந்திரம் உண்டு என்பதையும் நான் புரிந்துகொண்டேன்.	
நான் பகிரும் அனைத்து தனிப்பட்ட தகவல்களும் ரகசியமாக வைக்கப்படும் என்பதையும், ஆராய்ச்சி ஆய்வில் ஈடுபட்டுள்ளவர்களைத் தவிர வேறு யாருடனும் பகிர்ந்து கொள்ளப்படாது என்பதையும் நான் புரிந்துகொள்கிறேன்.	

பங்கேற்பாளரின் பெயர்: ஆராய்ச்சியாளரின் பெயர்:

கையொப்பம் தேதியுடன்: கையொப்பம் தேதியுடன்:

Appendix E

SOCIO-DEMOGRAPHIC QUESTIONNAIRE

Name :

Age :

Gender :

Mother’s qualification :

Father’s qualification :

Marital status of parents :

Socioeconomic status :

Place of living :

Domicile Status :

Family type :

No. Of siblings :

Birth order :

Appendix F

DEVELOPMANTAL FACTORS QUESTIONNAIRE

PRENATAL FACTORS

Mother's Age	:
Father's Age	:
Parental consanguinity	: ABSENT/PRESENT
Family history of medical illness	: YES/NO
Family history of mental illness	: YES/NO
Family history of disability	: YES/NO
History of maternal immigration	: ABSENT/PRESENT
History of Abortion/ Miscarriage	: ABSENT/PRESENT
Maternal Hypothyroidism	: ABSENT/PRESENT
Maternal Hypertensive disorder	: ABSENT/PRESENT
Gestational Diabetes	: ABSENT/PRESENT
Maternal Infection	: ABSENT/PRESENT
Maternal Stress	: ABSENT/PRESENT
Fetal Distress	: ABSENT/PRESENT

PERINATAL FACTORS

Pre-term delivery : YES/NO

Immediate Birth Cry : ABSENT/PRESENT

Hypoxia : ABSENT/PRESENT

Meconium Aspiration : ABSENT/PRESENT

POSTNATAL FACTORS

Neonatal Jaundice : ABSENT/PRESENT

Gadget Exposure : YES/NO

Duration of Gadget exposure (In years) :

Appendix G

ASSESSMENT TOOL I

INCLEN Diagnostic Tool for Autism Spectrum Disorder (INDT-ASD)

SECTION A

	Ask	Observe	Encircle the appropriate response		
			Yes	**No**	**Unsure /NA**
SOCIAL INTERACTION					
A1a	i) * ***For children aged less than 4 years:*** Does your child usually enjoy being taken in the lap or hugged? ***For children aged 4 years or more:*** When your child was a baby/toddler, did he/she enjoy being taken in the lap or hugged?	In children below 4 years age: Response to being touched and cuddled by parent: enjoys/ tolerates/ squirms/ stiffens/ gets upset/ Indifferent			
	ii) Does your child usually make eye contact with you or other people? *E.g. While playing, asking for things, talking*	*Quality of eye contact			

	to you.				
	iii) * Does your child usually use various gestures appropriately during social interactions? *E.g. Namaste, Salaam, waving bye-bye, hello, touching feet etc.(At least sometimes spontaneously)*	Use of these gestures in response to your greeting and while departing			
	iv) Does your child usually show appropriate facial expressions according to the situation? *E.g. being happy, sad, afraid etc.*	*Appropriateness of facial expressions while interacting with parents, with you (stranger), while playing, when given toy/favorite food or when scolded.			
A1b	i) * Does your child usually enjoy the company of other children?	Child's interaction with other children			
	ii) * ***For children aged 4 years or more:*** Does your child have friends of his/her age (In school and neighbor-hood) with whom he/she loves to chat, share food or play	Quality of child's interaction with other children of his/her age			

	together?				
	iii) * ***For children aged 4 years or more:*** Does your child play mostly with children who are much older or much younger than him/her?	Quality of child's interaction with other children			
A1c	i) * ***For children aged less than 4 years:*** Does/did your child ever point with his/her index finger to bring your attention to show the things that interest him/her ? *E.g. kite, plane flying in the sky, cow/dog on the road etc.* ***For children aged 4 years or more*:** Does your child usually bring things to show you on his/her own he/she has made painted or new toy/gift?	Observe how the child draws attention toward a toy/object of interest; Look for coordinated pointing			
	ii) * ***For children aged 4 years or more, and are able to speak:*** Does your child talk to you about things he/she likes or has achieved without being asked about them?				
A1d	i) * Does your child usually prefer to play alone and gets irritated/moves away when his/her sibs or other kids try to play with	Quality of play activity in a group of children or with			

	him/her?	siblings			
	ii) * Does your child play games involving turn taking or rule based with other children properly? *E.g. Cricket, Hide and seek/I-spy, Ludo, Stapoo, Ring-a- ring roses etc.*	Quality of child's involvement in rule- based games or games involving taking turns			
	iii) * Does your child usually share his/her happiness with you or come to you for comfort when hurt or upset?	Sharing happiness or distress with the parents			
	iv) * ***For children aged 4 years or more:*** Does your child usually share your happiness or try to comfort you when you are upset / sad?	Sharing of parent's happiness or distress by the child			
COMMUNICATION					
A2a	* Does your child speak normally for his/her age? If the child cannot speak normally: Can he/she communicate with you by using gestures? *E.g. pointing with index finger, nodding/ shaking head for yes/no etc.* ***If the child cannot speak at all AND <u>cannot communicate by appropriate gestures</u>, then only mark as "<u>NO</u>".***	Use of age-appropriate language (words and phrases); Spontaneous use of gestures for communication; *Quality/maturity of pointing			

	If the child cannot speak BUT can communicate by appropriate gestures, then mark as "YES".	(Mature or immature pointing and 'hand over hand' pointing)			
Ask A2b only if child is speaking at 2-3 word sentences level **Ask A2c only if the child is speaking at few words level**					
A2b	i)* Does your child initiate a conversation with you?	Quality of child's conversation with parents or yourself			
	ii)* ***For children aged 4 years or more:*** Can you have conversation with your child during which he/she not only answers your questions, but also adds something new to continue the conversation?	Quality of child's conversation with parents or yourself			
A2c	i) Does your child usually repeat words or phrases regardless of meaning (in part or whole) that he/she has heard? *E.g. If you say "toffee" he will also say "toffee" if you say "come" he will also say "come" and if you ask "what is your name", he/she also says "what is your name".*	*Immediate echolalia (words or phrases)			
	ii) Does he/she incessantly repeat things/T.V serial dialogue regardless of meaning/	* Delayed echolalia			

	context, whatever he/she has heard later on?				
	iii) ***For children aged 4 years or more:*** Does your child usually use "I for me" and "me for you" incorrectly? *E.g., when you ask "do you want milk?" he/she says "yes, you want milk" or "Rohit wants milk" (referring to him self).*	*Pronoun reversal			
	iv) ***For children aged 4 years or more:*** During conversation does your child often speak 'out of context' or irrelevantly?	Out-of-context speech and neologisms			
	v) **** For children aged 6 years or more:*** Does your child understand that somebody is making fun of him/her or can he/she understands jokes?	Child's response to an age-appropriate joke			
A2d	Does your child participate in games like "Pat-a-cake", "Peek-a-boo", "Ring-a-ring rose", "Akkad bakkad bambe po", "Posam paa", "Chal chameli baag mein" and "Totaa ud-maina ud" etc.? OR Does your child play variable imaginative play with toys like For girls:- kitchen set/ dolls/clay or dough	Quality of child's play with toys or other objects Look for any form of variable pretend play			

	For boys:- telephone/ toy gun/motor car? OR Has your child played different games like "ghar-ghar", "teacher-student" (school-school), "chor-police" etc. with other kids interactively				
RESTRICTED INTEREST					
A3a	i)* Does your child have excessive interest in odd things/activities which other children do not have? *E.g., collecting toffee wrappers, polythene bags, piece of string or rope, pulling thread and rubber band etc.*	Any unusual interests i.e. unusual for child's age			
	ii)* Does your child have excessive interest in typical things but the interest is so all encompassing that it interferes his/her activities? (Excluding T.V watching)	Excessive and all-encompassing interest in activities that are typical for other child his/her age			
	iii)* Does your child like lining or stacking objects/toys excessively? (Excluding blocks)	Excessive lining of objects or toys			
A3b	Does your child unreasonably insist on doing things in a particular way and/or become	Child's insistence on any unusual			

	upset if there is any change in the daily routine? *E.g., Taking exactly the same route to the school or market, insisting on food being served in the same pattern or sequence etc.*	routines or rituals			
A3c	i) Does your child keep on repeating any of the followings, like • flapping hands, • hand wringing, • toe-walking, • rocking or spinning, • making unusual finger or hand movements near his/her face?	*Any type of motor stereotypes, unusual finger/hand movements near face			
	ii) * Does your child have inappropriate fascination with movement? *E.g. spinning wheels, opening and closing of doors, electric fan, running water and any other revolving object etc.*	Child's inappropriate fascination with objects in motion			
A3d	Does your child prefer to play with a particular part of a toy/object rather than the whole toy/object? *E.g. wheels of a toy rather than the whole toy*	*Quality of child's play with different toys and objects			

SECTION B

Complete this section (1-5) based on responses from section A and further history taking (6-12)

1. No. of criteria fulfilled in A1 of the section A (Social Interaction) 0 : Less than two 1 : Two or more
2. No. of criteria fulfilled in A2 of the section A (Communication) 0 : Less than two 1 : Two or more
3. No. of criteria fulfilled in A3 of the section A (Restricted Interest) 0 : Less than two 1 : Two or more
4. Interpretation of questionnaire (1 to 3) 0 : **No ASD** (If response to 2 or more of 1 to 3 is "0") 1 : **ASD present** (If response to 1 is "1" and response to either or both of 2 and 3 is "1")

Appendix H

ASSESSMENT TOOL II

Developmental Screening Test (DST)

		Months	Days
	birth cry present		13
	equal bilateral movements		26
	responds to bell		39
	vocalizes sounds*		52
	smiles spontaneously		65
	eyes follow moving objects		78
3 M	head steady		90
	reaches for objects		15
	laughs aloud*		30
	recognizes mother		45
	vocalizes for pleasure / babbles*		60
	carries objects to mouth		75
6 M	rolls over		90
	imitates speech sounds*		23
	sits by self		46
	thumb finger grasp		68
9 M	shows curiosity		90
	says 3 words, ‘dada’, ‘mama’, etc*		23

stands alone……46

follows simple instructions……68

1Y cooperates for dressing……..90

---

many intelligible words*……1…….15

walks, runs well…….....3

indicates wants……4……...……..15

1 ½ Y scribbles spontaneously……..6

---

says sentence of 2 / 3 words……1…….....15

points out objects in pictures……...3

shows body parts.……4……...……..15

2 Y participates in play……..6

---

copies O……..……2

relates experience*……..……4

knows names, uses of common objects……..……6

begin to ask ‘Why’……..……8

takes food by self……..….10

3Y toilet control present……..…12

---

buttons up……2…...……..12

comprehends ‘hunger’, ‘cold’…….....4...……..24

plays co-operatively with children…….....7……...……6

repeats 3 digits.……9……...……..……..18

4Y tells stories…….12

---

define words……2

makes simple drawing…….4

dresses with no supervision…….……...6

describe actions in pictures…….8

gives sensible answers to questions……..10

5Y goes about neighborhood……..12

---

can name primary colors……2……..12

plays games governed by rules……..4……...…….…..24

writes simple words……...…7……..…..6

gains admission to school……..9…….……18

6Y enjoys constructive play……...12

---

adapts to home, school…….....2…….12

tells differences of objects……..4…….24

spells, reads, writes simple words…….…….7……..……..…6

enjoys group play……...9…….18

7Y knows comparative value of coins……..….12

---

combs hair by self……..…3

makes small purchases…….…..6

competition in school/play…….…....9

8Y tells time…….…..12

---

tells day, month, year…….…2

reads on own initiative…….……..4

recognizes property rights…….…….6

favourite of fairy tales……..……..8

muscle coordination games (marbles)…….…….10

9Y bathes self unaided……..…….…….12

---

cooperates keenly with companions…….…..……2…….12

has various hobbies, collections…….…...4……..24

goes about town freely……...……7…..……...……..…....6

sex difference in play become marked…….….9……...……...18

10Y can stay away from home……..…12

---

writes occasional short letters……3

comprehends social situations……...6

physical feats liked…….……9

11Y able to discuss problems……...12

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enjoys books, newspapers, magazines……..…….4

more independent in spending…….……..8

12 Y capable of self criticism……12

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shows foresight, planning, judgment……..2…….……....12

learns from experience……....4…….……24

plays difficult games……7…….……..…6

interested in dressing up……..9……18

13Y understand abstract ideas (Justice)……12

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makes sensible plans for future (job)……..4…….…...24

buys own clothing……...……1 year 2m…….…..…12

systematizes own work……...……1 year 7m…..……..……6

15Y purchase for others……..2 years

Appendix I

ASSESSMENT TOOL III

Indian Scale For Assessment Of Autism (ISAA)

Items	Rarely	Sometimes	Frequently	Mostly	Always
SOCIAL RELATIONSHIPS AND RECIPROCITY					
Has poor eye contact					
Lacks social smile					
Remains aloof					
Does not reach out to others					
Unable to relate to people					
Unable to respond to social/ environment cues					
Engages in solitary and repetitive play activities					
Unable to take turns in social interaction					
Does not maintain peer relationships					
EMOTIONAL RESPONSIVENESS					
Shows inappropriate emotional response					
Shows exaggerated emotions					
Engages in self-stimulating emotions					
Lacks fear of danger					

Excited or agitated for no apparent reason					
SPEECH-LANGUAGE AND COMMUNICATION					
Acquired speech and lost it					
Has difficulty in using non-verbal language or gestures to communicate					
Engages in stereotyped and repetitive use of language					
Engages in echolalic speech					
Produces infantile squeals/ unusual noises					
Unable to initiate or sustain conversation with others					
Uses jargon or meaningless words					
Uses pronoun reversals					
Unable to grasp pragmatics of communication					
BEHAVIOUR PATTERNS					
Engages in stereotyped and repetitive motor mannerisms					
Shows attachment to inanimate objects					
Shows hyperactivity/ restlessness					
Exhibits aggressive behavior					
Throws temper tantrums					
Engages in self-injurious behavior					
Insists on sameness					

SENSORY ASPECTS					
Unusually sensitive to sensory stimuli					
Stares into space for long periods of time					
Has difficulty in tracking objects					
Has unusual vision					
Insensitive to pain					
Responds to objects/ people unusually by smelling, touching or tasting					
COGNITIVE COMPONENT					
Inconsistent attention and concentration					
Shows delay in responding					
Has unusual memory of some kind					
Has ‘savant’ ability					