

Familial, Social and Environmental Risk Factors in Autism: A Case-Control Study

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Abstract

This case-control study was done to identify the correlation between the familial, social and environmental risk factors and autism. This hospital and specialized centre based study done from January 2002 to November, 2004. Thirty two children from the autism group and 14 children from the control group were enrolled. Mean age were 3.75 yrs. and 2.83 yrs. respectively. Significant proportion of children were in the highest birth orders, 68.8% in autism and 78.6% in the control group. Full term children were 96.9% and 92.9% respectively. 53.1% children in the autism and 57.1% in the normal speech delay group were born by cesarean sections. Higher education of parents in autism group was statistically significant ($p < 0.05$). Too much watching TV, inadequate opportunity to mix with peers and inadequate interactive relationship with the family members in the early childhood were significantly ($p = 0.001$) related to the development of autism.

Introduction

Autism and autism spectrum disorders are complex neurodevelopmental disorders characterized by deficits in social interaction and communication, and restricted, repetitive interests and behaviors beginning in infancy and toddler years.^{1,2} It is part of a larger family called the pervasive developmental disorders (PDD). Most recent reviews of epidemiology estimate a prevalence of one to two cases per 1,000 people for autism, and about six per 1,000 for Autism spectrum disorder (ASD)³ because of inadequate data, these numbers may underestimate ASD's true prevalence. ASD averages a 4.3:1 male-to-female ratio.⁴ These disorders range from severe (autism) to mild (Asperger's syndrome), and in total affect some 1 in 150 American children, about three-quarters of whom are boys.⁵ The prevalence of autism is believed to be rising.⁶ Many causes of autism have been proposed, but its theory of causation is still incomplete.⁷ The etiology of autism is unknown, although prenatal exposures have been the focus of epidemiological research for over 40 years.⁸

Recent research has investigated genetics, in-utero insults and brain function as well as neuro-chemical and immunological factors.⁷ However, there is increasing suspicion among researchers that autism does not have a single cause, but is instead a complex disorder with a set of core aspects that have distinct causes.^{9,10} Although these distinct causes have been hypothesized to often co-occur.¹⁰ Etiology is most likely polygenic and that environmental factors may interact with genetic

factors to increase risk.^{11,12} The factors associated with autism risk in the meta-analysis were advanced parental age at birth, maternal prenatal medication use, bleeding, gestational diabetes, being first born vs third or later, and having a mother born abroad.⁸ Both maternal and paternal age was independently associated with autism. Risk of autism increases with increasing maternal and paternal age.^{13,14} Autism has been associated independently with the highest birth order.^{15,16} Psychiatric disorder is more likely among parents of children with autism than parents of control subjects. Schizophrenia was more common in both parents. Depression and personality disorders were more common among case of mothers but not fathers.¹⁷ Also there is association between autism and socio-demographic factors, overall and in subgroups of children with autism with and without mental retardation (Autism/MR and Autism/no MR, respectively). Both markers of higher social class (higher maternal education and higher median family income) were significantly associated with autism/no MR, but not associated with autism/MR.¹⁸

Study shows among perinatal factors the risk of autism was increased for breech presentation, Apgar score ≤ 7 at 5 minutes, and gestation age at birth < 35 weeks, and for children of parents with a history of schizophrenia like psychosis or affective disorder.¹⁹ Autism, like other countries, is increasing in Bangladesh in the last decade. Many children are coming to the hospitals and private chambers with the diagnosis of autism. This study was conducted

to see whether there is any correlation between the familial, social and environmental risk factors and autism.

Materials and Methods

The study was conducted in Dhaka Shishu Hospital and in a Specialized Pediatric Neurology clinic in Dhaka, Bangladesh from mid January 2002 to November, 2004.

Inclusion criteria: Children diagnosed as autism using DSM-IV criteria were taken as cases. Children with speech delay without any neurological disorder were taken as control group.

Exclusion criteria: Any child with autistic character secondary to early onset epilepsy, uncontrolled epilepsy, visual impairment, mental retardation, Tuberos Sclerosis or other neurodegenerative or neuro-metabolic disorder were excluded from the study. Speech delay due to hearing impairment or epilepsy or mental retardation was excluded from control group.

Methods: Preformed questionnaires were used to identify the risk factors. Well trained persons having long experience in this field or the educated parents themselves filled up the questionnaires. Some variables were sub grouped into different categories like much, normal, little and very little. These were explained to the parents elaborately. The working definitions of these categories were as follows:

Very little: If less than ten percent time of a day was spent in the related activity, it was leveled as very little.

Little: If ten to twenty-five percent times of a day was spent in the activity, it was leveled as little.

Normal: If twenty-five to fifty percent times of a day was spent it was categorized as normal.

Much: More than fifty percent time of a day if spent it was leveled as much category.

Data was recorded in SPSS version 12 and analysis was done by chi-square test. P-value <0.05 is taken as significant.

Results

In this study, 32 children from the autism group and 14 children from the control group (children with speech delay without any neurological problem) were enrolled. Male: female ratio was 4.5:1 in autism group and 3.6:1 in the other group. Mean age were 3yr 9 month and 2yr 10 month respectively. Significant proportion of children were in the highest birth orders, 22(68.8%) in autism and 11(78.6%) in the control group. Full term children were 31(96.9%) and 13(92.9%) respectively. Large proportions of children were

born by cesarean section in both groups, 17(53.1%) in the autism and 8(57.1%) in the other group. Both parents were service holder, 27(84.4%) in the autism group and 11(78.6%) in the second group. Eighteen (56.3%) and 10(71.4%) population was from single family respectively.

In autism group, 21(65.6%) mothers had no antenatal problem, 5(15.6%) had minor problem, 3(9.4%) had major problem like hypertension, diabetes, PET etc and another 3(9.4%) had leaking membrane or mild P/V bleeding. Twenty-six (81.3%) children did not have any natal complication, 5(15.6%) had perinatal asphyxia, and 1(3.1%) had minor problem. The postnatal period was uneventful in 27(84.4%) of the autistic children, 2(6.3%) suffered loose motion, 2(6.3%) had severe illness like septicemia or meningitis and 1(3.1%) had respiratory problem. In the later period 6(18.8%) children had febrile seizure and another 6(18.8%) had illness like severe diarrhea, septicemia or meningitis, 1(3.1%) had epilepsy and 1(3.1%) respiratory distress.

On the other hand, in normal speech delay group 9(64.3%) had no maternal problem in the antenatal period, 2(14.3%) had serious illness and another 2(14.3%) had history of leaking membrane or P/V bleeding. 13(92.9%) had no natal complication and 1(3.1%) suffered perinatal asphyxia. 10(71.4%) children were alright in the postnatal period and 2(6.3%) had jaundice.

As family history was elicited it was found that 9(8.1%) of autistic group had history of speech delay in the father's family and 1(3.1%) in mother's family, Two (9.4%) had psychological problem in either mother or father's family. One (3.1%) children had mother with psychiatric illness. In the control group 6(42.9%) had history of speech delay in father's family and 1(7.1%) in mother's family. One (7.1%) had febrile seizure in the father's family. There was no history of psychiatric problem in either family.

In table I, it is shown that parents were significantly highly educated in the autism group than in the normal speech delay group, specially the mothers (87.5% father and 71.9% mother vs 57.1% father and 37% mother). Also the parents in the autism group were much more economically solvent than in the other group rather they were significantly in the lower income group. In this study 14 (43.8%) children were from high income or very high income group in autism group. Whereas 6 (42.3%) were from very lower income status in the normal speech delay group.

In this study, it found that more mothers were not working outside and remained in the house in both

groups. About 27(84.4%) mother in the autistic family and 11(78.6%) mother in the normal speech delay group remained at home. Table II shows 20(62.5%) mother in the autistic and 11(78.6%) in the other group had been taking care of their child herself. Eleven (34.4%) mother in the first group and 3(21.4%) in the second group; 12(37.5%) fathers, in the autism and 10(71.4%) in the normal group used to talk to the child very little while at home. Fourteen (43.8%) children in the autistic group had no opportunity to have others to talk to them at all.

This study (Table III) shows very little interaction was done in 9(28.1%) in the autism and 5(35.7%) in the normal group by the family members. Twenty-three (71.9%) children in the autism group continuously watched TV and on the other hand, 5(35.7%) of the normal group children had no TV at all at home. Fourteen (43.8%) in the autism group had occasional opportunity while 7(50.0%) in the normal group had always the opportunity to mix with peers. There was no opportunity to mix with peers at all in 13(40.6%) of the autistic children and 3(21.4%) of the normal speech delay children.

Table I: Distribution of the population by educational qualification of parents

| | Autism (n-32) | Normal speech delay(n-14) | p-value/ X^2 | Autism (n-32) | Normal speech delay(n-14) | p-value/ X^2 |
|----------------------|---------------|---------------------------|-----------------------|---------------|---------------------------|-----------------------|
| Parameters | Father | Father | | Mother | Mother | |
| No education | 1(3.1%) | 0(0.0%) | 1.0 | 1(3.1%) | 0(0.0%) | 1.0 |
| SSC or below | 3(9.4%) | 1(7.0%) | 1.0 | 3(9.4%) | 7(50.0%) | 0.004* ($X^2 9.45$) |
| HSC | 0(0.0%) | 5(35.5%) | 0.001* ($X^2 0.03$) | 5(15.6%) | 2(14.3%) | 1.0 ($X^2 0.07$) |
| BA/ MA or equivalent | 28(87.5%) | 8(57.5%) | 0.01* ($X^2 6.9$) | 23(71.9%) | 5(35.7%) | 0.04* ($X^2 5.35$) |

*p-value is significant (p<.05)

Table II: Distribution of populations by child rearing practice and speech interaction in the family.

| Characteristics | Autism n(%) | Normal speech delay n(%) | p-value/ X^2 |
|---|-------------|--------------------------|----------------------|
| Who takes care of the child at home | | | |
| Mother | 20(62.5) | 11(78.6) | p-0.33, X^2 1.14 |
| Maid or others | 7(21.9) | 0(0.0) | p-0.08, X^2 3.61 |
| Mother & others | 5(15.6) | 3(21.4) | p-0.68, X^2 0.23 |
| Time spent by mother talking with the child at home | | | |
| Much | 4(12.5) | 0(0.0) | p- 0.92, X^2 1.92 |
| Normal | 17(53.1) | 11(78.6) | p- 0.19, X^2 2.65, |
| Little | 0(0.0) | 0(0.0) | p- 1. |
| Very little | 11(34.4) | 3(21.4) | p- 0.49, X^2 0.77 |
| Time spent by father talking with the child at home | | | |
| Much | 1(3.1) | 0(0.0) | p- 1.0, X^2 0.35 |
| Normal | 18(56.3) | 4(28.6) | p- 0.15, X^2 2.99, |
| Little | 1(3.1) | 0(0.0) | p- 1.0, X^2 0.35 |
| Very little | 12(37.5) | 10(71.4) | p- 0.03*, X^2 4.49 |
| Time spent by others talking with the child at home | | | |
| Much | 2(6.3) | 3(21.4) | p- 0.15, X^2 2.32, |
| Normal | 16(50.0) | 8(57.1) | p- 0.65, X^2 0.20 |
| Little | 0(0.0) | 3(21.4) | p- 0.02*, X^2 7.34 |
| No opportunity | 14(43.8) | 0(0.0) | p-0.003*, X^2 8.80 |

* p-value is very significant

Table III: Distribution of the population by the characteristics of watching television, interaction with others and mixing with peers.

| Characteristics | Autism n(%) | Normal speech delay n(%) | p-value/ X^2 |
|--|-------------|--------------------------|------------------------|
| Time spent in interaction with the child at home | | | |
| Much | 2(6.3) | 1(7.1) | p- 1., X^2 0.01 |
| Normal | 21(65.6) | 8(57.1) | p- 0.58, X^2 0.30 |
| Little | 0(0.0) | 0(0.0) | p-1.0 |
| Very little | 9(28.1) | 5(37.5) | p- 0.73, X^2 0.26 |
| Time spent by the child watching TV at home | | | |
| Most of the time | 23(71.9) | 1(7.1) | p- 0.001*, X^2 16.35 |
| Normal | 6(18.8) | 8(57.1) | p- 0.01*, X^2 6.78 |
| Little | 3(9.4) | 0(0.0) | p- 0.54, X^2 1.40 |
| No TV | 0(0.0) | 5(35.7) | p- 0.001*, X^2 12.82 |
| How much opportunity the child has to mix with the peers | | | |
| Always | 5(15.6) | 7(50.0) | p- 0.02*, X^2 5.79 |
| Occasional | 14(43.8) | 4(28.6) | p- 0.52, X^2 0.94 |
| Little | 0(0.0) | 0(0.0) | p- 1.0 |

* p-value is very significant

Discussion

Studies show that at least some environmental factors are involved in the causation of autism. Significantly more autistics were found to be born of at risk pregnancies (defined as either first, fourth or later born or born to mothers aged 30 or older) than the base population.²⁰ Among the sex involvement boys have a significantly higher incidence of autism than girls: four out of every five people with autism are male.²¹⁻²³ This study also shows that more male children were brought with speech problem than female children. In this study male: female is 3.6:1 in both groups. First born child was comparatively much more affected. In the autism group it was 68% and in the normal speech delay group it was 78%.

Larsson found autism is more in children born <35weeks of gestation.¹⁹ But in this study it was found that around 97% of the children were full term in autism group and about 93% in normal speech delay group. Only 3.1% in autism group and 7.1% in normal group were preterm children. It was also seen that more than half of the children (52% in autism and 57% in normal group) were born by cesarean section; though a large numbers were also born of normal delivery.

This study also showed that parents were highly educated in the autism group than in the normal speech delay group, specially the mothers (87.5% father and 71.9% mother vs 57.1% father and 37% mother). Also the parents in the autism group were much more economically solvent than in the other group rather they were significantly in the lower income group. Fourteen (43.8%) children were from high or very high income group in autism group. Whereas 6(42.3%) were from very lower

income status in the normal speech delay group. Basin and Schendel found that higher social class (higher median family income) was significantly associated with autism overall. Both markers of higher social class (higher maternal education and higher median family income) were significantly associated with autism.^{17,19} Study shows that there is higher overall burden of psychiatric illness in the autistic family.^{18,19,24} This study showed that psychiatric and psychological problem in the parents family were associated risk factors in the autism group but not found in the normal speech delay group.

In this study it was tried to find out if other factors can be related to the development of autism. More mothers were not working outside and remained in the house in both groups despite being highly educated. About 27(84.4%) mother in the autistic family and 11(78.6%) mother in the normal speech delay group were remained at home. 62.5% mother in the autistic and 11(78.6%) in the other group took care of their child herself. 34.4% mother in the first group and 3(21.4%) in the second group; 12(37.5%) father in the autism and 10(71.4%) in the normal group used to talk to the child very little while at home and 14(43.8%) children in the autistic group had no opportunity to have others to talk to them at all. Very little interaction was done in 9(28.1%) in the autism and 5(35.7%) in the normal group by the family members. 71.9% children in the autism group continuously watched TV and on the other hand, 5(35.7%) of the normal group children had no TV at all at home. 43.8% in the autism group had occasional opportunity while 7(50.0%) in the normal group had always the opportunity to mix with peers. There was no opportunity to mix with peers at all in 13(40.6%) of the autistic children and 3(21.4%) of the normal speech delay children.

Conclusion: Higher parental education (Higher social class), too much watching TV, inadequate opportunity to mix with peers and inadequate interactive relationship with the family members in the early developmental childhood, when speech develops, were found to be related to the development of autism. Further study should be done to see the relationship between the qualitative interaction with the children in the early childhood and the development of autism as it is the interactive behavior with the child in the early childhood which is essential for the normal development of speech and communication, socialization and behavior. This may be independent of relationship of the care taker with the child in the family, the number of the family members or family income or educational level.

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