

# Autistic traits in the offspring of schizophrenic patients: a cross-sectional study

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## Background

Recent research shows that for every kid who receives an actual autism diagnosis, there is another who has autistic traits including repetitive behaviors and communication problems.

## Aim

The aim of this study was to detect the existence of autistic traits among offspring of schizophrenic patients in the age group from 4 to 11 years, and its association with the sociodemographic data.

## Patients and methods

Sixty-three offspring of schizophrenic patients (who were diagnosed using DSM-IV) from 4 to 11 years of age (based on a pilot study) were selected using a systematic random sampling technique. The Autism Spectrum Quotient-Children's version (AQ-Child) questionnaire was applied and medical, neurological history and examination, and psychological assessment were carried out for each child.

## Results

According to the AQ-Child, the normal insignificant score of autistic traits ranges from 0 to 45 and no child lied in this category. About 55.6 % of the children scored below the cutoff point (46–75) and 44.4% of the children scored above the cutoff point (76).

## Conclusion

The frequency of autistic traits was markedly high in the children of schizophrenic patients. No statistically significant difference was found between above and below AQ score groups as regards sociodemographic and clinical factors, except for socioeconomic status.

## Keywords:

autistic traits, income, offspring, parents, schizophrenia, sociodemographic

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## Introduction

Autism is a neurodevelopmental disorder represented by impaired social interaction, verbal and nonverbal communication, and repetitive and restricted behavior. The signs are usually noticed by parents in the initial 2 years of their child's life leading to clinically significant functional impedance. A sample of the symptoms includes stereotyped and repetitive use of language or idiosyncratic language, lack of social or emotional interactions, and persistent preoccupation with unusual objects. Intellectual disability, Rett syndrome, or global developmental delay should be excluded (American Psychiatric Association, 2013).

Autistic-like traits (ALTs) are constantly distributed in the general population with the autism spectrum disorder (ASD) at the upper extreme end. It has been shown that ALTs and clinical ASD are etiologically related (Lundström *et al.*, 2012).

Caution should be exercised when using any cutoff score of autistic traits to indicate the diagnosis of ASD, because diagnosis is not reliant on an absolute score but

on whether the traits cause impairments in everyday functioning (World Health Organization, 1994).

Schizophrenia and ASDs are currently considered as distinctive and scarcely overlapping (American Psychiatric Association, 1994).

Historically, ASD was often viewed as childhood schizophrenia because the impaired social interactions and bizarre behavior found in ASD were symptoms of schizophrenia (Rutter, 1972).

It was found that schizophrenia in the parents was a significant risk factor for ASD in siblings, and the exposure to schizophrenia in siblings also represents a significant risk factor for ASD. In other words, the likelihood of ASD was 2.9-fold higher with a parental history of schizophrenia in both the Stockholm County

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cohort and a Swedish national cohort (Sullivan *et al.*, 2012).

Therefore, we aimed to assess autistic traits among the offspring of schizophrenic patients using the Autism Spectrum Quotient-Children's version (AQ-Child) questionnaire and its association with the socio-demographic data.

### Patients and methods

A cross-sectional study was performed from May 2014 to December 2015 in the Psychiatric Department of Zagazig University Hospitals, Zagazig City, Sharkia Governorate, Egypt.

The sample was selected randomly from the offspring of schizophrenic patients attending to the outpatient clinic or admitted in psychiatric department. All participants were screened to determine eligibility for participation in the study according to the specified inclusion and exclusion criteria. A pilot study was performed by applying AQ-Child to 16 children of schizophrenia patients within the age group of 4–11 years. Seven children scored above the cutoff point (76); therefore, the prevalence of autistic traits was calculated to be 42%, and as the rate of both inpatient and outpatient schizophrenic patients in this location was 70 patients per year, the sample size was estimated to be 63 children (first-degree relatives of schizophrenic patients).

#### Inclusion criteria

Offspring of schizophrenic patients in outpatient clinic or admitted in the psychiatric department, of both sexes, from 4 to 11 years of age, who had only one parent with schizophrenia.

#### Exclusion criteria

Offspring out of the determined age group, with psychiatric disorders or mental retardation, any organic disorder affecting mentality, or whose both parents were schizophrenic were excluded.

The healthy spouse were asked to fill a semistructured questionnaire designed to collect the following: sociodemographic data of the child and his or her family (child's name, age, sex, residence, education, social class, age of the parents, the occupation of the parents, and their education), medical, neurological, and psychiatric history, history of schizophrenia in one of the parents of the child (duration of the illness, compliance on treatment, and the subtype of the schizophrenia); schizophrenia was diagnosed according to the DSM IV criteria.

Medical and neurological examination was performed to exclude any neurological and metabolic disorders and head trauma.

Before applying the AQ-Child questionnaire on the children of the schizophrenic parents, mental retardation was excluded by applying the Stanford-Binet Intelligence scale, fifth edition (Roid, 2003).

The AQ-Child is a 50-item questionnaire reported by the parents; it was developed to find out the autistic traits in children, with age ranging from 4 to 11 years. Items were formulated to produce a nearly equivalent agree/disagree response to avert bias in response. It is composed of a series of descriptive statements designed to assess five areas associated with autism and the wider phenotype: social abilities (items 1, 11, 13, 15, 22, 36, 44, 45, 47, and 48), attention switching (items 2, 4, 10, 16, 25, 32, 34, 37, 43, and 46), imagination (items 3, 8, 14, 20, 21, 24, 40, 41, 42, and 50), details attention (items 5, 6, 9, 12, 19, 23, 28, 29, 30, and 49), and communication (items 7, 17, 18, 26, 27, 31, 33, 35, 38, and 39); each of these areas is represented by ten items. Higher scores are compatible with more 'autistic-like' behavior (Auyeung *et al.*, 2008).

In the scoring system of Baron-Cohen *et al.* (2001), items are scored as 1 for a response in the 'autistic' direction and 0 for a 'nonautistic' response. The responding scale in our study relied on the scoring scheme utilized in latest studies of the AQ-Adult (Hoekstra *et al.*, 2007), in which the response scale is considered as a four-point Likert scale. Parents rated to what extent they agree or disagree with the information about their children with the following response categories: 0 representing definitely agree, 1 representing slightly agree, 2 representing slightly disagree, and 3 representing definitely disagree. These items were reverse scored as necessary. This approach was utilized as it was felt that the extent of endorsement of each item contained additional information and was therefore preserved. Total AQ scores were represented by summation of each item score. The minimum AQ score (0) denotes absence of autistic traits; the maximum score (150) proposes full presence of all autistic items (Auyeung *et al.*, 2008).

A score of 76 presented both high sensitivity (95%) and high specificity (95%). With a cutoff of 76, fewer than 2% of control girls and 7% of control boys scored at or over the Autism spectrum conditions (ASC) cutoff, whereas 95% of children with Asperger syndrome (AS)/ High-functioning autism (HFA) and 95% of

children with autism scored at or over this cutoff (Auyeung *et al.*, 2008). However, caution should be practiced when utilizing any cutoff to denote diagnosis because the diagnosis does not depend on an absolute score but on impairments that the traits lead to in their daily functioning (American Psychiatric Association, 1994).

If the resulting AQ score was at or above 76 then follow-up with a medical practitioner (psychiatrist) is needed to perform further tests in order to confirm the diagnosis of ASD or Asperger's syndrome (Justine, 2013).

In this study, the AQ-Child was translated into Arabic by a certified translation center (CITA: Italian Center for Translation). Thereafter, it was retranslated to English by another certified expert, and a comparison was made between this English version and the original (English) AQ-Child's version. Cronbach's  $\alpha$  coefficients were calculated and it was high ( $\alpha=0.8$ ).

The AQ-Child Arabic version was validated by three professors of psychiatry (face validity). After that, the total score of the Arabic version of the AQ-Child was compared with each part of it to test the internal consistency.

### Statistical analysis

The collected data were computerized and statistically analyzed using SPSS program version 18.0, Chicago: SPSS Inc. Qualitative data were inspected as frequencies and relative percentages. The  $\chi^2$ -test was utilized to estimate the difference between qualitative variables in different groups. Quantitative data were expressed as mean $\pm$ SD. Independent *T*-test was utilized to estimate the difference between quantitative variables in two groups in normally distributed data. *P* less than 0.05 was regarded statistically significant, *P* value less than 0.005 was regarded highly significant, and *P* value of at least 0.05 was considered nonsignificant.

## Results

Our study included 63 children of 26 families in which one parent was schizophrenic patient; 69.2% of them had insufficient income. The mean age of the children was 8.8 years; 50.8% of them were male, and most of them (49.2%) were in primary school. The majority of schizophrenic fathers (73.1%) were uneducated and (79.3%) were not working, with a mean age of 45.72 years. As regards schizophrenic mothers, most of them (65.4%) were uneducated and none of them were working, with a mean age of 38.32 years (Table 1).

**Table 1 The sociodemographic data**

Variables	N (%) (N=63)
Age of the children [mean $\pm$ SD (range)] (years)	8.8 $\pm$ 3.2 (4–11)
Age [mean $\pm$ SD (range)] (years)	
Schizophrenic fathers	45.72 $\pm$ 8.57 (24–63)
Schizophrenic mothers	38.32 $\pm$ 7.01 (24–50)
Sex of the children	
Male	32 (50.8)
Female	31 (49.2)
Education of the children	
Uneducated	20 (31.7)
KJ	6 (9.5)
Primary school	31 (49.2)
Preparatory school	6 (9.5)
Fathers' education	
Uneducated	19 (73.1)
Educated	7 (26.9)
Mothers' education	
Uneducated	17 (65.4)
Educated	9 (34.6)
Occupation of the fathers	
Not working	11 (42.3)
Working	15 (57.7)
Occupation of the mothers	
Housewife	25 (96.2)
Working	1 (3.8)
Income of the family	
Insufficient	18 (69.2)
Sufficient	8 (30.8)
Socioeconomic status of the family	
Low	21 (80.8)
Moderate	5 (19.2)

KJ, kids junction preschool.

The mean duration of illness of schizophrenic parents was 10.8 years. Most of them were noncompliant on treatment (84.6%), without a family history of psychiatric disorder (53.8%), with negative consanguinity (84.6%), and undifferentiated type (76.9%) (Table 2).

According to the AQ-Child, the normal insignificant score of autistic traits lies from 0 to 45 and no children were in this category; 55.6 % of the children scored between 46 and 75 (below the cutoff point), and 44.4 % of the children scored above the cutoff point (76) (Table 3).

Most of the children with higher AQ scores had uneducated fathers (78.6%), uneducated mothers (67.9%), and nonworking mothers (96.4%), with 57.1% (16 from 28) of their parents with age ranging from 40 to 59 years and with a mean age of their schizophrenia parents (43.18 years) higher than those with children with low AQ score (40.57 years) but with no statistically significant difference (Table 4). The relation between the AQ-Child questionnaire and

**Table 2 The clinical data of the schizophrenic parents**

Variables	N (%) (N=26)
Duration of illness [mean±SD (range)] (years)	10.8±5.3 (1–21)
Schizophrenic parent	
Mothers	14 (53.8)
Fathers	12 (46.2)
Compliance	
Noncompliant	22 (84.6)
Compliant	4 (15.4)
Subtype of schizophrenia	
Undifferentiated	20 (76.9)
Paranoid	2 (7.7)
Disorganized	4 (15.4)
Consanguinity	
Negative	22 (84.6)
Positive	4 (15.4)
Family history	
Negative	14 (53.8)
Positive	12 (46.2)

**Table 3 The score of autistic traits of the children of schizophrenic patients on the Autism Spectrum Quotient-Children's version questionnaire**

Variables	N (%) (N=63)
AQ-Child score	
Above the cutoff point (76)	28 (44.4)
Below the cutoff point (76)	
46–75	35 (55.6)
0–45	0

AQ-Child, Autism Spectrum Quotient-Children's version.

schizophrenia in the mothers or the fathers (duration of illness, subtype, and compliance on treatment), consanguinity, and family history of psychiatric illness of the parents were statistically nonsignificant except for income, where insufficient income increases the risk for autistic traits among offspring of schizophrenic patients (Table 5).

## Discussion

Several studies focused on the psychiatric disorders found in children who have a schizophrenic parent, whereas few studies included autism in these psychiatric disorders. Meanwhile, our study focused on the prevalence of autistic traits among children of schizophrenic parents, and thus our study is considered novel in Egypt.

In our study, we found that the prevalence of autistic traits among the children of schizophrenic parents is 44.4%, who scored above the cutoff point on the AQ-Child questionnaire. Posserud *et al.* (2006) estimated that the frequency of children with high scores above the cutoff point on the ASSQ was about 2.7% in the general population of children 7–9 years of age, indicating

that autistic traits in children of schizophrenic parents were high and severe compared with that found in the general population, and this reveals the strong genetic influence of schizophrenic parents on the high score of autistic traits in their children.

Daniels *et al.* (2008) support our results; they reported that schizophrenia among both the mothers and the fathers was associated with autism in their children.

Moreover, Larsson *et al.* (2005) studied the relation between psychiatric history of the parents, and the autism risk in their children and detected a markedly increased risk for autism in the children of parents with a psychiatric history of psychosis or mood disorder.

Sullivan *et al.* (2012) found in a Swedish and a Stockholm County cohort study that the presence of schizophrenia in parents was accompanied with an increased risk for ASD; it was approximately three times higher in those whose parents suffered from schizophrenia. Bipolar disorder revealed a pattern of associations similar to that of schizophrenia but of lesser degree.

## Sex

In this study, there was no statistically significant relation between the severity of autistic traits and the sex of the child. In agreement with our study, Mandic-Maravic *et al.* (2015) found that there were no sex differences in autistic symptoms, but female patients showed better functioning in daily living skills, without reaching a statistically significant difference ( $P=0.062$ ). Moreover, Reinhardt *et al.* (2015) did not find any significant differences between male and female patients in the ASD group on assessing autism symptoms and adaptive functioning.

In addition, the study by Larsson *et al.* (2005) found out that the risk for ASD outcome in a child with a parent with psychiatric disorder (including schizophrenia) was not correlated to the sex of the child. Moreover, in agreement with our study, Holtmann *et al.* (2007) found that there was no sex difference in the autistic symptom severity.

In contrast, Ruzich *et al.* (2015a) reported in their study a moderate effect of sex on AQ, with male patients scoring higher than female patients by an average of 2.5 points. Moreover, Ruzich *et al.* (2015b) in their study on measuring autistic traits in the general population found that male patients scored significantly higher compared with female patients on the AQ in the nonclinical sample. However, there was no significant

**Table 4 Relation between the sociodemographic data of the children and their score on the Autism Spectrum Quotient-Children's version questionnaire**

Sociodemographic data	AQ-Child score		$\chi^2$	P
	<76 [N (%)]	>76 [N (%)]		
Child sex				
Male	19 (59.4)	13 (40.6)	0.384	0.535
Female	16 (51.6)	15 (48.4)		
Child education			6.285	0.099
Uneducated	9 (45.5)	11 (55.5)		
Kindergarten	2 (33.3)	4 (66.7)		
Primary	22 (71.0)	9 (29.0)		
Preparatory	2 (33.3)	4 (66.7)		
Fathers' education			0.02	0.89
Uneducated	27 (77.1)	22 (78.6)		
Educated	8 (22.9)	6 (21.4)		
Mothers' education			2.36	0.12
Uneducated	17 (48.6)	19 (67.9)		
Educated	18 (51.4)	9 (32.1)		
	Children [N (%)]	Children [N (%)]	$\chi^2$	P
Father's occupation			0.05	0.82
Not working	16 (45.7)	12 (42.9)		
Working	19 (54.3)	16 (57.1)		
Mother's occupation			0.32	0.5
Not working	34 (97.1)	27 (96.4)		
Working	1 (2.9)	1 (3.6)		
Schizophrenic parents			0.319	0.572
Father	15 (51.7)	14 (48.3)		
Mother	20 (58.8)	14 (41.2)		
Age of schizophrenic parents (years)			2.618	0.27
20–39	16 (66.7)	8 (33.3)		
40–59	17 (51.5)	16 (48.5)		
≥60	2 (33.3)	4 (66.7)		
	Mean±SD (range)	Mean±SD (range)	t	P
Father's age	44.3±8.9 (24–62)	47.5±10.3 (24–63)	1.31	0.18
Mother's age	38.8±7.0 (25–50)	39.2±8.02 (24–50)	0.46	0.85
Age of schizophrenic parents	40.57±7.617	43.18±9.549	1.239	0.232

statistical difference between male and female patients in the clinical sample. This study was applied to adult male and female patients with no psychiatric history in first-degree relatives. Allison *et al.* (2008) stated that there was a significant sex difference, with boys scoring higher than girls on the quantitative version of the Checklist for Autism in Toddlers. This finding is consistent with a number of previous screening instruments: male patients scored higher on the Childhood Autism Spectrum Test (CAST) (Williams *et al.*, 2008), the Social Reciprocity Scale (Constantino *et al.*, 2003), and on the child, adolescent, and adult versions of the AQ, a screening instrument for high-functioning autism or AS in adolescents or adults of average IQ or above (Dworzynski *et al.*, 2012). Another study revealed a higher prevalence of ASC in male patients (Chakrabarti and Fombonne, 2005). Boys are four times more likely to have ASD according to many sources and are clearly more likely to suffer from these

types of symptoms (Rutter, 2005). The previous results are contradictory to our study, but may be this is because of sampling and methodological differences, in addition to the absence of a family history of psychiatric disorders in the selected probands.

A study by Dworzynski *et al.* (2012) revealed that, in the absence of additional intellectual or behavioral problems, girls are less likely compared with boys to fulfill the diagnostic criteria for ASD at equivalently high levels of ALTs. Moreover, Holtmann *et al.* (2007) reported that parent reports revealed significantly more symptoms in female patients than in male patients, particularly social problems, attention problems, and thought problems.

**Age of schizophrenic parent**

In this study, there was no significant statistical relation between the severity or the incidence of autistic traits in

**Table 5** The relationship between the clinical data and the Autism Spectrum Quotient-Child score of their children

Variables	AQ-Child score		t	P
	<76	>76		
Duration of illness [mean±SD (range)]	10.66±5.3 (1–20)	11.04±4.7 (5–21)	0.57	0.768
	Children [N (%)]	Children [N (%)]	$\chi^2$	P
Compliance on treatment				
Noncompliant	32 (91.4)	24 (85.7)	0.1	0.75
Compliant	3 (8.6)	4 (14.3)		
Subtype of schizophrenia				
Undifferentiated	26 (74.3)	20 (71.4)	1.51	0.47
Paranoid	2 (5.7)	4 (14.3)		
Disorganized	7 (20)	4 (14.3)		
Consanguinity				
Negative	30 (85.7)	24 (85.7)	0.13	0.7
Positive	5 (14.3)	4 (14.3)		
Family history				
Negative	19 (54.3)	13 (46.4)	0.38	0.53
Positive	16 (45.7)	15 (53.6)		
Income				
Insufficient	15 (44.1)	19 (55.9)	3.914	0.048*
Sufficient	20 (69.0)	9 (31.0.6)		

\*Significant difference.

the children and the age of the schizophrenic parent. In agreement with our study, Larsson *et al.* (2005) stated that no statistically significant association between risk for autism in the offspring and parental age was found. Moreover, a large case-control study from Sweden reported between the ages of the parents was not associated with an increased risk for autism after adjusting for parental history of psychiatric disorder and other prenatal factors (Hultman *et al.*, 2002). Zhang *et al.* (2010) found that there was no statistically significant association between maternal age and the development of autism.

In contrast to our results, many studies in different countries like Denmark (Lauritsen *et al.*, 2005), Iran (Sasanfar *et al.*, 2010), China (Zhang *et al.*, 2010), and Sweden (Hultman *et al.*, 2011) found that high paternal age ( $\geq 40$  years) was associated with six-fold increase in autism in their offspring.

Moreover, Sandin *et al.* (2012) stated that advanced age of both mothers and fathers is associated with an increased risk for autism in their offspring. Sandin *et al.* (2016) stated that there is a positive correlation between paternal and maternal age and the incidence of autism in their offspring and a positive correlation between gaps between two parents' ages and incidence of autism in their offspring.

Yang *et al.* (2015) showed the negative association between maternal age at delivery and the risk for autism. Moreover, Croen *et al.* (2002) and Golding

*et al.* (2010) showed that the risk for autism increased with the increase in maternal age.

This discrepancy with our results may be because of sampling and methodological differences, in addition to the absence of psychiatric illness (schizophrenia) in the parents of those autistic children in these studies; moreover, we studied autistic traits and not autism.

#### Socioeconomic status

In our study, there was no statistically significant difference as regards the relation between the severity of autistic traits in the children and the socioeconomic status of the schizophrenic parent, where schizophrenic parents with insufficient income were associated with an increased risk of having children with a high score of autistic traits.

In agreement with our study, Rai *et al.* (2012) stated that lower socioeconomic status was associated with an increased risk for ASD.

However, Russell *et al.* (2011) stated that maternal socioeconomic class did not significantly predict a child to either having an ASD diagnosis or displaying severe autistic traits. Larsson *et al.* (2005) in the unadjusted analyses of their study stated that less parental wealth did not represent a risk factor for autism.

This is contradictory to the results of our study as the parents in our study had a serious mental illness unlike

those in the mentioned study who did not suffer from any mental illness.

#### **Education and occupation of the parents**

In our study, there was no statistically significant difference as regards the relationship between the severity of autistic traits in the children and the education and the occupation of their parents. In concordance with our result, Larsson *et al.* (2005) mentioned in their study that no statistically significant association was found between autism and maternal education. Both Rai *et al.* (2012) and Yang *et al.* (2015) stated that there were no important relationships between the risk for ASD in the children and parental education. Moreover, Delobel-Ayoub *et al.* (2015) stated in their study that, as regards ASD without associated intellectual disability, the prevalence was not associated with education or occupation of the parents. These results are in agreement with the results of our study.

In contrast with our study, other studies mentioned that children of parents with manual occupations were at higher risk for ASD (Rai *et al.*, 2012), and that mothers with lower level of education tended to have children with a higher risk for ASD (Rai *et al.*, 2012; Yang *et al.*, 2015).

Fujiwara (2014) found that the rate of suspected autism was much higher for toddlers of less-educated mothers.

This contrast may be because of the different study population, sample size, or cultural differences.

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#### **Conclusion**

Our study revealed that there was significant increase in the prevalence and severity of autistic traits among children of schizophrenic parents compared with the same prevalence detected by studies on children of general population. No statistically significant difference was found between above and below AQ score groups as regards sociodemographic and clinical factors except for socioeconomic status.

#### **Limitations**

- (1) The small sample size; as our study is considered a new one in Egypt, our sample size was based on a pilot study.
- (2) Data taken through the AQ questionnaire were obtained through the parents, but no additional reports could be obtained from teachers.

- (3) Overall, 69.2% of the parents involved in our study had insufficient income, 80.8% of them were of low socioeconomic status, and 19.2 % were of moderate socioeconomic status. There were no parents with high socioeconomic status involved; 73.1 % of the fathers were uneducated and 65.4% of the mothers were uneducated, and all the educated percentage of the assessed children belong to governmental schools. All this adds a limitation to our study as this impairs the assessment of autistic traits in highly educated children with highly educated, working parents with high socioeconomic status, and thus makes our study nonrepresentative to our community.
- (4) Because of the poor educational level of the parents involved, the items mentioned in the AQ-Child version was too hard for them to understand, especially the items concerned with the imagination of the child, and hence they could not fill them by themselves; the clinical interviewer had to fully explain each question in the questionnaire, and this was highly time consuming.
- (5) Lack of the control group of children of healthy nonparents without any history of psychiatric disorders.

#### **Recommendation**

Follow-up of children, especially those with high scores of autistic traits for child abuse, may be targeted in future study.

Moreover, screening for other psychiatric comorbidities that may be associated with severe autistic traits is recommended.

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#### **Conflicts of interest**

There are no conflicts of interest.

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