# Two years' outcome of autism in a sample of Egyptian and Saudi children: a comparative prospective naturalistic study

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**Background**

Previous studies have shown marked variability in the outcome of autistic children and have reported different prognostic factors related to this issue.

**Aim**

The current study was carried out to (a) examine and compare the outcome of autism in a sample of Egyptian and Saudi patients from a comprehensive point of view over a period of 2 years and (b) identify factors and prognostic variables related to outcome.

**Methods**

The study included 48 children with autism. They were recruited from the Institute of Psychiatry, Ain Shams University, Cairo, Egypt, and the Al-Amal complex for Mental Health, Dammam, Kingdom of Saudi Arabia. The diagnosis was made according to *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. The sample included 20 Egyptian and 28 Saudi patients. They were assessed at baseline and at follow-up after 2 years. Assessment included clinical assessment, the Clinical Global Impression – Improvement Scale, the Childhood Autism Rating Scale, the Gilliam Autism Rating Scale, the Vineland Adaptive Behavioral Scale, and the Stanford Binet intelligence quotient test.

**Results**

Good outcome among the entire sample was significantly correlated with higher age of noticing abnormality, higher intelligence quotient, mild severity of autism, fairly high scores on the Vineland scale, and low stereotypy scores. There was a tendency toward a better outcome in the Egyptian group compared with the Saudi group. However, this tendency was not statistically significant. In the Egyptian group, there was a significant decrease in Gilliam subscales scores, indicating improvement in autism level, with no significant improvement in Vineland subscales. In the Saudi group, there was an improvement in the Gilliam stereotype subscale and worsening in the Vineland total and subscales. Good outcome among the entire sample was also significantly associated with having atypical autism, absence of seizures, or regression; normal milestones of development, high parental concern, having normal electroencephalography, taking no drugs or being stable on one drug therapy, early behavioral intervention, receiving phoniatric therapy, and improvement of more than two core deficits in response to drug therapy.

**Conclusion**

The outcome of autism appears to be related to certain influential factors such as the severity of autism, familial and clinical factors, perinatal and developmental factors as well as method of dealing and intervening with autism. Specifically, initial severity of autism, parental concern, and early intervention with behavioral approaches appear to be the strongest predictors of the outcome of autism.

**Keywords:**
autism, egyptian, outcome, saudi

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## Introduction

Autism is a serious developmental disorder with onset in early childhood. Autism is increasingly being identified over the past 20 years. It is an important cause of social disability and is reported more often from the developed world than from the developing countries. Children with autism present unique challenges related to communication, behavior, and social skills [1].

There are an increasing number of individuals who have received a diagnosis of autism spectrum disorders over the past decade [2]. However, the outcome of autism varies considerably between them. In clinical practice, clinicians sometimes observe that toddlers receiving little therapy make marked progress whereas others receiving intensive therapy make less progress [3].

Western outcome studies have earlier investigated the future of autism, but with highly controversial results. In 1970, Rutter [4] reported that only 1.5% of autistic children had achieved normal functioning and about 35% showed fair or good adjustment. These children required some degree of supervision, experienced some difficulties

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with people, had no personal friends, and showed minor oddities of behavior, whereas the majority (>60%) remained severely handicapped and were living in hospitals for mentally retarded or psychotic individuals or in other protective settings. Nineteen years later, Szatmari *et al.* [5] reported that the majority of autistic children were functioning poorly in terms of occupational-social outcome and psychiatric symptoms, and that a surprising number had a very good outcome and might be considered recovered.

Research studies have attempted to determine prognostic factors that can help to predict the outcome of this mysterious group of heterogeneous disorders. Szatmari *et al.* [5] reported that the severity of early autistic behavior was a poor predictor of outcome. Other studies found that behavioral treatment was the hallmark of an effective intervention for autism when compared with pharmacologic treatment [6]. One of the important factors also reported is early identification of autism spectrum disorders, shown to improve the child's benefit from different interventional programs [1].

Outcome studies on autism from Arab countries are exclusively scarce. Cultural factors play an important role in shaping some dimensions of the illness behavior with respect to symptom recognition and response to illness. Although Arab citizens share the broad cultural characteristics in terms of their Arabic language and common Islamic religious backgrounds, they still differ in their values, beliefs, customs, social relationships, and economic burdens. Different cultures may have different opinions about the appropriate intervention and treatment of children with disabilities. Each Arab country has its distinct character, with living and nutritional habits that could be protective or could act as risk factors. In general, Arab cultures are characterized by a high rate of marriages among cousins, high support for nuclear families by their extended families, and consequently high tolerance rate for taking care of mentally ill individuals, especially children. Arabic cultures and families are more tolerant to behaviors in children that would be seen by western societies as 'abnormal'. However, any claims remain speculative as little or no research has been carried out as yet to investigate the effects of culture on autism [7].

In a previous cross-sectional comparative transcultural study [8], the authors of the current study investigated two samples of patients with autistic spectrum disorder (ASD) and their caregivers from Egypt and Saudi Arabia for the impact of culture on some dimensions of the illness behavior in addition to clinical, familial, developmental, and interventional profiles in both countries. It was found that both groups did not differ significantly in the symptomatology of autism. Delayed language development was significantly higher in the Egyptian group whereas delay in all developmental milestones was more significant in the Saudi group. The age of noticing abnormality was younger in the Saudi group, whereas the age at diagnosis and at the commencement of intervention was lower in the Egyptian group. The Saudi group showed a higher percentage of missing examinations, older birth order, and significantly higher preference to drug treatment, whereas the Egyptian group showed a high preference for behavioral and phoniatric therapies, higher paternal and maternal education, higher employment among parents, and higher family concern. The authors argued that this difference in illness behavior is attributable to culture. In this context, the current study was carried out on the same two samples in order to investigate and provide new data on the outcome of autism from the two Arab cultures: Egypt and Saudi Arabia. In addition, the current work attempted to provide profiles and factors explaining different possible outcomes if found.

## Aim of the work

This work was carried out to (a) examine and compare the outcome of autism in a sample of Egyptian and Saudi patients from a comprehensive point of view, clinical, developmental, and adaptive functioning, over a period of 2 years and (b) identify the factors related to outcome and prognostic variables such as intelligence quotient (IQ), comorbid psychiatric conditions, prenatal factors, developmental, familial and parental factors, investigations, and treatment programs (pharmacological and/or behavioral therapies).

## Methods

### Design and site of the study

The current study was a prospective longitudinal naturalistic study that was initiated in August 2007 and continued until July 2009. Two groups of autistic children matched for age, sex, IQ, and severity of autism were recruited from the child psychiatry clinics in two large centers with large catchment areas, namely, the Institute of Psychiatry, Ain Shams university hospitals in Cairo, Egypt, and the Al-Amal complex for mental health, Dammam, Kingdom of Saudi Arabia. Inclusion criteria were children with typical or atypical autism whether newly diagnosed or being regularly followed up. Also, those with comorbidities for example mental retardation and/or epilepsy, were included. Children with Rett's disorder or childhood disintegrative disorder and those with irregular follow-ups or were lost to follow-up were excluded.

A list of autistic patients in the year before was prepared in the two centers including about 150 patients from the Egypt and 100 from Saudi Arabia. On the basis of the inclusion and exclusion criteria, there were about 70 children from Egypt and 60 children from Saudi Arabia who matched in terms of age, sex, and IQ. From these 130 patients selected, 80 agreed to participate and provided an informed consent. An initial assessment was performed but 32 patients were lost to follow-up after 2 years and were thus excluded from the study. The reason for dropout was mostly living far from the hospital and having to travel a long distance to receive treatment. We finally had 48 patients: 20 Egyptians and 28 Saudis. Of the total 48 patients, 33 had been diagnosed previously with ASD and were being regularly followed up in both clinics whereas 15 patients had been newly diagnosed at the time of enrollment in the study. The final groups of Egyptian and Saudi patients still matched in terms of age, sex, and IQ. The study was approved by the ethical and scientific committees of the Institute of Psychiatry, Ain Shams University, and the Al-Amal Complex for Mental Health.

### Procedure and tools

All patients were diagnosed according to the *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. (DSM-IV) diagnostic criteria for autism [9]. A comprehensive approach for the assessment of autistic children was used twice: baseline assessment on entry into the study included (a) clinical assessment sheet for symptoms of autism and associated symptoms such as hyperactivity, regression, seizures, and comorbid psychiatric conditions, (b) assessment sheet for family factors (parents education and work, patient education, family history of related disorders, and family concern for autism), (c) assessment sheet for perinatal and developmental factors, (d) sheet for detailed intervention and management (investigations, modality of treatment: drug, behavioral therapy, and others), (e) clinical assessment for severity of autism using the Arabic version of the Childhood Autism Rating Scale (CARS) [10,11], (f) the Arabic version of the Gilliam Autism Rating Scale (GARS) [12,13], (g) psychometric assessment for IQ, using the Arabic version of Stanford Binet version IV [14], and (h) the Vineland Adaptive Behavioral Scale (VABS) [15,16]. At the end of the assessment, families were contacted 2 years after their initial assessment and patients were assessed using (a) CARS, (b) VABS, (c) GARS, and finally (d) the Clinical global Impression – Improvement Scale (CGI-I) to assess the overall improvement [17]. Throughout the 2 years, clinical assessment for improvement was additionally ongoing during regular follow-up visits.

CARS [10] consists of 15 areas representing different domains of child autistic behavior. The last item is a global rating of autism. Ratings are performed on a four-point scale (normal to severely abnormal). Individuals are designated as not autistic to severely autistic depending on the total score and the number of items scored as severely abnormal.

GARS [12] is a psychometric diagnosis and baseline assessment of the severity of autistic features for ages 3–22 years. It consists of 56 items, subdivided into four subscales: communication, social interaction, stereotyped behaviors, development, and total score. The higher the score, the worse the autistic subscale.

VABS [15] is a semistructured interview that assesses the individual's daily functioning. It includes four subdomains (communication, social skills, daily living, and motor skills) and the composite adaptive behavioral score. The child's scores identify variations from typical age-appropriate attainments. The higher the score, the better the developmental adaptability. The Vineland has been normed recently on individuals with autism [18].

CGI-I [17] assesses the overall improvement. It is a measure of change ranging from very much improved (score of 1) through no change (score of 4) and very much worse (score of 7). By convention, scores of 1 and 2 (very much or much improved, respectively) are used to define treatment responders and patients with scores of 3–7 are considered as nonresponders.

The clinical sheets were designed by the authors according to knowledge in the literature and the DSM-IV symptom checklist for autism. CARS and CGI-I were conducted by the authors. GARS, VABS, and IQ assessments were performed by two well-trained and experienced clinical psychologists (one for Egyptian and another for Saudi patients). All Arabic scales were previously standardized and validated. The general outcome was considered as good (favorable) or poor (unfavorable) on the basis of clinical follow-up using CGI-I and a statistically significant change in the scores of the above-used scales over the second assessment time point.

During the second assessment time point, there were incomplete data in both groups: two from the Egyptian group (one did not finish Vineland scale and the other did not finish GARS) and six from the Saudi group: three of them did not finish GARS, one did not finish the Vineland scale, and two did not finish either of them. However, these cases were included in statistics as they started the second assessment scales but did not finish all of them completely. In addition, all of them were being followed up all throughout the study and were assessed clinically but they dropped some of the psychometric scales.

### Statistical analysis

Data obtained were analyzed using the statistical package of social sciences (SPSS Inc., Chicago, Illinois, USA) computerized version 17 by an expert statistician who chose the best tests for a small sample size. Numerical data were represented in the form of means and SD. Data were tested for normality using the Kolmogorov–Smirnov test. Normal data were compared using an independent-sample *t*-test, whereas non-normal data were compared using the Mann–Whitney ($U$) or Wilcoxon ($Z$) test. Categorical data were presented in numbers and frequencies and were tested for statistical associations using $\chi^2$-tests. Correlations were performed using bivariate analysis and prognostic variables were tested using a multiple regression test.

## Results

Both groups matched in terms of age (mean Egyptian age: 7.4 years, mean Saudi age: 7.6 years, $U = 253.5$, $P = 0.5$) and sex [among Egyptians; 12 (60%) were males and eight (40%) were females (ratio, 1.5 : 1); among the Saudi, 18 (64.3%) were males and 10 (35.7%) were females (ratio, 1.8 : 1) ($\chi^2 = 0.091$; $P = 0.76$)]. The mean IQ was 65.5 ± 20.9 in the Egyptian group and 63.1 ± 23.1, $U = 259$, $Z = -0.4$, $P = 0.6$, in the Saudi group.

### Comparison of autism outcome between Egyptian and Saudi groups

Both groups differed significantly in the first assessment in stereotype and developmental subscales of GARS, with higher scores in stereotype and lower developmental scores in the Saudi group compared with the Egyptian group (Table 1). In the second assessment, the Egyptian group showed significantly higher scores in the total Vineland, Vineland communication, and daily skills subscales as compared with the Saudi group (Table 1). In the Egyptian group, there were significant differences between the mean scores of the first and the second assessment in most of the Gilliam subscales and the total scores (Table 1); there was a decrease in these subscale scores, indicating an improvement in the severity of autism. In the Saudi group, there were significant differences between the scores of the first and the second assessment in the stereotype Gilliam subscale and the Vineland total, communication, and daily skills subscales. Comparison of the means of these subscales (Table 1) indicated improvement in stereotype but worsening of the developmental levels appropriate for age. In other words, in the Saudi group, patient scores worsened in contrast to Egyptian patient scores, which improved over time (Table 1).

In terms of the general outcome of the entire sample, it was found that 50% of the total sample ($n = 24$) had good outcome. On comparing both Egyptian and Saudi groups, it appeared that there was a tendency toward better outcome in the Egyptian group, although not statistically significant [60% of Egyptian patients versus 42.9% of Saudi patients, ($\chi^2 = 1.3$, $P = 0.1$)]. Males did not differ from females in the outcome using CGI-I. In the entire sample, 14 (46.7%) males had good outcome whereas 16 (53.3%) had poor outcome, whereas 10 (55.6%) females had good outcome as compared with eight (44.4%) females with poor outcome ($\chi^2 = 0.3$, $P = 0.3$).

### Comparison between patients with good and poor outcome

In the Egyptian group, no statistically significant difference was found between those with good or poor outcome for either age of the patient at diagnosis or start of intervention. Similarly, no statistically significant difference was found between the scores of patients with good or poor outcome on baseline GARS, CARS, or VABS total score or subscales. However, good outcome was significantly associated with a diagnosis of atypical autism; negative family history of similar condition; absent seizures; and normal developmental history other than language ($P < 0.0001$). Parental concern; parental education; use of behavioral modification; and phoniatric therapy were also associated significantly with good outcome ($P < 0.0001$).

**Table 1 Comparison between and within Egyptian and Saudi groups on the first and second assessment scores of the Gilliam and Vineland scales**

| | Mean ± SD | | | | |
|---|---|---|---|---|---|
| Scale assessment scores | Egyptian | Saudi | *t*(*U*) | *d.f.*(*Z*) | *P* |
| Gilliam scale (total) A | 93.8 ± 14.7 | 86.5 ± 14.6 | 1.69 | 46 | 0.09 |
| Gilliam scale (total) B | 84.7 ± 13.27 | 84.6 ± 15.11 | 0.03 | 38 | 0.97 |
| Comparison of A vs. B [*t*(*Z*)/*P*] | 5.5/0.000 | 1.1/0.1 | | | |
| Gilliam stereotype A | 7.5 ± 3.3 | 9.57 ± 3.1 | 182 | −2.06 | 0.04 |
| Gilliam stereotype B | 6.16 ± 3.3 | 8.18 ± 3.91 | −1.72 | 38 | 0.09 |
| Comparison of A vs. B [*t*(Z)/*P*] | −2.3/0.009 | −1.9/0.04 | | | |
| Gilliam communication A | 6.26 ± 2.8 | 8.03 ± 3.1 | 146.5 | −0.23 | 0.8 |
| Gilliam communication B | 6.45 ± 2.9 | 7.5 ± 2.5 | −1.016 | 27 | 0.32 |
| Comparison of A vs. B [*t*(*Z*)/*P*] | −2.2/0.02 | −1.7/0.08 | | | |
| Gilliam social interaction A | 8.75 ± 3.3 | 6.85 ± 3.32 | 197 | −1.7 | 0.08 |
| Gilliam social interaction B | 6.88 ± 3.1 | 6.09 ± 2.18 | 176 | −0.589 | 0.5 |
| Comparison of A vs. B [*t*(*Z*)/*P*] | −3.09/0.02 | −1.4/0.1 | | | |
| Gilliam developmental A | 10.7 ± 1.7 | 8.6 ± 3.3 | 142 | −2.16 | 0.03 |
| Gilliam developmental B | 10.27 ± 1.8 | 8.7 ± 2.8 | 1.95 | 35 | 0.05 |
| Comparison of A vs. B [*t*(*Z*)/*P*] | −1.4/0.1 | −1.2/0.1 | | | |
| Vineland total score A | 44.5 ± 15.16 | 41.75 ± 19.8 | 0.69 | 45 | 0.49 |
| Vineland total score B | 45.6 ± 12.9 | 35.77 ± 17.4 | 125 | −2 | 0.04 |
| Comparison of A vs. B [*t*(*Z*)/*P*] | −0.2/0.8 | 3.7/0.000 | | | |
| Vineland communication A | 39.4 ± 13.7 | 41.3 ± 18.9 | 221.5 | −0.96 | 0.3 |
| Vineland communication B | 46.8 ± 11.67 | 36.8 ± 17.3 | 120 | −2.129 | 0.03 |
| Comparison of A vs. B [*t*(*Z*)/*P*] | −0.8/0.4 | −2.6/0.008 | | | |
| Vineland daily skills A | 46.47 ± 17.2 | 41.6 ± 23.5 | 226.5 | −0.86 | 0.38 |
| Vineland daily skills B | 47.77 ± 15 | 35.1 ± 20.25 | 110.5 | −2.43 | 0.01 |
| Comparison of A vs. B [*t*(*Z*)/*P*] | −0.02/0.9 | −3.1/0.001 | | | |
| Vineland socialization A | 48.2 ± 17.6 | 47.4 ± 21.03 | 0.13 | 45 | 0.89 |
| Vineland socialization B | 50.44 ± 17.4 | 44.4 ± 20.4 | 0.99 | 38 | 0.33 |
| Comparison of A vs. B [*t*(*Z*)/*P*] | −0.8/0.3 | 1.6/0.1 | | | |
| Vineland motor A | 62.4 ± 18.9 | 66.15 ± 20.8 | −0.45 | 22 | 0.65 |
| Vineland motor B | 61.7 ± 13.23 | 45.75 ± 14.59 | 1.98 | 12 | 0.07 |
| Comparison of A vs. B [*t*(*Z*)/*P*] | −0.3/0.7 | 2.5/0.1 | | | |

A and B, refer to baseline and final assessments, respectively; *t*, independent *t*-test; *U*, Mann–Whitney value; *Z*, Wilcoxon test value.

In the Saudi group, age of noticing abnormality was significantly older in the good outcome group (mean age ± SD = 3.8 ± 1, $P = 0.03$); baseline IQ and CARS, GARS total, stereotype, and VABS total and subscales were significantly better in the good outcome group ($P < 0.0001$). GARS communication, social, and developmental subscales showed no statistically significant difference between the patients with good and poor outcome. Good outcome was significantly associated with atypical autism, absence of seizures or regression, and average development except for language, paternal work, phoniatric therapy, and alternative therapy ($P < 0.05$).

When the entire sample was considered, as shown in Table 2, age of noticing abnormality was significantly older in the good outcome group. Moreover, baseline IQ and CARS, GARS total, stereotype, and VABS total and subscales were significantly better in the good outcome group; GARS communication, social, and developmental subscales showed no statistically significant difference between good and poor outcome patients.

The entire sample was then assessed to determine factors related to good and poor outcome. The results are shown in Table 3. Good outcome was significantly associated with having atypical autism, absence of seizures or regression, having normal milestones of development except for language, and high parental concern toward caring about their autistic child ($P < 0.05$) and vice versa. $\chi^2$-Test did not show any significant association between outcome and hyperactivity, psychiatric comorbidity, or abnormal physical examination.

Moreover, the $\chi^2$-test did not show any significant association between outcome and each of level of parental education, type of work of parents, or level of education of patients themselves ($P = 0.3$, 0.1, 0.2, 0.1, and 0.08, respectively).

As shown in Table 4, there were significant associations between good outcome and having normal electroencephalography (EEG), taking no drugs or being stable on one drug therapy, early behavioral intervention, taking phoniatric therapy, and improvement in more than two core deficits in response to drug therapy.

### Predictors of outcome

Multiple regression analysis was carried out using the forced entry method to detect possible predictors of outcome within the entire sample. The total Gilliam score at baseline ($\beta = 1.034$, $t = 2.7$, $P = 0.01$) was the strongest predictor of outcome, followed by parental concern ($\beta = 0.416$, $t = 2.1$, $P = 0.04$) and type of intervention ($\beta = 0.18$, $t = 0.08$, $P = 0.04$).

## Discussion

It is known that ASD have variable developmental outcomes for reasons that are not entirely clear [19]. Studies on autism and its variable outcome are scarce from the developing countries. To the authors' knowledge, the current study is one of few studies investigating the outcome of autism in two large strategically important Arab countries in the Middle East, Egypt and Saudi Arabia, simultaneously.

### Change over time

Originally, there was no significant difference in the GARS scores between both groups, except for stereotype and developmental subscales, being higher in stereotype and lower in developmental scores in the Saudi group as compared with the Egyptian group (Table 1). In the second assessment, differences between both groups became nonsignificant for all GARS total and subscales (Table 1). As for the VABS, originally, there were nonsignificant differences between both groups, whereas in the second assessment, the Egyptian group showed significantly higher scores in total Vineland, Vineland communication, and daily skills subscales as compared with the Saudi group (Table 1). Moreover, on comparing the scores of the first and second assessments in each group separately, it was clear that patients in the Egyptian group showed significant improvement in the severity of autism, as indicated by a decrease in the mean scores of the Gilliam total and subscales, whereas the mean scores of the VABS and subscales did not show significant changes between the first and the second assessment, indicating slow or stationary developmental levels in the Egyptian group (Table 1). However, the patients in the Saudi group showed a significant improvement in the stereotype subscale scores, but not in the other Gilliam subscales. Surprisingly, the scores of patients in the Saudi group on VABS worsened significantly over time.

Freeman *et al.* [20] reported that their autistic patients improved with age in all domains of VABS. The rate

**Table 2 Factors determining good from poor outcome in the entire sample**

| | Mean ± SD | | | | |
|---|---|---|---|---|---|
| Variable | Good outcome | Poor outcome | *t*(*U*) | *d.f.*(*Z*) | *P* value |
| Age of noticing abnormality | 2.3 ± 1 | 1.5 ± 0.9 | 139 | −3.1 | 0.02 |
| IQ | 79.3 ± 17.5 | 49.7 ± 15.01 | 64 | −4.6 | 0.000 |
| CARS A | 32.5 ± 4.08 | 42 ± 7.5 | 30.5 | −3.3 | 0.001 |
| Stereotype A | 7.3 ± 3.5 | 10.04 ± 2.6 | 163 | −2.6 | 0.009 |
| VABS A | 52.2 ± 16.4 | 33.1 ± 14.1 | 3.4 | 45 | 0.001 |
| Communication A | 52.1 ± 15 | 34 ± 13.9 | 109 | −3.5 | 0.000 |
| Socialization A | 58 ± 18 | 37.04 ± 14.9 | 4.3 | 45 | 0.000 |
| Daily skill A | 53.3 ± 19 | 33.3 ± 18.4 | 128.5 | −3.1 | 0.001 |

A, refers to baseline assessment; CARS, Child Autism Rating Scale; IQ, intelligent quotient; *t*, independent *t*-test; *U*, Mann–Whitney value; VABS, Vineland Adaptive Behavioral Scale; *Z*, Wilcoxon test value.

**Table 3 Relation between clinical factors and outcome**

| | n (%) | | | | |
|---|---|---|---|---|---|
| Variables | Good | Poor | $\chi^2$ | *d.f.* | *P* value |
| Type of autism | | | | | |
| Typical | 18 (42.9) | 24 (57.1) | 6.8 | 1 | 0.01 |
| Atypical | 6 (100) | 0 | | | |
| Psychiatric comorbidity | | | | | |
| Yes | 9 (37.5) | 15 (62.5) | 0.8 | 1 | 0.3 |
| No | 6 (54.5) | 5 (45.5) | | | |
| Perinatal problems | | | | | |
| Yes | 8 (42.1) | 11 (57.9) | 0.78 | 1 | 0.3 |
| No | 16 (55.2) | 13 (44.8) | | | |
| Developmental milestones | | | | | |
| All delayed | 3 (20) | 12 (80) | 8.09 | 2 | 0.01 |
| DLD only | 18 (62.1) | 11 (37.9) | | | |
| Normal | 3 (75) | 1 (25) | | | |
| Family history | | | | | |
| Consanguinity | 2 (33.3) | 4 (66.7) | 5.5 | 4 | 0.2 |
| Autism | 4 (40) | 6 (60) | | | |
| DLD | 10 (76.9) | 3 (23.1) | | | |
| MR | 2 (33.3) | 4 (66.7) | | | |
| Negative FH | 6 (46.2) | 7 (53.8) | | | |
| Parental attitude | | | | | |
| Concern | 23 (67.6) | 11 (32.4) | 14.5 | 1 | 0.000 |
| Neglect | 1 (7.1) | 13 (92.9) | | | |
| Seizures | | | | | |
| Yes | 1 (12.5) | 7 (87.5) | 5.4 | 1 | 0.02 |
| No | 23 (57.5) | 17 (42.5) | | | |
| Hyperactivity | | | | | |
| Yes | 12 (44.4) | 15 (55.6) | 0.76 | 1 | 0.3 |
| No | 12 (57.1) | 9 (42.9) | | | |
| Regression | | | | | |
| Yes | 3 (25) | 9 (75) | 4 | 1 | 0.04 |
| No | 21 (58.3) | 15 (41.7) | | | |
| Examination signs | | | | | |
| Physical | 0 | 1 (100) | 6.8 | 3 | 0.07 |
| Behavioral | 7 (38.9) | 11 (61.1) | | | |
| Combined | 3 (30) | 7 (70) | | | |
| Absent signs | 4 (100) | 0 | | | |

DLD, delayed language development; MR, mental retardation; negative FH, negative family history.

of growth in communication and daily living skills was related to the initial IQ whereas the rate of growth in social skills was not. In another study, Chawarska *et al.* [21] reported that symptoms of social dysfunction were relatively stable over time and so was the severity of stereotyped behaviors 3 years after the first assessment. In a study investigating developmental trajectories in autism, Darrou *et al.* [22] found two distinct outcome groups with more stability than change. When changes did occur, they pertained to symptom severity (which decreased) and speech level and adaptive behavior (which improved).

Our results are in agreement with western research for the Egyptian patients. However, our results are contradictory to western studies for Saudi patients, which might indicate that differences in culture do not affect the severity of autism but a protective and conservative culture such as that of Saudi Arabia might have a negative influence on adaptive functioning. Results, however, should be considered with caution because of the small sample size of the study.

### Outcome of autism

Prospective studies over a 2-year period have shown variable results. Chung *et al.* [23] reported that 50.1% of their sample had poor or very poor outcome at follow-up. These results are similar to those of the current study, in which the percent of good versus poor outcomes in the entire sample was 50%. However, another follow-up study of children with ASD, for diagnostic stability over 2 years, found that 32% of their sample had improved and failed to fulfill the diagnostic criteria for autism [24]. It is noteworthy that there was a tendency toward better outcome over a 2-year period in the Egyptian group (60%) versus the Saudi group (42.9%). However, this difference was not statistically significant ($P = 0.1$). Failure to reach statistical significance might be because of the small sample size in each group.

### Factors influencing autism outcome

Good outcome in the entire sample in the current study was significantly associated with having atypical autism, absence of seizures, and regression. Poor outcome was correlated with the reverse. This was consistent with the results of previous studies [19,22,25]. Also, good outcome in the entire sample was significantly associated with higher age of noticing abnormality, higher IQ, mild severity of autism (as shown by low CARS scores and low total Gilliam scores at the final assessment), fairly high scores of VABS, and low stereotypy scores (Table 2). In agreement with these findings, there has been growing concern that, independent of the diagnosis of ASD, intellectual level, and adaptive functioning, psychiatric symptoms may influence treatment related to outcome in autism [26]. Similar to the current results, Chung *et al.* [23] found that higher IQ and onset of speech before 5 years of age were good predictors of outcomes in their sample. Moreover, similar to our results, they did not find any sex difference related to the outcome of autism. Moore and Goodson [27], in their study, found that children whose scores deteriorated in the social domain tended to have presented initially with more significant behavioral problems, specifically, few repetitive behaviors observed at age 2, and became more apparent by age 4–5. A significant interval between first noticing abnormalities and the establishment of a definitive diagnosis was reported in a previous research [26,28]. Similarly, in a previous report on Saudi patients abnormality was detected at younger patient age, whereas treatment was commenced at a later age [8]. The temporal gap between diagnosis and treatment intervention among Saudi autistic children is longer, which again may add to the higher tendency toward poor outcome among them. Also, younger age of noticing abnormality might imply more developmental comorbidities, for example mental retardation, which in itself is an important poor prognostic variable. This poses important implications for early diagnosis, intervention, and prognosis.

The hallmark finding among all familial factors was the significant association between good outcome and high parental concern toward caring about their autistic child and vice versa (Table 3). In a study investigating the relationship between parental concerns about development in the first year and a half of life and later autism diagnostic outcomes, Ozonoff *et al.* [29] reported that parents who have an older child with autism reported significantly more concerns in autism-related areas,

**Table 4 Relation between interventional factors and outcome**

| Outcome | Variables | *n* (%) Good outcome | *n* (%) Poor outcome | $\chi^2$ | *d.f.* | *P* value |
|---|---|---|---|---|---|---|
| Radiology findings | Normal | 2 (33.3) | 4 (66.7) | 0.63 | 2 | 0.7 |
| | Abnormal | 1 (20) | 4 (80) | | | |
| | Unavailable | 1 (50) | 1 (50) | | | |
| EEG findings | Normal | 9 (60) | 6 (40) | 6.7 | 2 | 0.03 |
| | Abnormal | 1 (10) | 9 (90) | | | |
| | Unavailable | 3 (60) | 2 (40) | | | |
| Audiometry | Normal | 18 (54.5) | 15 (45.5) | 3.17 | 2 | 0.2 |
| | Abnormal | 0 | 2 (100) | | | |
| | Unavailable | 1 (100) | 0 | | | |
| Type of intervention | Drugs only | 4 (28.6) | 10 (71.4) | 4.5 | 3 | 0.2 |
| | Behavioral only | 4 (66.7) | 2 (33.3) | | | |
| | Combined drug/behavioral | 15 (60) | 10 (40) | | | |
| | Others | 1 (33.3) | 2 (66.7) | | | |
| Drugs used | No drugs | 5 (62.5) | 3 (37.5) | 12.7 | 3 | 0.005 |
| | Stable monotherapy | 15 (75) | 5 (25) | | | |
| | Stable polytherapy | 2 (22.2) | 7 (77.8) | | | |
| | Changeable polytherapy | 2 (18.2) | 9 (81.8) | | | |
| Behavioral intervention | Early | 17 (73.9) | 6 (26.1) | 10.2 | 2 | 0.005 |
| | Late | 3 (33.3) | 6 (66.7) | | | |
| | None | 4 (25) | 12 (75) | | | |
| Phoniatric therapy | Yes | 16 (64) | 9 (36) | 4.09 | 1 | 0.04 |
| | No | 8 (34.8) | 15 (65.2) | | | |
| Response to drugs | Little or no response | 0 | 17 (100) | 26.8 | 1 | 0.000 |
| | Better core deficits | 15 (88.2) | 2 (11.8) | | | |
| Type of improved core deficit | Better social | 0 | 1 (100) | 21.1 | 3 | 0.000 |
| | Better communication | 3 (75) | 1 (25) | | | |
| | Better 2 or more deficits | 11 (84.6) | 2 (15.4) | | | |
| | No improvement | 1 (5.9) | 16 (94.1) | | | |

EEG, electroencephalography.

by the time their child was 12 months of age, than parents of children with typical outcomes. These concerns were significantly related to independent measures of developmental status and autism symptoms and helped predict which infants would later be diagnosed with autism. In agreement, the previous reporting of higher parental concern in Egyptian parents compared with Saudi parents [8] may further explain the tendency toward better outcome in the Egyptian group.

Of particular clinical importance was the finding of a significant association between good outcome and having normal EEG (Table 4). The importance of EEG findings in autism has been highlighted frequently in studies. Anderson *et al.* [30] noted that abnormal EEGs are important for the diagnosis and treatment of epilepsy; however, their usefulness for the treatment and prognosis of autism has not been established. Preliminary results suggest that EEG abnormalities might be predictive of overall response in autistic individuals treated with the anticonvulsant valproic acid. Again, given the lower incidence of seizures in Egyptian compared with Saudi patients (5 vs. 25%) [8], this notion may further add to the explanation for the tendency of the Egyptian group to have better outcome.

However, abnormal radiological or audiometric findings failed to show any significant association with outcome of autism. This important negative finding is in contrast to the majority of MRI studies reporting major brain abnormalities in cerebellar hemispheres, vermis, and other brain areas that may be related to level of functioning in autistic patients [30]. However, this result should be interpreted with caution as most MRI reports in clinical settings focus on major abnormal clinical findings rather than research-related findings.

Another important debatable finding was the failure to show any significant association between type of treatment intervention (whether drug only, behavioral only, or combined drug and behavioral intervention) and outcome of autism. This is consistent with Darrou *et al.* [22], who also reported that the level of intervention was not related to outcome. Nevertheless, a significant association can be collectively observed between good outcome and taking no drugs or being stable on one drug therapy, early behavioral intervention, receiving phoniatric therapy, and improvement in more than two core deficits in response to drug therapy especially social deficits (Table 4). Surprisingly, comprehensive reviews of the options for medical management in ASD are lacking, particularly reviews that address both pharmacologic and behavioral treatments [31]. Accordingly, randomized-controlled trials to test the efficacy of an intervention that combines both medication and behavioral therapy in the treatment of severe behavioral disturbances in the context of autism are highly needed.

Finally, when multiple regression analysis was carried using the forced entry method to detect possible predictors of general outcome in the entire sample, the total Gilliam score at baseline, indicating the initial severity of autism, was found to be the strongest predictor of outcome, followed by parental concern and type of intervention.

### Implications

These results are preliminary and again cannot be generalized to all Egyptian and Saudi autistic children because of the limited sample size. These findings need further replication in larger community studies. Nonetheless, the current study suggests that certain characteristic profiles (including clinical, psychometric, familial, developmental, and treatment modality) can be applied to determine the prognosis of children with autism. This will have major clinical implications on service providers to increase parental awareness and concern, physician and psychiatrist awareness, and highlight the importance of early detection and intervention.

### Strengths and limitations

The current study is a naturalistic study in which all cases of autism were included even if they had a comorbidity such as mental retardation and epilepsy. Thus, the sample represented many clinical cases with various comorbidities. The size of the entire sample ($n = 48$) was large in comparison with some of the previous outcome studies [32–37]. Moreover, the authors attempted to control threats to internal and external validity: (a) all cases who presented to the outpatient clinics through the 5 working days of the week were recruited into the study, (b) the tools included clinical as well as psychometric testing to describe the sample, (c) all the tools used were standardized and validated, not merely translated, (d) to avoid overestimation or underestimation of parameters of interest, clinical psychologists were blinded to the purpose of the study, and (d) statistical data analysis was carried out by an expert statistician who chose the appropriate tests relevant to the study rationale, sample size, and generalizability.

The results of the current study should be considered with caution as the sample is not a community representative sample with respect to sample size. This is the primary limitation of the current study. Continuation of this work with a larger cohort and more specific inclusion criteria for diagnosis would be important to replicate and further validate these findings.

## Conclusion

Autism is a complex biobehavioral disorder with varied trajectories and qualitatively different patterns of behavior. It presents the same core deficits worldwide, but with marked variability in diagnostic subtypes, associated comorbid problems, severity of core symptoms as well as wide variability in management approaches. Consequently, outcome studies also showed marked variability in outcome and prognosis. Outcome of autism appears to be related to certain influencing factors such as the severity of autism, familial factors, perinatal and developmental factors, and in the approach used to deal and intervene with this problem. Taking into consideration all these factors together may have an important impact on the general outcome of autism later on. Specifically, initial less severity of autism, parental concern, and early intervention with behavioral approaches appear to be the strongest predictors of good outcome.

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### Conflicts of interest

There are no conflicts of interest.

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