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The Early Warning Signs of Autism Spectrum Disorder among Saudi Children

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الظواهر للإنذار المبكر باحتمالية الإصابة باضطراب طيف التوحد لدى الأطفال السعوديين

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Abstract

Background: Identifying Autism Spectrum Disorder (ASD) as early as possible is the most important step to be achieved due to the fact that early intervention can result in significant improvement of ASD symptoms. It is proved that the impairments identified in children with ASD are in skills that normally develop between the first 12 to18 months of life. **Aim:** To determine the early warning signs for participants with ASD in the north of Riyadh. **Method:** A retrospective case control study, 57 subjects with ASD typical symptoms were selected by a convenience sampling method at King Khalid University Hospital and compared with a randomly selected, community based control group (N=84) matched for age and gender. Written informed consent was obtained from all parents/caregivers who completed questionnaires and were also interviewed. **Results:** Our findings suggest that loss of shared enjoyment with family members, absence of early speech symbols, e.g. stringing sounds together, loss of eye to eye contact between the child and others and lack of imaginative play are early warning signs of ASD by the age 12 to 18 months in Saudi subjects with ASD.

Key Words: Autism Spectrum Disorder, ASD, warning signs, Saudi Arabia.

Declaration of interest: None.

Introduction

Autism Spectrum Disorder (ASD) is defined as a group of neurodevelopmental disorders characterized by impairments in communication, social interaction, repetitive behaviors, abnormal movement patterns and sensory dysfunction.[1] According to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), children with autism were classified as either having autistic disorder, Asperger's disorder, childhood disintegrative disorder or pervasive developmental disorder not otherwise specified. However, DSM-V has put all the four disorders under one umbrella.

The prevalence of autism has increased dramatically over the past two decades; however, the reason for this is still unclear. A 2012 review of global prevalence estimates of ASD found a median of 62 cases per 10,000 people although there is limited evidence from low-and middle-income countries. It affects 86-91 per 10,000 children in the United States of America (USA)[3, 4] while a higher rate of 157 out of 10,000 has been reported in United Kingdom (UK).[5] New research from the Centers for Disease Control and Prevention suggested ASD prevalence rates in the USA have increased to 11.3 in 1,000.[33]

In Arab countries, the prevalence of ASD ranges from 1.4 cases per 10,000 children to 29 per 10,000 children in Oman and United Arab Emirates, respectively. It is estimated that the prevalence of autism in Saudi Arabia is 18 per 10,000, which is slightly higher than the 13 per 10,000 reported in developed countries.[6] Traditionally, ASD is not diagnosed until the age of 36 months; however, a recent study has shown that diagnosis can be established at earlier age. Identifying ASD as early as possible is the most important step to be achieved because early intervention can result in significant improvement of symptoms. An ASD diagnosis in the USA is not established until the age of three to four

years.[7] There is strong evidence to suggest that early intervention, mainly before the age of three and a half, is more effective than after the age of five.[8,9] Another study suggests that intervention starting even before age of three years will result in a better outcome for the child.[10] It has been stated that the chance to start treatment for ASD specifically around the child's first birthday, which is the age of altering brain growth, seems to have the ability to change outcomes for affected children, although this has not been achieved yet. These findings emphasize the urgent need for early diagnosis of ASD so the early intervention will lead to a significant outcome. Diagnosis of ASD in many Arab countries is not often made until later in the child's life, particularly where the disorder has a mild or moderate course.[11] Failure or delay in diagnosing has led to excess impairments, which had a hugely negative impact on the children and their families.[11] Many studies found that highly effective interventions involve behavioural modification.[34]

Most research on the possible early warning signs that can be detected in the first two years of life in children with autism revealed many positive signs.[12,13] One study on social communication among a sample of preschool children with ASD showed important implications for earlier diagnosis. It was proved that the impairments identified in children with autism are in skills that normally develop between the first 12 to18 months of life.[12,13] These results suggest there is a group of pre-linguistic behaviors that appear to be important early indicators of ASD. Studies from the Middle East on this topic have been particularly rare. Numerous studies have documented that delayed attainment of social skill milestones, including joint attention, social orienting and pretend playing are important early warning signs of ASD.[14,15] Parents' perception and understanding of ASD is extremely important in early diagnosis of the disorder. In addition, parents are considered an important a part of any treatment plan because they can monitor their children's behaviour. However, many factors can influence a parent's perception, such as depression. As a result, understanding of the contextual influences on parent perceptions is important for making clinical decisions regarding a child's treatment.[35]

The main objective of the current study is to determine the early warning signs of ASD as perceived by parents of children with autism attending special private schools and as part of the Autism Research and Treatment Centre at the King Khalid University Hospital in Riyadh between December 2012 to March 2013 as a way to help with early diagnosis.

Methodology

Participants

A total of 141 subjects were recruited to the current study and separated into two groups: 57 were known ASD cases according to the DSM-IV-TR criteria and were selected, using convenience sampling method (N=57; 49 boys and 7 girls) with Mean age= 9 years (SD=5). A healthy control group was randomly selected during well-baby check-ups in a primary baby healthcare clinic and matched with cases by gender, age, race, and socioeconomic status (N=84; 43 boys and 38 girls) with Mean age= 5 years (SD=4). Cases to control ratio was 1:1.5. Estimated numbers of subjects and cases were calculated by the sample size calculator provided by the Macorr website at a confidence level of 95% and a population size of 4.6 million (based on data published on the Riyadh Development Authority official website on 24th of September 2012). Sample selection occurred from the period between January 2013 and March 2013.

The inclusion criterion for the group with autism was meeting the cut-off score for ASD based on the DSM-IV criteria. While the exclusion criteria for both cases and controls were:

a. Dysmorphic features, Fragile X syndrome, any serious neurological diseases, (e.g. seizures, psychiatric disorders (e.g. bipolar disorder), or neurodevelopmental disorders and disabilities (e.g. AHDH).
b. Known endocrine, cardiovascular, pulmonary, liver or kidney diseases.

c. Children above the age of 12 years were also excluded due to the possible difficulty in recalling the information from the caregiver.

After recruiting the sample, all caregivers of the 141 subjects, mainly mothers, were informed about the research procedures and consented to participate voluntarily in the study. All were aware that there would be no penalty or loss of benefits should they wish not to participate. After consenting, all caregivers were asked to recall information about the child through an interview-based questionnaire.

Measures

The current study was conducted by interviewing the parents/caregivers of children diagnosed with autism and completing a questionnaire. Participant recruitment was from the following centres: The Autism Research and Treatment (ART) Centre of King Saud University, Al-Amodi Autism Research Chair at King Khalid University Hospital (KKUH), Azam Autism Centre in Riyadh, the Autism families' Association Centre, and children without autism from the well-baby clinic in King Khalid University Hospital. The questionnaire was designed according to what was observed from the previous literature to be important. It consisted of two parts with 24 questions in each. The first part included questions about the general health status of parents, labour, delivery and breast-feeding of the child, and family socioeconomic and education status. The second part of the questionnaire included items about the child's behaviour in his/her first 18 months of life as perceived by the parents or caregivers. In addition, these items were taken from the CSBS DP Infant-Toddler Checklist[16] to identify different aspects of development in infants and toddlers. These items were translated into Arabic and modified according to the culture in Saudi Arabia. This part consisted of seven categories: emotion and eye gaze, communication, gesture, sounds, words, understandings and object use. Furthermore, participants were given a complete description of the study and written informed consent was obtained from all parents/caregivers before enrolment in the study.

Study setting

Riyadh is the capital city of the Kingdom of Saudi Arabia. Riyadh has an estimated population of 4.6 million, including Saudi and non-Saudi populations. The non-Saudi population was estimated by the High Commission for the Development of Riyadh to be around 1.7 million. The rest of the population is comprised of Saudi citizens.[17]

Control subjects for the current study were recruited from the Well Baby Clinic at King Khalid University Hospital. Subjects with autism were recruited from the Autism Research and Treatment Centre (ART) and Al-Amodi Autism Research Chair, Azam Autism Centre and Autism Families Association. All were located in Riyadh.

Both the Autism Research and Treatment Centre and Al-Amodi Autism Research Chair are part of King Khalid University Hospital. King Khalid University Hospital is an 800-bed tertiary hospital located largely in the northern area of Riyadh. It has a special outpatient building, over 20 operating rooms and fully equipped and staffed laboratory, radiology and pharmacy services. The facility provides a primary and secondary care services to all people who live in the northern area of Riyadh. In addition, it provides tertiary care services to all referred patient. The care service that is provided includes all types of investigation and medication is free of charge.[18]

Furthermore, Azam Autism Centre is a special education centre in the northern part of Riyadh, which has capacity to support 60 children with autism and includes a specialist teacher for each child. In addition, the Autism Families Association is a community society that aims to raise awareness about ASD through weekly lectures from a variety of relevant specialists.

Statistical analysis

Data were entered analysed using the Statistical Package for the Social Sciences, Version 16.0 (SPSS 16.0). Chi-square test and t-test were used to determine any baseline difference in behaviour between individuals with and without autism. The data were presented as means ± standard deviation, frequency, median, maximum, minimum and percentage.

Statistical differences were ascertained using the chi-square with significance set at a P value of 0.05 or lower.

Ethical consideration

Oral assent was obtained from each participant and Parents/caregivers asked to sign a consent form which outlined the sponsor, study plan, and benefits of the research. In addition, it was clarified that all the information provided would be kept confidential and the identity would never revealed. Furthermore, it was mentioned that if an individual refuses to participate in this study, there would be no retribution or loss of benefits.

Results

A total of 141 children, (n= 57 cases, n= 84 controls) were analysed from which n= 56 subjects with ASD were recruited to the study, (49 boys and 7 girls), with mean age 9.8±4.1 (mean ±SD). The mean age of diagnosis was 2.27±1.37 (mean ±SD). The gender ratio (male: female) for all time periods was 7:1, ($p<0.001$)

Table 1: Comparison between boys and girls according to age at point of ASD diagnosis

Age (y)	Boys	Girls
1.0 – 1.9	2	1
2.0 – 2.9	4	4
3.0 – 4.0	30	1
>4.0	10	0
Total	46*	6

Table 2 presents a comparison between history of pregnancy and delivery for the group with autism and for the control group; 42 mothers with children who have autism had a vaginal delivery compared to 53 in the control group, which was not statistically significant ($p=0.36$). In addition, 80.7% of mothers with ASD diagnosed children did not have any medical complication during pregnancy compared with control group (78.6%).

Table 2: Comparison between mothers of participants and mothers of control group during pregnancy and delivery

Characteristics	ASD group (n=57)	Control group (n=84)	P value
The method of childbirth			**0.35**
Vaginal delivery	42 (75%)	53 (63.9%)	
Caesarean section	12 (21.4%)	27 (32.5%)	
Assisted delivery (forceps, aspirator, induced)	2 (3.57%)	3 (3.6%)	
Total	56	83**	
Full-term pregnancy			**0.092**
Yes	56 (98.2%)	76 (91.6%)	
No	1 (1.75%)	7 (8.4%)	
Total	57	83 ***	
Complication during that pregnancy			**0.74**
No	46 (80.7%)	66 (78.7%)	

Yes	11 (19.3%)	18 (21.3%)	
Total	57	84	

Mother's mean age for group with autism (29 ± 5.7 y) compared to controls (31 ± 7.6 y) (statistically not significant, p = 0.122). Father's mean age in autistic group (34 ± 9 y) was not statistically significant compared to controls (37 ± 8.4, p = .11).

(*) Five missing data.

(**) One missing data.

(***) One missing data.

The socio-demographic characteristics of participants are listed in Table 3. There were no significant differences in the monthly income between the two groups. Moreover, the educational levels for parents demonstrated no statistical differences between the two groups.

Table 3: Socio-demographic characteristics of participants

Characteristics	Cases (n= 57)		Controls (n= 84)	P value
Age of mother (y)				0.122
20 – 29	19 (34.5%)		37 (45%)	
30 - 39	28 (50%)		30 (36.5%)	
40 – 49	3 (5.4%)		9 (11%	
Total	50(*1)		76(*2)	
Age of father (y)				0.11
20 -39	41 (74.5%)		48 (60%)	
40 – 59	14 (25.5%)		31 (40%)	
Total	55(*3)		79(*4)	
Education level of mother				
Secondary school	21		19	
High education	26		50	
Total	47(*5)		69(*6)	
Education level of father				
Secondary school	15		14	
High education	29		48	
Total	44(*7)		62(*8)	
Family monthly income (Saudi riyals)				0.55
<5000	3 (5.4%)		10 (12.3%)	
5000-15000	30 (54%)		38 (47%)	
15000-30000	14 (25%)		20 (24.6%)	
>30000	8 (14.5%)		13 (16%)	
Total	55(*9)		81(*10)	
Mother's emotional status during pregnancy				0.903
Same	33(63%)		52(65%)	
Better	7 (13.4%)		12 (15%)	
Worse	12 (23%)		16 (20%)	
Total	**52(*11)**		**80(*12)**	

(*1) Seven missing data. - (*2) Eight missing data. - (*3) Two missing data. - (*4) Five missing data. - (*5) 10 missing data. - (*6) 15 missing data. - (*7) 13 missing data.- (*8) 22 missing data (*9) 2 missing data. - (*10) 3 missing data. - (*11) 5 missing data. - (*12) 4 missing data.

Overall, 33 out of 52 (63%) mothers of children with autism indicated there was no difference in the level of their antenatal emotional condition when compared with other pregnancies. Seven (13.4%) mothers estimated that the antenatal emotional condition of their diagnosed child was better when compared to their other pregnancies; however, 12 (23%) reported that it was worse. Of the 84 mothers of children without autism 52(65%) estimated that there was no difference in the level of antenatal emotional condition during their

pregnancies while 12 (15%) mothers estimated that they were better and 16 (20%) mothers have reported that it was worse. Despite this, there was no significant difference in the level of antenatal emotional condition between mothers of participants in either group (p-value 0.903).

Furthermore, 33 (57.8%) participants with autism received both breast and bottle-feeding during the first two years of life. Whereas, 14 (24.5%) participants with autism received only breast feeding and 10 (17.5%) were bottle fed. Similarly, 54 (64.2%) out of 84 control subjects received both breast and bottle-feeding during the first two years of life and 15(17.8%) received only breast feeding and 15(17.8%) received only bottle-feeding. The proportion of participants with autism (24.5%) who only breast-fed was slightly higher than the subjects in the control (17.8%) group. The difference was not statistically significant (p-value .616).

Table 4: Feeding pattern

Feeding pattern	Cases (n=57)	Controls (n=84)	P value
Breast-feeding pattern			0.616
Breast feeding	14 (24.5%)	15 (17.8%)	
Bottle feeding	10 (17.5%)	15 (17.8%)	
Both	33(57.8%)	54 (64.2%)	
Total	57	84	
Time bottle feeding was introduced (mo)			0.939
<1	9 (33.3%)	18(36.7%)	
1-6	15(55.5%)	26 (53%)	
7 – 12	2(7.4%)	2 (4%)	
>12	1(3.7%)	3 (6%)	
Total	27	49	
Reason for bottle feeding			0.293
Child refusal	12 (30%)	9 (22.5%)	
Mother's personal desire	7 (18%)	12 (30%)	
Mother's health status	4 (10%)	7 (17.5%)	
Other	6 (15.3%)	12 (30%)	
Total	**29**	**40**	

The reasons behind suboptimal breast-feeding were investigated in both groups. Among participants with autism, 13 (45%) of mothers reported their child refusing to be breast fed while 7 (24%) indicated it was the mother's personal desire and 4 (13.7%) indicated mother's health condition with the rest 5 (17%) identifying other reasons. By contrast, among control subjects, 9 (22.5%) mothers gave child refusal as the reason for not breast feeding while 12 (30%) indicated it was the mother's personal desire and 7 (17.5%) related the choice to mother's health condition with the rest 12 (30%) citing other reasons. Suboptimal breast-feeding due to child refusal was two times higher among participants with autism (45%) than control subjects (22.5%). However, this difference was not statistically significant (p-value 0.307).

Emotion and eye gaze

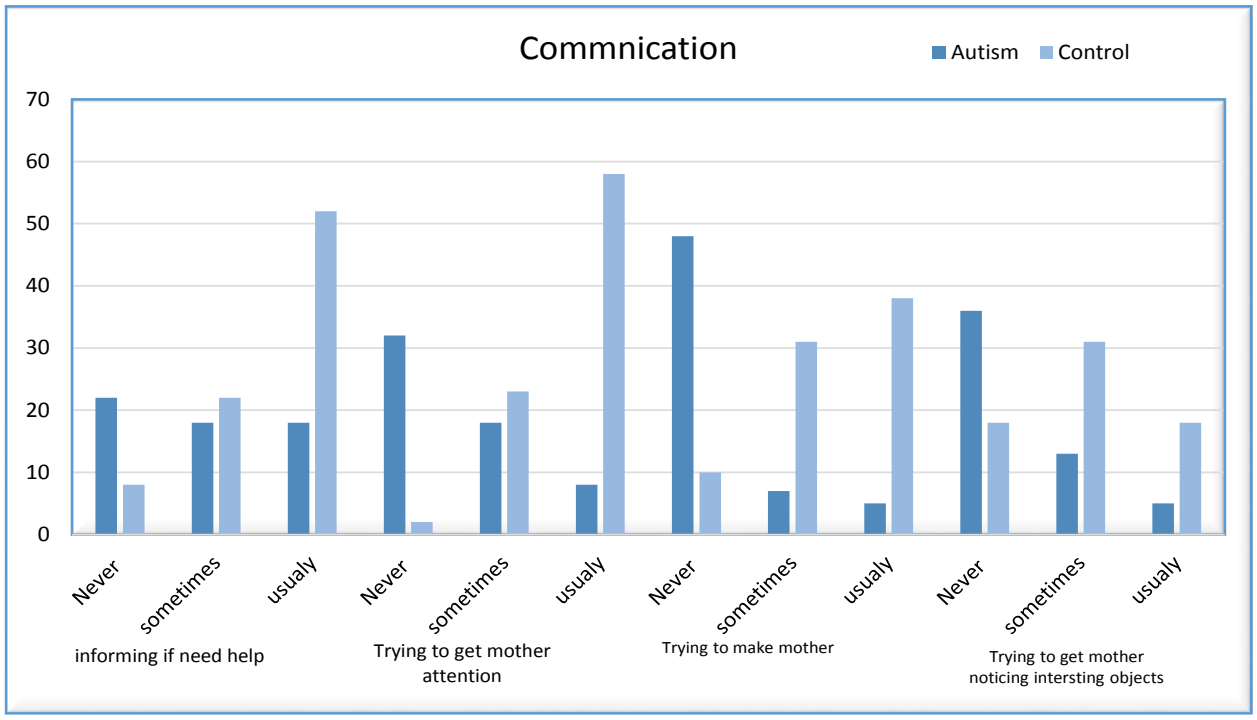
In terms of emotion and level of eye contact, 40 out of 57 (70%) mothers with children who had autism were able to detect if their babies were happy or upset by their eye gaze in their first 18 months of age, while 82% of controls were able to detect if their babies were happy or upset by their eye gaze in their first 18 months of age (highly statistically significant, $p< 0.001$).

Furthermore, 57.8% (33 out of 57 subjects) of participants with autism and 8.3% in the control group (7 out of 84 control subjects) exhibited a lack of eye contact as perceived by their mothers and caregivers (highly statistically significant, $p< 0.001$). Forty five percent of participants with autism and 3% of controls had never simultaneously smiled whilst making eye contact with their parents or caregiver (highly

statistically significant, p<0.001). Furthermore, 12 out of 57 (21%) participants with autism and 69 out of 84 control subjects (82.1%), had usually, simultaneously smiled whilst making eye contact with their parents or caregiver (highly statistically significant, p< 0.001).

Thirty five out 57 (61.4%) participants with autism and 5 subjects out of 84 (10.4%) had never gazed toward anything that had been pointed out to them by their parents or caregivers (highly statistically significant, p<0.001). In addition, 14.2% of participants with autism and 65.4% of the control group routinely gazed at things that were pointed out to them by their parents or caregivers (highly statistically significant, p< 0.001).

Figure 1. Demonstrate communication



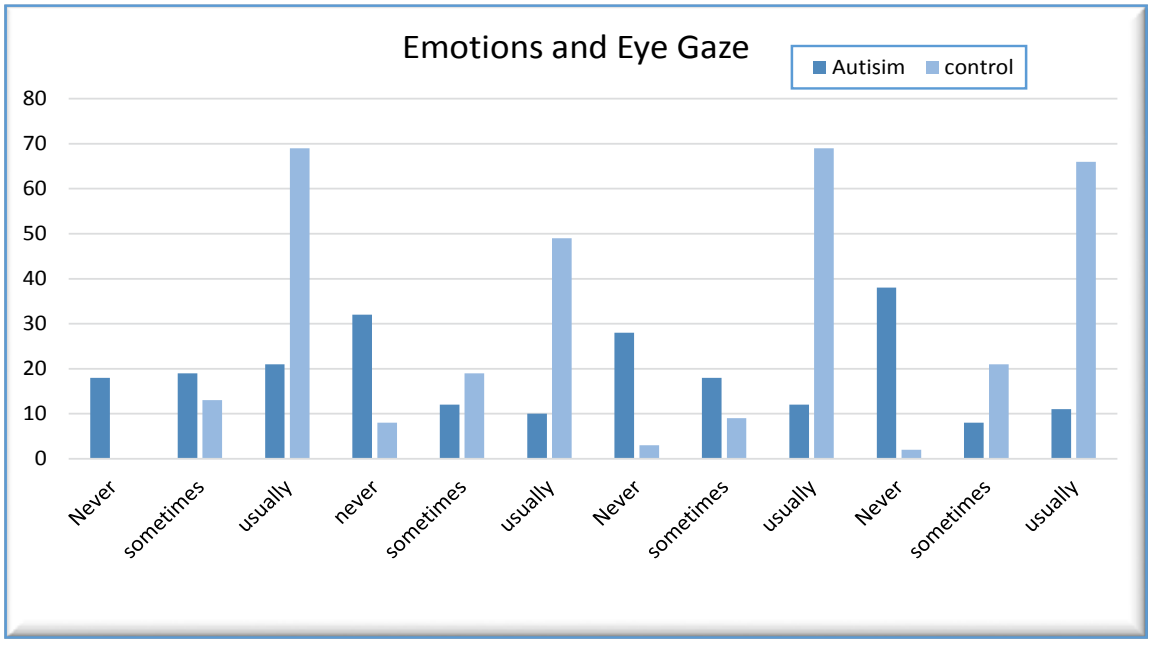
Communication

There were 22 (38.5%) and 6 (7.1%) of participants with autism and control subjects who never tried to inform their mother or caregivers when they needed any help. In addition, 16 (28%) of participants with autism and 23 (27.3%) of control subjects answered with sometimes. Furthermore, 16 (28.1%) of participants with autism and 53 (63%) of control subjects answered with most of the time. For the remaining three participants with autism and two control subjects, their mothers or caregivers couldn't remember if their children were able to express whether or not they required help (highly statically significant, p< 0.001). Thirty two participants with autism (56.1%) and two (2.3%) from the control group could did not attempt to re-engage the attention of their parents or caretakers when they were not paying attention (highly statistically significant, p < 0.001). In addition, 16 (28%) and 8 (14%) of participants with autism, responding sometime and most of the time respectively, did not attempt to regain the attention of their parents or caretakers when they were not paying attention. However, 24 (28%) and 57 (67.8%) control subjects did not attempt to regain the attention of their parents or caretakers when they were not paying attention (high statically significant, p<0.001).

Nine (7%) of the participants with autism and 67 out of 84 (80%) of the control subjects were interested in doing things to make their parents and caretakers laugh most

of the time (highly statistically significant, p< 0.001). Conversely, 43 out 57 (75.4%) participants with autism and 10 out of 84 (12%) from the control group were never interested in making their families laugh as perceived by their parents and caregivers (highly statistically significant, p< 0.001). Moreover, about 59.6% of participants with autism (34 out of 57) and 20.2% of control subjects (17 out of 84) never showed interest or attempted to get their parents to notice interesting objects (highly statistically significant, p< 0.001). Whereas, 21% of participants with autism (12 out of 57) and 36.9% of control subjects (31 out of 84) were sometimes showing such interest. Similarly, 8.77% of participants with autism (5 out of 57) and 21.4% of control subjects (18 out of 84) have shown positive interest and attempted to get their parents to notice interesting objects most of the time. These data are statically significant (p<0.001).

Figure 2. Demonstrate emotions and eye gaze



Gesture

Thirty one out of 54 (54.38%) participants with autism and three children in the control group (3.57%) never took things and gave them to their mother, e.g. toy, bag, glasses, mobile phone, (highly statistically significant, p <0.001).

Moreover, on questioning as to whether the child was showing things to his/her mother in order to see them rather than take them 41 (71.9%) participants with autism had never done this compared with only 14 controls (16.6%). On the other hand, only 7 (12.28%) participants with autism were reported as doing this often compared with the majority of the control group (32 participants; 38.09%, which was highly statistically significant, p-value <0.001.

Furthermore, the large bulk of the group with autism (33 participants; 57.89%) never waved their hands in order to welcome or bid farewell to other people compared with 4 children in the control group (4.76%).

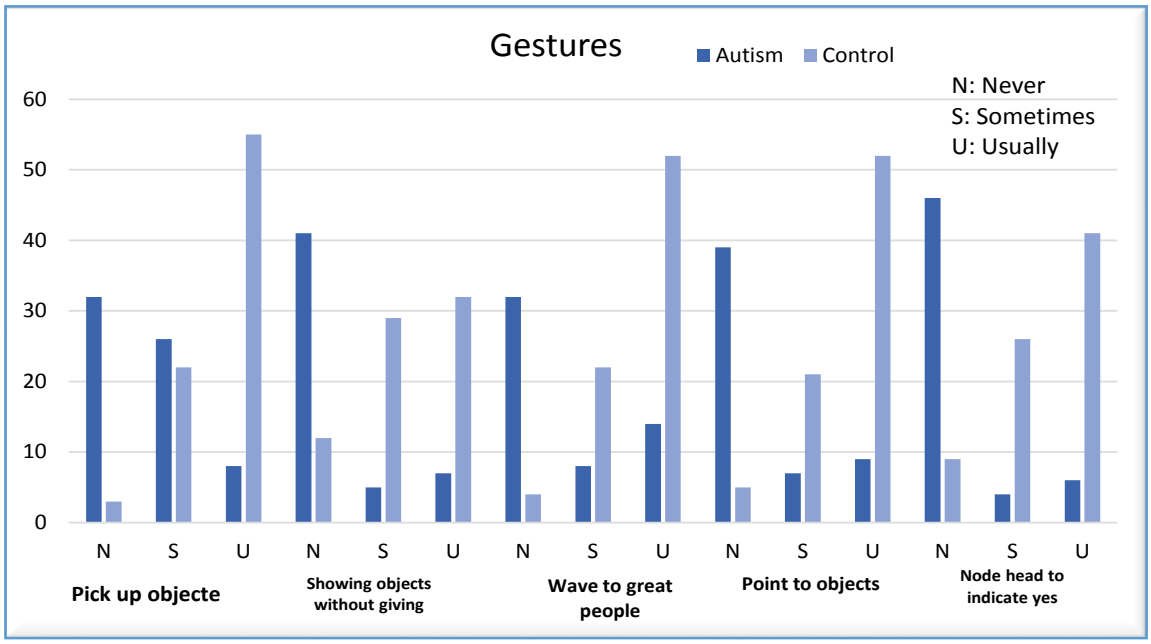
In comparison, only 14 (24.56%) participants with autism have been reported doing this often in contrast to the majority of the control subjects 55 children (65.5%), which was highly statistically significant, p-value <0.001).

Moreover, on asking about whether the child was pointing to things around him/her by his/her hands, e.g. if the bell rings he/she pointed to the door to let his/her parents know), 39 (68.42%) participants with autism and 4 (4.76%) controls were reported as never

having done this. Whereas, there were 9 (15.78%) participants with autism against 52 (61.90%) normal participants who were reported as they often used to do such thing, which was highly statistically significant, p-value <0.001).

In addition, on reporting whether the children were shaking their head to show their acceptance to something, a sum of 45 (78.95%) of participants with autism had never done this. In contrast, in the control subjects there are only 9 children (10.71%) who never did such thing. Whereas, there are only 7 autistic children were often doing this (12.28%) compared to 41 normal children (48.81%), which was highly statistically significant, p-value <0.001).

Figure 3. Demonstrate gesture



Sounds and words

Furthermore, among 57 participants with autism, there were 29 (50%) who were unable to use any sounds or words in order to get attention and help compared to 7% in the control group. Thirteen out of 57 (22%) of participants with autism and 14 out of 84 control subjects (16.6%) were sometimes able to use such sounds and words, which was highly statistically significant, p-value <0.001). Similarly, 19 out of 57 (32.3%) participants with autism were never able to string words and sounds together such as, uh oh, mama, gaga and bye bye, compared to 4.7% in the control group. Sixteen out of 57 (28%) participants with autism and 6 out of 84 (7.1%) control subjects were sometimes able to do such things, which was highly statistically significant, p-value <0.001).

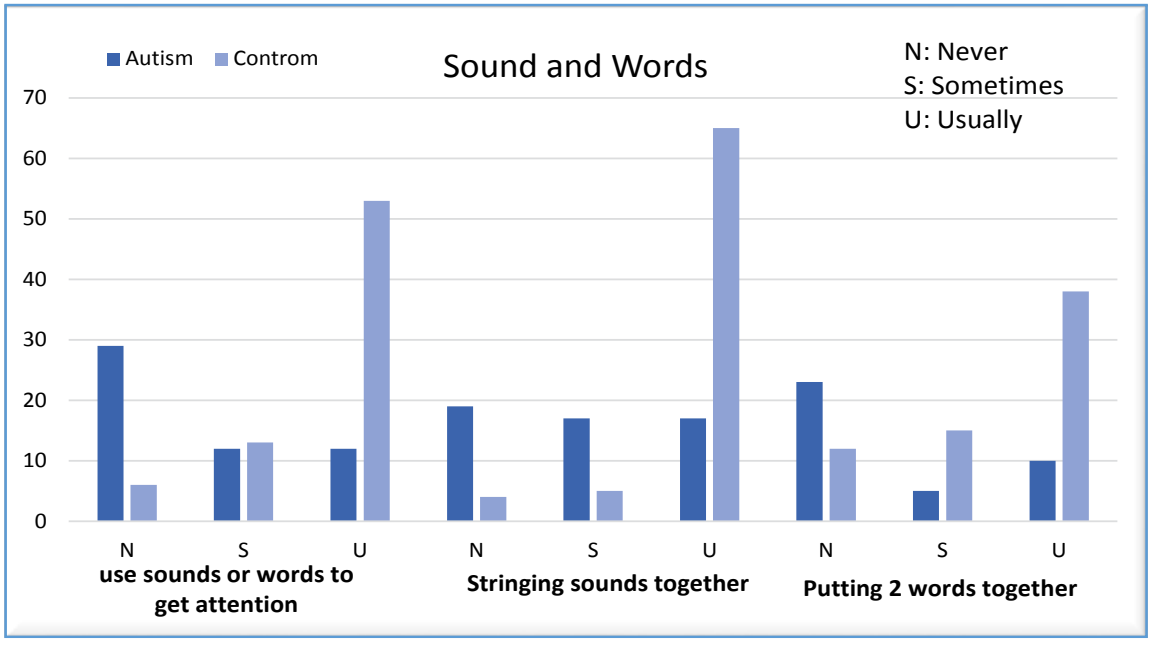
Twenty out of 57 (35%) participants with autism and 3 out of the 84 (3.6%) of the control subjects were unable to use any of the following constant words "ma, na, ba, da, ga, wa, la, ya, sa, sha", which was highly statistically significant, p-value <0.001. Moreover, 14 out of 57 participants with autism were able to use only one of two words while only 4 participants with were able to use more than 8 of those constant words. In contrast, 21 normal participants were able to use one to two words and 9 from the control group were able to use more than eight of those constant words, which was also highly statistically significant, p-value <0.001).

Thirty participants (52%) with autism and 9 (10%) from the control group were unable to use any meaningful words such as baba and mama. Moreover, 13 (22%) participants with autism were able to use one to three meaningful words compared with 35 (41%) control

subjects, which was highly statistically significant, p-value<0.001. in addition, 8 (14%) participants with autism and 20 (23%) normal control were able to use between four to ten meaningful words. One (1.7%) participant with autism and six (7%) normal control used more than 30 words by the age of 18 moths (statistically significant).

Twenty four out of the 57 (42%) participants with autism and 13 out of the 84 (15%) from the control group were unable to put two words together; for example, bye-bye daddy, which was statistically significant. However, five (8%) of the autistic subjects and 15 (18%) of the normal control, were sometimes able to put two words together. Moreover, 10 (17%) participants with autism compared to 36 (43%) of the control subjects were able to put two words together most of the time (highly statistically significant, p value is < 0.001).

Figure 4. Demonstrate sounds and words



Perception and understanding

20 out of 57 (35.08%) autistic subjects and 2 (2.3%) normal control were never able to look or turn their heads when their mothers call them.

Moreover, 27 out of 57(47.36%) autistic subjects and 11 out of 84 (13%) of normal control cannot understand different words or phrases without gestures. While

around 10 out of 57 (17.54%) autistic subject and 23 out of 84 (27.38%) normal subjects can understand 4 to 10 words without gesture (statistical significant, P < 0.001).

Object use

Furthermore, 25 out of 57 (43%) participants with autism and 2 (2%) from the control group showed no interest in playing with a variety of objects. However, 7 (12%) participants with autism and 55 out of 84 (65.47%) from the control group were interested in playing with a variety of objects most of the time (highly statistically significant, P< 0.001). With a significant p value (less than 0.001), there were 18 out of 57 (31.57%) participants with autism and 6 (7%) from the control group who were unable to use objects appropriately, e.g. using toothbrush to brush their teeth. While 7 (12%) participants with autism and 26 out of 84 (45.61%) from the control group could use correctly more than 8 objects.

Twenty out of 57 (35.08%) participants with autism and 11 (13%) controls were unable to stack any blocks. In contrast, there were 13 (22%) participants with autism and 26 out of 84 (30.95%) from the control group who were able to stack 3-4 blocks. In addition, 2 (3%) of the autistic subjects and 11 (13%) of normal subjects can stack more than 5 block, which was statistically significant p<0.023.

Furthermore, 34 out of 57 (59.64%) of participants with autism and 10 (12%) from the control group were not able to pretend play with toys, e g. feed a stuffed animal, put a doll to sleep or put an animal figure in a vehicle. However, 3 (5%) of participants with autism and 41 out of 84 (48.80%) control subjects were always pretending to play with toys, which was highly statistically significant, p<0.001.

Figure 5. Demonstrate perception, understanding and object use

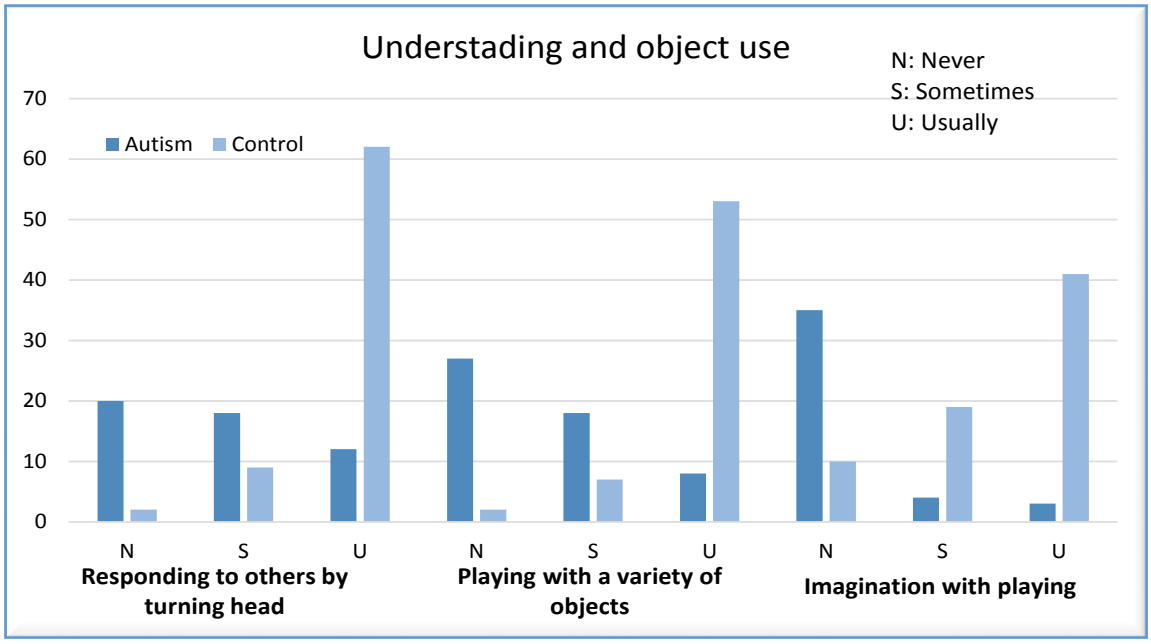


Table 5: Sounds, words, perception and object use

Characteristics	Cases (*n*= 57)	Control (*n*= 84)	P value
Number of constant sounds the child uses			*>0.001*
0	20	2	
1-2	14	23	
3-4	13	21	
5-8	4	15	
>8	4	12	
Number of meaningful words the child uses			>0.001
0	30	9	
1-3	13	35	
4-10	8	20	
10 -30	4	7	
>30	1	6	
Child understanding of words without gesture			>0.001
0	27	11	

1-3	6	21	
4-10	10	23	
11-30	3	11	
>30	5	8	
Appropriate use of objects such as cup and bottle			0.001
0	18	6	
1-2	14	17	
3-4	12	16	
5-8	5	15	
>8	7	26	
Number of blocks child can stack			>0.001
0	20	11	
1-2	10	15	
3-4	12	19	
>5	**2**	**11**	

Discussion

Autism spectrum disorder (ASD) comprises a group of complex neurodevelopmental disorders characterized by impaired social interaction and communication.[19] Identifying ASD as early as possible is the most important step to be achieved because early intervention can result in a significant improvement of associated symptoms. Delayed attainment of social skill milestones, including joint attention, social orienting, and pretend playing are important early warning signs of ASD. Furthermore, signs such as deficits in response to voice, calling their name,[14] and language impairment during communication are considered less specific signs of ASD. In addition, repetitive behaviors and restricted interests are signs, which may appear following the social skills and communication impairments[20].

Results from the current study demonstrated that ASD is more common among boys than girls (7:1). This finding is consistent with the other studies[21] thus suggesting that gender is a risk factor.

In the current study, no significant differences were found between participants with autism and control subjects in the health status of the mother during pregnancy (e.g. anaemia and diabetes), duration of pregnancy and the mode of delivery. This was contrary to a study conducted in Oman in 2010, which showed that the percentage of premature deliveries was three times higher in cases with autism than in control participants. Moreover, frequent incidences of serious illness or trauma during pregnancy were reported in the same study among participants with autism more than controlled subjects.[21]

The sociodemographic determinants, including parent's age, educational level and family income are similar in both groups. These findings suggest that there is no influence of these factors on the possibility of having child with autism.

Several breast-feeding practices and their influence on the chance of having child with autism have been conducted. It was proved that breast-feeding decreases the likelihood of a child to have autism spectrum disorder.[22,23] A case–control study conducted by Schultz et al. research group, based on an online parental survey of approximately 1000 children with autism and control group children reported the absence of breast-feeding is significantly associated with an increased likelihood of an autism spectrum disorder (OR 2.48, 95% CI 1.42–4.35). The study also found a prolonged duration of breast-feeding was associated with a decrease in the likelihood of an autism spectrum disorder diagnosis.[22] Alfarisi et al. concluded that an increased risk of ASD has been found to be associated with suboptimal breast-feeding practices in Oman.[21] However, despite all the previous studies, the present study demonstrated that there was no difference in the incidence of ASD among breast-fed and bottle-fed subjects compared to the control group. The results of the current study are not in

agreement with Alfarisi and Schultz studies, because the social practices for breast-feeding is strongly encouraged despite difficulties such as child rejection of breast-feeding. Therefore, child refusal of breast-feeding is not considered to be a warning sign of ASD.

Language development is a crucial life skill established in early childhood. Children who showed delay in their language skills should be detected early as it can be a warning sign about the child's developmental behaviour. Research over the past decades have determined multiple language predictors that are indicators of impaired language development, which assure earlier identification and thus early intervention.[24,25] These predictors are emotion and use of eye gaze, use of communication, use of gestures, use of sounds, use of words, understanding of words and use of objects. Children who are delayed in many of these indicators from around 18 months of age are more likely to have ASD. As such, evaluating these language predictors is a promising solution for identifying toddlers at risk and starting treatment earlier than 18 month of age, which offers the opportunity for significant early intervention.[34]

Regarding emotion and eye gaze, the current study showed that there is a significant difference between the group with autism and the control group. Subjects with autism had notable impairment in their eye gaze and emotional affect. About 26.3% from the group with autism demonstrated lack of warm and joyful expressions with gaze when they were under age 18 months while none from the control group demonstrated such difficulty. In addition, 57.8% from the group with autism exhibited a lack of shared attention with eye gaze when engaged with their parents and caregivers as compared to 8.3% from the control group. Furthermore, 45% of those with autism had lack of facial expressions in their first 18 months of age while in control group only 3% had this sign. Moreover, around 61.4% from the group with autism demonstrated poorly coordinated eye gaze and were unable to respond when their parents or caregivers pointed out objects to them. This difficulty was reported in only 10.4% of the control group. These findings are consistent with past research on children diagnosed with autism in their first two years of life.[15]

Previous reports confirmed that lack of communication is an early indicator of autism.[26] In the current study, it lack of communication in participants was detected in the first 18 months of age. In addition, the results showed that this was the most common concern for parents that led them to seek medical help for their children. However, our results showed that 38.5% of participants with autism were found to have difficulties in communicating with their parents and lack of expression for their demands before or around 18 months of age. While in control subjects, it was only 7%. Moreover, 56% of participants with autism were demonstrating a poor ability to attract the attention of their parents or caregivers. This difficulty was reported in only 2% of the control subjects. Furthermore, lack of shared enjoyment was a problem for 75.4% participants with autism while for the control group it was 10%. Moreover, those with autism exhibited more lack of sharing interest in their first 18 months of life than control subject (57% and 20% respectively).

In the field of words and sounds, the current study found that approximately half of the participants with autism were unable to use any sounds or words to seek help from others in their first 18 months of life while only 7% from the control group had this difficulty. Moreover, 32% of those with autism were unable to string any words together as against 4.7 % from the control subjects. Around 35% of participants with autism were unable to maintain a constant vocabulary compared with 3.6% of control subjects. A study conducted in Australia reported that failure of toddlers at 12 months to use sounds and words could be a risk factor for a future speech delay, ASD or any other developmental abnormality.[16] The same study demonstrated that at this age, it could be difficult for the parents to remember their child's communication ability compared to when child is older,[16] which likely explained the small percentages from the control group.

Furthermore, the current study found that 52% of participants with autism were unable to use any meaningful words and 42% were unable to string two

words together at all. In contrast, 10% of control subjects were unable to use any comprehensible words and 15% were unable to put two words together. It has been found that toddlers with ASD possess a limited vocabulary and less complex syllabic structures.[15]

In the current study, the lack of comprehensible words was evident with 82% of participants with autism being unable to comprehend what was said to them.

In addition, those with autism in the current study were unable to respond by looking or turning toward their parents when called. Additionally, they were unable to understand different words or phrases in the absence of clear prompting. In contrast, none of the control subjects demonstrated this difficulty. The findings were consistent with a prospective study in which three groups being compared were defined on the basis of diagnostic assessment at 24 months: (1) siblings with ASD (n= 15), (2) siblings not meeting diagnostic criteria for ASD (n= 82), and (3) low-risk controls (n= 49) - none of whom had ASD. Participants with ASD exhibited delays in early language and communication when compared with siblings and controls without ASD. Further, participants with autism exhibited delays in their understanding of words and use of gestures. The prospective study highlighted how delays in communication and language development can be early sign in those with ASD. The study recommended monitoring children for delays in gesture as such delays are among the earliest indicators of ASD.[27]

As it relates to use of every-day objects, the current study found that 44% of participants with autism were not interested in playing with a variety of toys and were likely to display repetitive movements with such objects instead. An observational study published in 2012 suggested that repetitive behaviour among young subjects with ASD in clinic and home settings was an early indicator of ASD.[28] Children gain an understanding of objects and people in their environment through the play. Observing a child during play is a helpful indicator for understanding what the child knows. By the age of 12 to18 months, toddlers start to push, pull, stack, turn on and otherwise physically manipulate objects. They start to play with different objects and use them in ways that appropriately foster healthy development. These developing abilities highlight the normal progression of children's play skills. This was an important consideration in the present study, which found that young subjects with ASD were unable to use objects appropriately, e.g. using toothbrush to brush their teeth or use the spoon to eat. Indeed, 32% of participants with autism compared to 46% from the control group were able to use about 30 objects correctly. In addition to that, 35% of those with autism were unable to stack any toy blocks when compared to 13% of the control group. Furthermore, 60% of participants with autism were unable to engage in imaginary play with toys, e.g. feed a stuffed animal, help a doll get off to sleep or put an animal figure in a vehicle. The play behaviors of children provide a baseline for understanding their overall developmental level; for example, imaginary play can reflect a child's ability to watch and imitate the actions of other people in their environment. In the current study, this important developmental milestone was less apparent in participants with autism as there were clear limitations to their social responses, which seemed to affect play behaviour and imaginary play in those under two years of age who had autism.[29]

Results from our study demonstrated statistically significant impairments of gesture for participants with autism at 12 to 18 months of age as compared with controls. These impairments were characterized by limited ability to point towards objects, lack of waving hands or head nodding, and difficulty in using the hand as a tool without directed gaze. Our results support several previous studies examining levels of numerous deficits in children with autism, such as difficulties in focusing on another person or drawing other people's attention to an object.[30] Other studies have emphasized that the main deficits reported were in gestural joint attention.[31] Another study that examined the gesture defect in subjects with autism concluded that the subjects studied were highly defective in symbolic gestures, particularly nodding their head as an acceptance sign and many other actions, and instead of this, they mainly communicate using primitive motoric

gestures.[32] This explains the difference in gesture that has been noticed between participants with autism and those without the disorder.

Limitations

The current study is dependent on memory recall of data, which could have introduced recall bias and misclassification error, and it is considered as one potential weakness. To overcome this bias, a future prospective study is highly recommended. In addition, because of the time limit the research was conducted on a relatively small sample size due to the difficulty in contacting families who had children diagnosed with autism because the disorder is not considered common.

Conclusion

The current study, which was conducted in the Riyadh area, identified many early warning signs of ASD in Saudi participants aged 12 to 18 months, including loss of shared enjoyment with family members, absence of early speech symbols such as stringing sounds together, using consonant sounds and using meaningful different words, loss of eye to eye contact between the child and others and lack of imaginative play.

Recommendation

Larger scale epidemiological studies are strongly recommended for the population of Saudi Arabia in order reach a conclusive decision about the importance of early detection of ASD through the early warning signs. Furthermore, education of primary health care providers and professionals about early warning signs associated with ASD would be essential.

Acknowledgments

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الملخص

الخلفية: التشخيص المبكر لطيف التوحد يعتبر من أهم الخطوات لعلاج طيف التوحد وذلك لأنه هناك علاقة وطيدة بين الاكتشاف المبكر وعلاج المرض. وقد أثبتت الدراسات ان الاضطرابات لدى أطفال التوحد تتعلق بمهارات يكتسبه الطفل الطبيعي ما بين عمر 12-18 شهر من ولادته. **منهجية البحث:** في هذه الدراسة الوصفية، تم إشراك عدد 57 من الأطفال المصابين بالتوحد ومقارنتهم ب 84 طفل طبيعي، وذلك بالقيام بمقابلات مع الوالدين أو رعاتهم وتعبئة استبانة، حيث تحتوي الاستبانة على أسئلة عامة (اجتماعية واقتصادية) عن الطفل ووالديه، بالإضافة إلى أسئلة عن تصرفات الطفل وسلوكه في عمر 18 شهراً وما دونها، كما تحتوي الاستبانة على شرح مبسط للبحث ونموذج إقرار بسرية المعلومات وطلب موافقة على تعبئته.

تم جمع البيانات في الفترة من يناير 2013م إلى مارس 2013م، ومن ثم تحليلها عن طريق برنامج (SPSS)

النتائج: أ ظهرت الدراسة أن ضعف مهارات التواصل بالعين مع أفراد العائلة، عدم القدرة على التعبير بالفرح او الحزن، عدم القدرة على إصدار أصوات معينة وعدم القدرة على اللعب التخيلي تعتبر من العلامات المبكرة لطيف التوحد لدى الأطفال بعمر 12-18 شهر السعوديين في منطقة الرياض.

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