Characteristics and outcomes of the screening program of autism spectrum disorder in Primary Healthcare Centers in Bahrain

Muna A. Almohri[1], Mahmood A. Alawainati[1,2], Zahra A. Ayoob[1], Nayla A. Nasser[3], Noof A. Abdulaal[1], Ahmed A. Aldailami[4], Donya A. Aldailami[4]

Abstract:

BACKGROUND: Autism spectrum disorder (ASD) is a chronic neurodevelopmental condition that requires early diagnosis and intervention for the improvement of the patient's skills and functioning. Several guidelines, therefore, recommend the screening of all children for ASD. This study determined the outcomes of ASD screening program in Primary Healthcare Centers (PHCs) in Bahrain.

MATERIALS AND METHODS: A cross-sectional study was conducted in 12 of the 27 PHCs in Bahrain. The Modified Checklist for Autism in Toddlers-Revised (MCHAT-R) was completed for children who attended the selected centers. Findings from the checklists and the outcome of positive screening cases were recorded. MCHAT-R scores of <3 were indicative of a low risk for ASD. Children with moderate and high MCHAT-R risk were referred for psychiatric assessment. SPSS version 25.0 was used for data analysis; mean and standard deviation were calculated for continuous variables, and categorical variables presented as frequency and percentage. Chi-square test or Fisher's exact test, as appropriate, used to test for statistical significance.

RESULTS: A total of 3729 MCHAT-R checklists of children with a mean age of 2 years were included. Most children were Bahraini (78.0%), half of whom were males (51.3%). While most of the children (98.8%) had a low-risk MCHAT-R score, 1.2% had a moderate-high risk MCHAT score (12.33/1000). Of the cohort, 19 cases (0.51%) had ASD, 5.10/1000 children. Nearly two-thirds of children with confirmed ASD were males (63.2%), and one-third were females (36.8%). In addition, 14 cases (41.2%) of those who had moderate-high MCHAT refused to follow the subsequent diagnostic protocol.

CONCLUSION: This study revealed a low prevalence of positive MCHAT-R screening and confirmed ASD cases. The vast majority of children who were positive on screening had a confirmed diagnosis of ASD. Some cases with positive MCHAT results failed to follow up for diagnosis. Therefore, improving parental and community awareness regarding ASD is important for a better outcome.

Keywords:

Autism spectrum disorder, children, primary healthcare centers, screening

[1]Medical Services, Primary Healthcare Centres, [3]Department of Child and Adolescent, Psychiatry Hospital, Government Hospitals, Manama, [2]Department of Family Medicine, Royal College Surgeons in Ireland - Medical University of Bahrain, [4]Department of Surgery, King Hamad University Hospital, Muharraq, Bahrain

Address for correspondence:
Dr. Muna A. Almohri, House 1495, Road 2531, Block 525, Sar, Bahrain. E-mail: muna.almohri@gmail.com

Introduction

Autism spectrum disorder (ASD) is a chronic neurodevelopmental condition characterized by the impairment of social communication and social interaction in several contexts as well as restricted, repetitive behaviors, interests, and activities.[1] Early diagnosis and management of ASD are crucial for the improvement of patient outcomes.[1] Therefore, some agencies and academies such as the Centers for Disease Control and Prevention (CDC) and the American Academy of Pediatrics recommend the screening of children for

ASD at 18 and 24 months of age as early interventions are effective and important.[2]

The prevalence of ASD is variable across the studies. In general, the prevalence ranges between 2.04 and 27.5/1000 children. In Bahrain, one study reported a prevalence of 4.3/1000 children.[1,2] While many papers in the literature consistently indicate a higher prevalence in favor of male diagnosis of ASD, with a 4:1 male-to-female ratio, several studies explore the possibility of biases that prevent females from being initially diagnosed with ASD, thus suggesting that the true ratio might be lower.[3,4] A large systematic review of 54 studies and more than 50,000 patients with ASD reported an ASD male-to-female ratio of 3:1.[5]

The characteristics of ASD are diverse but include unusual motor or verbal behaviors, and deficits in social interactions and communication.[6] Therefore, ASD coincides with other speech and language disorders, as well as neurodevelopmental conditions such as epilepsy and cerebral palsy. This highlights the importance of awareness of such associations to ensure thorough evaluation and assessment.[7]

Primary care physicians play a fundamental role in screening for ASD using validated tools such as the Modified Checklist for Autism in Toddlers-Revised (MCHAT-R), the Screening Tool for Autism in Toddlers and Young Children, and the Infant-Toddler Checklist.[8] In April 2021, MCHAT-R was introduced in all Primary Healthcare Centers (PHCs) in Bahrain to screen all toddlers at the age of 2 years for ASD.[9] It is also used for other ages up to 5 years if indicated. Children with positive MCHAT-R are referred for psychiatric evaluation using the Childhood Autism Rating Scale 2 (CARS 2) and Diagnostic and Statistical Manual-5 (DSM-5) criteria.

Conflicting findings have emerged from several studies conducted to determine the outcomes of the MCHAT-R screening program. In the Arab region, a study in Saudi Arabia revealed that 12% of screened patients had positive results while the majority of children had a low-risk MCHAT score (88%). However, only 1% of the participants were confirmed to have ASD.[10] Lebanon exhibited higher results, with 21.8% classified as moderate risk and 2.9% as high risk.[11] Chaaya *et al.*, in a study of toddlers from 177 nurseries in Lebanon, reported comparable findings. Approximately, 26% of the population was identified as high risk and labeled as possibly having ASD.[12] Similarly, a cross-sectional study conducted in Egypt revealed that 24.9% of the population identified as medium risk, while 2.8% were at high risk for ASD.[13] In Turkey, the screening program using MCHAT was positive for around 10% of the cases (9.8%), while 0.8% were confirmed to have ASD.[14] The rate of children who screened positive for ASD using MCHAT screening was 9.4% in India.[15]

Interestingly, some studies have revealed unfavorable outcomes of the MCHAT-R screening program. For instance, a study in Egypt revealed a high false-positive rate of the MCHAT-R screening program (23.8%) and concluded that the program failed owing to overdiagnosis and overusage of the services.[16]

This study aimed to determine the outcomes of the MCHAT-R screening program which include prevalence of positive MCHAT screening and ASD in children aged 2 years of age attending PHCs. To the best of our knowledge, this is the first study in Bahrain to determine the findings and outcomes of the ASD screening program after its application in PHCs here in Bahrain.

Materials and Methods

This is a cross-sectional study conducted from May to July 2023. Completed checklists (MCHAT-R) for children aged 2 years who attended child screening clinics in the period between August 2021 and January 2022 were studied. This period was selected to ensure that all children with positive results were given adequate time for follow-up and diagnosis. By the lottery method, three PHCs were chosen from each governorate, making 12 out of a total of 27 PHCs distributed over 4 governorates. Ethical approval was obtained from the Ethics Committees Vide Letter No. 39020523 dated 02/05/2023, with a waiver of informed consent since there was no direct relation with human subjects in this study. Considering the total number of children who attended the selected health centers in the specified duration ($n = 9000$), a 5% margin of error, and a 95% confidence interval, a sample size of 369 was needed.

The MCHAT-R screening questionnaire for ASD is composed of 20 questions for children between 16 and 30 months, with a score range of 0 and 20. The answers to the questions in the checklist are completed by the physicians during interviews with the parents or caregivers. Scores between 0 and 2 are indicative of a low risk toward ASD, scores between 3 and 7 are indicative of a medium risk for ASD, while scores of more than 7 are indicative of a high risk for ASD. All patients with medium and high risk for ASD were to be referred to the psychiatric hospital for further assessment and evaluation. In the psychiatric hospital, DSM-5 criteria and CARS 2 are used as diagnostic tools. The total scores of CARS-2 range from 15 to 60; any score of <30 is in the nonautistic range, scores between 30 and 36.5 indicate mild-moderate autism, while scores equal to or more than 37 indicate severe autism.[17]

The MCHAT-R checklists were completed by trained family physicians in the child screening clinics, and according to the MCHAT-R score, the treating family physicians decided on the referral as per referral guidance.

The data collected included data obtained from the manually filled MCHAT-R checklists and the electronic medical records. The manually completed checklists included data on age, sex, nationality, and the details of MCHA-R items and scores, while the electronic medical records included data on referral destinations and outcomes. The electronic medical records of positive cases of screening were reviewed by three researchers: a psychiatrist and two family physicians. All the manually filled MCAHT-R checklists in the selected health centers were included.

The prevalence of positive MCHAT-R tests was calculated by dividing the number of children with medium-high risk for ASD by the total number of participants. The prevalence of ASD was estimated by dividing the number of positive cases according to the DSM-5 criteria by the total number of participants. To calculate the rates per 1000 children, we multiplied the prevalence of positive MCHAT-R and ASD by 1000.

The data were incorporated into an Excel sheet and then to SPSS for analysis (V.25.0; IBM Corp, Armonk, New York, USA). Data cleaning was performed. Means with standard deviations were calculated for continuous variables, while numbers and percentages were calculated for categorical variables. As appropriate, Chi-square, Fisher's exact test, *t*-test, and correlation coefficient were calculated to determine the differences between the groups. $P < 0.05$ was considered statistically significant.

Results

A total of 3729 toddlers were included in the present study. Of all the participants, 51.3% ($n = 1914$) were males and 78.0% were Bahraini ($n = 2908$). The mean age of participants was 2 ± 0.0 years. Table 1 presents the demographic characteristics of the participants.

The distribution of MCHAT questionnaire items is presented in Tables 2 and 3. Smiling back at the parent ($n = 3722$, 99.8%) and looking at the parent in the eyes when talking, playing with him or her, or dressing ($n = 3721$, 99.8%) were the most frequent normal responses. In contrast, being upset with daily noises ($n = 233$, 6.2%) and not playing pretend or making beliefs ($n = 109$, 2.9%) were the most at-risk features.

About 99% ($n = 3683$) of children had a low-risk MCHAT-R score, 0.8% ($n = 31$) had a moderate risk,

and 0.3% ($n = 15$) had a high-risk MCHAT-R score. The overall rate of positive MCHAT cases was 1.2% (12.3/1000 children) [Figure 1].

Of all the cases with moderate and high-risk MCHAT ($n = 46$), 73.9% ($n = 34$) were referred for psychiatric assessment, 5 cases were referred to other institutions (10.9%), and 7 cases (15.2%) were not referred. Of the 20 cases seen in psychiatry, 19 cases (95%) had confirmed diagnosis of ASD according to the DSM-5 criteria. Of the 19 diagnosed cases of ASD, two-thirds of them were males ($n = 12$, 63.2%), and 52.6% (10/19) were classified as mild to moderate while 9 cases (47.4%) had severe ASD according to the DSM-5 and CARS-2 criteria. The rate of confirmed ASD cases was 5.1/1000 children. In addition, 14 cases (41.2%) of those who had moderate-high MCHAT refused to follow the subsequent diagnostic protocol. Regarding those who had positive MCHAT and were not referred for further assessment, 6/7 (85.7%) had underlying neurodevelopmental disorders/syndromes, while 1 case (14.3%) had no obvious reason for nonreferral [Figure 2]. No association was found between the MCHAT score and the severity of ASD according to the DSM-5 criteria ($P = 0.077$, $r = 0.427$) [Figure 3].
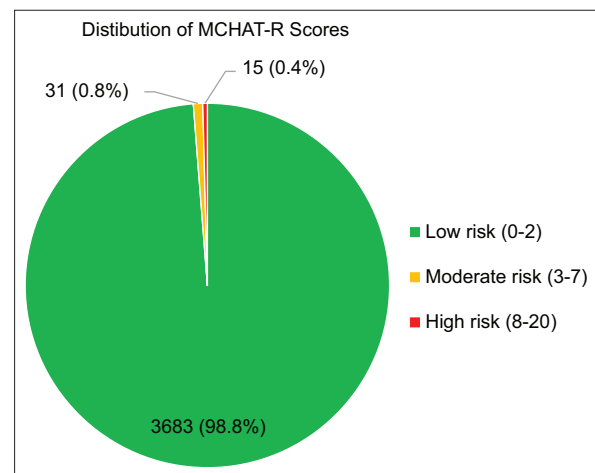
Figure 1: Risk of autism spectrum disorders according to the Modified Checklist for Autism in Toddlers scores among children in Primary Healthcare Centers in Bahrain. MCHAT-R: Modified Checklist for Autism in Toddlers-Revised.

Table 1: Demographic characteristics of children aged 2 years attending Primary Healthcare Centers in Bahrain (*n*=3729)

Variable	*N* (%)
Sex	
Male	1914 (51.3)
Female	1815 (48.7)
Nationality	
Bahraini	2908 (78.0)
Non-Bahraini	821 (22.0)
Age, Mean±SD	2±0.0

SD=Standard deviation

Table 2: Results of the Modified Checklist for Autism in Toddlers Questionnaire among children attending Primary Healthcare Centers in Bahrain (*n*=3729)

Questions	Yes N (%)	No N (%)
1. If you point at something across the room, does your child look at it?	3706 (99.4)	23 (0.6)
2. Have you ever wondered if your child might be deaf?	37 (1.0)	3692 (99)
3. Does your child play pretend or make-believe?	3620 (97.1)	109 (2.9)
4. Does your child like climbing on things?	3703 (99.3)	26 (0.7)
5. Does your child make unusual finger movements near his or her eyes?	81 (2.2)	3648 (97.8)
6. Does your child point with one finger to ask for something or to get help?	3697 (99.1)	32 (0.9)
7. Does your child point with one finger to show you something interesting?	3694 (99.1)	35 (0.9)
8. Is your child interested in other children?	3709 (99.5)	20 (0.5)
9. Does your child show you things by bringing them to you or holding them up for you to see - not to get help, but just to share?	3710 (99.5)	19 (0.5)
10. Does your child respond when you call his or her name?	3705 (99.4)	24 (0.6)
11. When you smile at your child, does he or she smile back at you?	3722 (99.8)	7 (0.2)
12. Does your child get upset by everyday noises?	233 (6.2)	3496 (93.8)
13. Does your child walk?	3717 (99.7)	12 (0.3)
14. Does your child look at you in the eye when you are talking to him or her or playing with him or her?	3721 (99.8)	8 (0.2)
15. Does your child try to copy what you do?	3716 (99.7)	13 (0.3)
16. If you turn your head to look at something, does your child look around to see what you are looking at?	3694 (99.1)	35 (0.9)
17. Does your child try to get you to watch him or her?	3693 (99.0)	36 (1.0)
18. Does your child understand when you tell him or her to do something?	3687 (98.9)	42 (1.1)
19. If something new happens, does your child look at your face to see how you feel about it?	3699 (99.2)	30 (0.8)
20. Does your child like movement activities?	3719 (99.7)	10 (0.3)
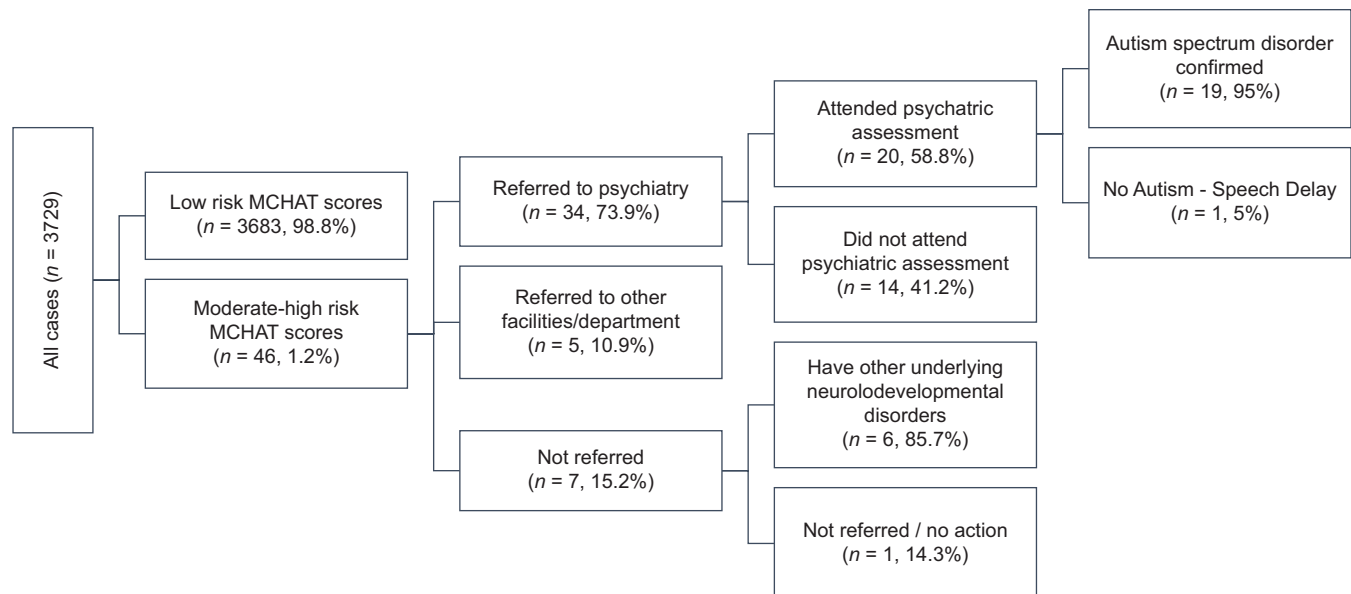
Figure 2: Outcomes and management of positive modified checklist for autism in toddler cases in Primary Healthcare Centers in Bahrain. MCHAT: Modified Checklist for Autism in Toddlers

Discussion

Our study's aim was to determine the findings and outcomes of the MCHAT-R screening program in PHCs in Bahrain. We found that 1.2% of all the children screened had positive MCHAT-R scores (12.3/1000 children). In contrast to our findings, many studies reported higher rates of positive MCHAT cases. Studies from Turkey (9.8%), India (9.4%), Lebanon (21.8%), Egypt (24.9%), and Saudi Arabia (12%) revealed a higher number of children with positive MCHAT screening (moderate-to-high risk MCHAT-R scores) ranging between 9.8% and 24.9%.[12-17]

Compared to our findings, some studies reported higher rates of ASD in children, while lower rates have also been reported. For instance, the prevalence of ASD was lower in Omani children (2.04/1000 children), but a higher

Table 3: Distribution of Modified Checklist for Autism in Toddlers-Revised questionnaire among children attending Primary Healthcare Centers according to their classification categories, Bahrain (n=3729)

Items	Low (n=3683) N (%)	Moderate (*n*=31) N (%)	High (*n*=15) N (%)	P-value
1. If you point at something across the room, does your child look at it?*				
Yes	3679 (99.9)	25 (80.6)	2 (13.3)	<0.001
No	4 (0.1)	6 (19.4)	13 (86.7)	
2. Have you ever wondered if your child might be deaf?*				
Yes	28 (0.8)	4 (12.9)	5 (33.3)	<0.001
No	3655 (99.2)	27 (87.1)	10 (66.7)	
3. Does your child play pretend or make-believe?*				
Yes	3593 (97.6)	23 (74.2)	4 (26.7)	<0.001
No	90 (2.4)	8 (25.8)	11 (73.3)	
4. Does your child like climbing on things?*				
Yes	3664 (99.5)	28 (90.3)	11 (73.3)	<0.001
No	19 (0.5)	3 (9.7)	4 (26.7)	
5. Does your child make unusual finger movements near his or her eyes?**				
Yes	64 (1.7)	9 (29.9)	8 (53.3)	<0.001
No	3619 (98.3)	22 (71.0)	7 (46.7)	
6. Does your child point with one finger to ask for something or to get help?**				
Yes	3670 (99.6)	22 (71.0)	5 (33.3)	<0.001
No	13 (0.4)	9 (29.0)	10 (66.7)	
7. Does your child point with one finger to show you something interesting?*				
Yes	3674 (99.8)	18 (58.1)	2 (13.3)	<0.001
No	9 (0.2)	13 (41.9)	13 (86.7)	
8. Is your child interested in other children?**				
Yes	3676 (99.8)	26 (83.9)	7 (46.7)	<0.001
No	7 (0.2)	5 (16.1)	8 (53.3)	
9. Does your child show you things by bringing them to you or holding them up for you to see - not to get help, but just to share?*				
Yes	3679 (99.9)	26 (83.9)	5 (33.3)	<0.001
No	4 (0.1)	5 (16.1)	10 (66.7)	
10. Does your child respond when you call his or her name?*				
Yes	3679 (99.9)	21 (67.7)	5 (33.3)	<0.001
No	4 (0.1)	10 (32.3)	10 (66.7)	
11. When you smile at your child, does he or she smile back at you?*				
Yes	3681 (99.9)	30 (96.8)	11 (73.3)	<0.001
No	2 (0.1)	1 (3.2)	4 (26.7)	
12. Does your child get upset by everyday noises?**				
Yes	218 (5.9)	9 (29.0)	6 (40.0)	<0.001
No	3465 (94.1)	22 (71.0)	9 (60.0)	
13. Does your child walk?*				
Yes	3680 (99.9)	25 (80.6)	12 (80.0)	<0.001
No	3 (0.1)	6 (19.4)	3 (20.0)	
14. Does your child look you in the eye when you are talking to him or her, playing with him or her, or dressing him or her?*				
Yes	3682 (100.0)	29 (93.5)	10 (66.7)	<0.001
No	1 (0.0)	2 (6.5)	5 (33.3)	
15. Does your child try to copy what you do?*				
Yes	3682 (100.0)	29 (93.5)	5 (33.3)	<0.001
No	1 (0.0)	2 (6.5)	10 (66.7)	
16. If you turn your head to look at something, does your child look around to see what you are looking at?*				
Yes	3669 (99.6)	22 (71.0)	3 (20.0)	<0.001
No	14 (0.4)	9 (29.0)	12 (80.0)	
17. Does your child try to get you to watch him or her?**				
Yes	3664 (99.5)	23 (74.2)	6 (40.0)	<0.001
No	19 (0.5)	8 (25.8)	9 (60.0)	

Contd...

Table 3: Contd...

Items	Low (*n*=3683) N (%)	Moderate (*n*=31) N (%)	High (*n*=15) N (%)	*P-value*
18. Does your child understand when you tell him or her to do something?*				
Yes	3675 (99.8)	10 (32.3)	2 (13.3)	<0.001
No	8 (0.2)	21 (67.7)	13 (76.7)	
19. If something new happens, does your child look at your face to see how you feel about it?*				
Yes	3670 (99.6)	25 (80.6)	4 (26.7)	<0.001
No	13 (0.4)	6 (19.4)	11 (73.3)	
20. Does your child like movement activities?*				
Yes	3677 (99.8)	30 (96.8)	12 (80.0)	<0.001
No	6 (0.2)	1 (3.2)	3 (20.0)	

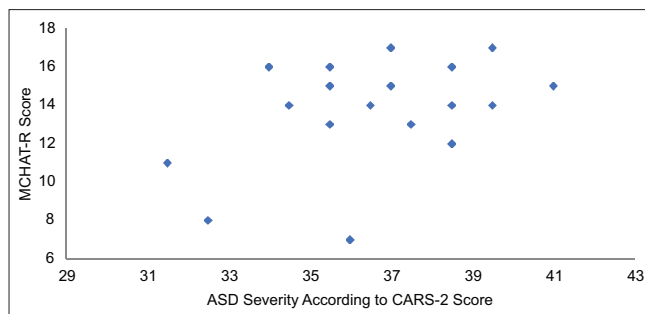*Fisher's exact test, **Chi-square test

Figure 3: Correlation between Modified Checklist for Autism in Toddlers-Revised and Childhood Autism Rating Scale 2 scores ($r = 0.427$, $P = 0.077$). MCHAT-R: Modified Checklist for Autism in Toddlers-Revised, CARS-2: Childhood Autism Rating Scale 2, ASD: Autism spectrum disorder

prevalence was reported in Qatar (11.4/1000 children).[1] Internationally, the CDC, through the Developmental Disabilities Monitoring Network, reported a much higher ASD prevalence in the United States in 2020 (27.6/1000 children).[3] Compared to a previously conducted study on the prevalence of ASD in Bahrain, the current study revealed a higher prevalence of confirmed ASD (0.43/1000 children vs. 5.1/1000 children).[2] The differences observed in the various studies can be attributed to several factors such as varying age groups, settings, sample size in each study, the utilization of diverse screening tools, and the application of different diagnostic criteria. For instance, the study conducted in Bahrain considered all adult Bahraini population in its analysis, while the study in Egypt was of children aged 2–5 years. Symptoms of autism often become more apparent with increasing child's age; therefore, including children older than 2 years may explain the higher prevalence of abnormal M-CHAT screenings observed in some studies. Here, we considered children aged 2 years in the analysis. In addition, genetic factors could have played a role in the variation in the prevalence of ASD in the literature.[1,13]

The results of this study showed that most of the children with confirmed ASD were males. In line with our findings, the literature constantly revealed that ASD has a male predominance.[5-7] Similar findings were also found in the previously conducted studies in Bahrain and other countries.[2,4]

As for the MCHAT-R questionnaire, the most frequent at-risk features identified were being upset with daily noises (6.2%) and the inability to play pretend or make beliefs (2.9%). This can be elucidated by the fact that up to 90% of people with ASD experience some form of sensory hypersensitivity, including hearing.[18] In addition, studies have demonstrated that the absence or deficiency in symbolic play can serve as an early indicator of ASD between the 1st and 2nd years of life.[19] However, there are no studies in the literature to compare the scoring of the 20 components of the MCHAT-R questionnaire across different countries.

Within the positively identified cases from MCHAT-R screening in the present study, other underlying syndromes and neurodevelopmental abnormalities such as intellectual disabilities and hearing disorders led to a positive screening score. This could affect the outcomes of ASD screening programs. A similar observation was also noted by Alawami *et al*., in Saudi Arabia.[10] Furthermore, no association was found between MCHAT-R items and ASD severity. Despite the absence of studies on such an association in the literature, further studies are warranted to explore its implications.

The majority of children who had positive MCHAT-R test results were referred to the psychiatry department for further assessment, and nearly all those children who were further assessed by psychiatrists were diagnosed with ASD. This highlights the importance of screening in health centers for the early diagnosis of ASD. However, a considerable number of parents of children with moderate-high risk MCHAT-R refused to follow the diagnosis protocol. Parents differ in their inclination to accept the diagnosis of a child, sometimes strategically avoiding and reluctant to acknowledge a diagnosis and seek care.[20]

This study has several strengths. It is the first study conducted in Bahrain that explores the characteristics

and outcomes of the ASD screening program in PHCs. It had a large sample size and included multiple health centers from different regions in the kingdom. However, there are some limitations, as some children with positive MCHAT scores were lost to follow-up for further diagnostic processes. Considering the design of the study, some sociodemographic characteristics including parents' age, level of education, and family history of autism were not available in the medical records.

Conclusion

In summary, the majority of 2-year-olds attending PHCs had low-risk MCHAT-R scores resulting in low prevalence of both positively screened cases and ASD. The vast majority of positive MCHAT-R cases seen in Psychiatry had confirmed diagnosis of ASD. This highlights the effectiveness and importance of the screening program in PHCs for the early diagnosis and management of children with ASD. The increased rate of parents who declined referral and follow-up in this study warrants the need to increase public awareness of ASD. Moreover, continuous training for healthcare workers is necessary to improve their recognition of the features of ASD. Further studies are also needed to follow up the negatively screened children.

Financial support and sponsorship

Conflicts of interest
There are no conflicts of interest.

References

1. Chiarotti F, Venerosi A. Epidemiology of autism spectrum disorders: A review of worldwide prevalence estimates since 2014. Brain Sci 2020;10:274.
2. Al-Ansari AM, Ahmed MM. Epidemiology of autistic disorder in Bahrain: Prevalence and obstetric and familial characteristics. East Mediterr Health J 2013;19:769-74.
3. McCrossin R. Finding the true number of females with autistic spectrum disorder by estimating the biases in initial recognition and clinical diagnosis. Children (Basel) 2022;9:272.
4. Posserud MB, Skretting Solberg B, Engeland A, Haavik J, Klungsøyr K. Male to female ratios in autism spectrum disorders by age, intellectual disability and attention-deficit/hyperactivity disorder. Acta Psychiatr Scand 2021;144:635-46.
5. Loomes R, Hull L, Mandy WP. What is the male-to-female ratio in autism spectrum disorder? A systematic review and meta-analysis. J Am Acad Child Adolesc Psychiatry 2017;56:466-74.
6. Nazeer A, Ghaziuddin M. Autism spectrum disorders: Clinical features and diagnosis. Pediatr Clin North Am 2012;59:19-25, ix.
7. Vogindroukas I, Stankova M, Chelas EN, Proedrou A. Language and speech characteristics in autism. Neuropsychiatr Dis Treat 2022;18:2367-77.
8. Levy SE, Wolfe A, Coury D, Duby J, Farmer J, Schor E, *et al.* Screening tools for autism spectrum disorder in primary care: A systematic evidence review. Pediatrics 2020;145:S47-59.
9. Primary Healthcare Centers Launch the "Early Autism Detection" Service. Ministry of Health; 2021. Available from: https://www.moh.gov.bh/News/Details/4703. [Last accessed on 2024 Aug 12].
10. Alawami AH, Perrin EC, Sakai C. Implementation of M-CHAT screening for autism in primary care in Saudi Arabia. Glob Pediatr Health 2019;6:1-9.
11. Richa S, Khoury R, JRouhayem J, Chammay R, Kazour F, Bou Khalil R, *et al.* Estimating the prevalence of autism spectrum disorder in Lebanon. Encephale 2020;46:414-9.
12. Chaaya M, Saab D, Maalouf FT, Boustany RM. Prevalence of autism spectrum disorder in nurseries in Lebanon: A cross sectional study. J Autism Dev Disord 2016;46:514-22.
13. Yousef A, Roshdy E, Abdel Fattah N, Said R, Atia M, Hafez E, *et al.* Prevalence and risk factors of autism spectrum disorders in preschool children in Sharkia, Egypt: A community-based study. Middle East Curr Psychiatry 2021;28:1-14.
14. Oner O, Munir KM. Modified checklist for autism in toddlers revised (MCHAT-R/F) in an urban metropolitan sample of young children in Turkey. J Autism Dev Disord 2020;50:3312-9.
15. Ravi S, Chandrasekaran V, Kattimani S, Subramanian M. Maternal and birth risk factors for children screening positive for autism spectrum disorders on M-CHAT-R. Asian J Psychiatr 2016;22:17-21.
16. Mohamed FE, Zaky EA, Youssef A, Elhossiny R, Zahra S, Khalaf R, *et al.* Screening of Egyptian toddlers for autism spectrum disorder using an Arabic validated version of M-CHAT; report of a community-based study (Stage I). Eur Psychiatry 2016;34:43-8.
17. Chlebowski C, Green JA, Barton ML, Fein D. Using the childhood autism rating scale to diagnose autism spectrum disorders. J Autism Dev Disord 2010;40:787-99.
18. Gentil-Gutiérrez A, Cuesta-Gómez JL, Rodríguez-Fernández P, González-Bernal JJ. Implication of the sensory environment in children with autism spectrum disorder: Perspectives from School. Int J Environ Res Public Health 2021;18:7670.
19. González-Sala F, Gómez-Marí I, Tárraga-Mínguez R, Vicente-Carvajal A, Pastor-Cerezuela G. Symbolic play among children with autism spectrum disorder: A scoping review. Children (Basel) 2021;8:801.
20. Di Renzo M, Guerriero V, Zavattini GC, Petrillo M, Racinaro L, Bianchi di Castelbianco F. Parental attunement, insightfulness, and acceptance of child diagnosis in parents of children with autism: Clinical implications. Front Psychol 2020;11:1849.