M-CHAT-R SCREENING DIAGNOSTICS FOR THE DETECTION OF AUTISTIC DISORDERS

T.A. Gavrilova
Reacenter in Samara, Russia., ndm2@mail.ru

Y.N. Madzhidova
Reacenter in Tashkent, Uzbekistan.

S.B. Muhammadsolikh
Tashkent Pediatric Medical Institute, Uzbekistan.

N.T. Khusenova
Tashkent Pediatric Medical Institute, Uzbekistan.

Follow this and additional works at: https://uzjournals.edu.uz/pediatrics

Recommended Citation
Available at: https://uzjournals.edu.uz/pediatrics/vol3/iss1/5

This Article is brought to you for free and open access by 2030 Uzbekistan Research Online. It has been accepted for inclusion in Central Asian Journal of Pediatrics by an authorized editor of 2030 Uzbekistan Research Online. For more information, please contact sh.erkinov@edu.uz.
M-CHAT-R SCREENING DIAGNOSTICS FOR THE DETECTION OF AUTISTIC DISORDERS

Cover Page Footnote
Tashkent Pediatric Medical Institute, Uzbekistan.
M-CHAT-R SCREENING DIAGNOSTICS FOR THE DETECTION OF AUTISTIC DISORDERS

1Gavrilova T.A., 2Madzhidova Y.N., 3Muhammad Sadik S.B., Khusenova N.T.
1Reacenterin Samara, 2Tashkent Pediatric Medical Institute, 3Reacenterin Tashkent

Abstract

Background. Autism and autism spectrum disorders are one of the most common developmental disorders among young generation of our modern society today. The prevalence of this social disaster and autism-related conditions has been steadily growing. The main characteristic of this disease is a permanent deficit in social communication and social interaction.

Methods. The research was conducted on children visiting the Reacenter Clinic. 27 children were involved to our study. The screening diagnostics was conducted on children using M-CHAT-R based on 20 questions, developed by Diana Robins, Deborah Fein, and Marianne Barton (2009), which is widely used to identify risk assessment of ASD.

Results. A survey of parents revealed a low risk level in 30% of children, medium risk in 45% of children, and high risk in 25% of children. Thus, the prevalence of medium and high risk of ASD was established among the examined 20 children according to the screening questionnaire M-CHAT-R (45 and 40%, respectively). An assessment with a suspicion of autism and autism spectrum disorder in 64% of cases revealed the answer "Yes" to the questions and in 36% of cases revealed the answer "No".

Conclusion. The assessment allowed us to establish the risk of developing ASD in 30% of children with a low level of risk, in 45% of children an average level of risk, and in 25% of children a high level of risk.

Key words: ASD, screening test method, M-CHAT-R, risk level.

BACKGROUND

Autism spectrum disorder (abbreviated as ASD; formerly known as childhood autism, early infantile autism, atypical autism, Kanner’s autism, highly functional autism, pervasive developmental disorder without further elaboration, childhood disintegrative disorder and Asperger’s syndrome) developmental disorder, with the onset in infancy or childhood, characterized by a persistent lack of ability to start and maintain social interaction and social relations, as well as limited interests and repetitive behavioral activities. The term and the diagnosis of ‘infantile autism’ were introduced into the world of science by an American psychiatrist, Leo Kanner (Ivanov et al, 2015). Over the past 65 years etiological paradigms within psychiatry have changed significantly in parallel with
the development of the concept that cognitive and behavioral disorders have organic ‘brain-based’ etiology. The first suggestion that rare genetic and biomedical conditions can lead to autism and that it is not associated with ‘bad parenting’, was voiced by phenylketonuria, but then these syndromic cases of autism were considered exceptions. In the 60s and 70s of the last century autism was considered a form of psychosis or childhood schizophrenia (Friedman, 1969). Finally, in 1980s, autism was classified as a developmental disorder and the thesis of its biological nature was accepted (Ivanov et al, 2015). The main characteristic of the disorder is a permanent deficit in social communication and social interaction (Bashina et al, 2005).

Autism spectrum disorders are complex, pervasive, and multifactorial neurodevelopmental conditions. Observation of aberrant behavior forms the basis of diagnosis, with criteria focused on impairments in social communication and interaction, and restricted, repetitive patterns of behavior, interests, or activities (APA, 2013). Heterogeneity of presentation is a hallmark (Abrahams et al, 2008) with comorbid psychiatric and medical morbidities frequently reported. Commonly identified psychiatric and cognitive comorbidities with ASD include social anxiety disorder, oppositional defiant disorder, attention-deficit/hyperactivity disorder, and intellectual disability. Medical conditions frequently reported include immune system abnormalities, gastrointestinal disorder, mitochondrial dysfunction, sleep disorders, and epilepsy (cited in Masi et al, 2017).

Autism and autism spectrum disorders are some of the most common developmental disorders in children. The prevalence of autism and related conditions has a steady upward trend. The prevalence of autism worldwide is increasing by 14% every year (Bashina et al, 2005; and Charman et al, 2008). The success of treatment and rehabilitation of patients with ASD largely depends on the early diagnosis of this disease, which is an urgent problem in pediatric neurology.

In order to on time ASD identification, the American Academy of Pediatrics suggested a universal screening for all children that narrowing the gap between suspicion, diagnosis, and intervention (Johnson et al, 2007). This reinforces the importance of having reliable screening instruments adapted to the local culture, which can be universally applied to all children in routine health check-ups. Among these screening instruments recommended by the American Academy of Child and Adolescent Psychiatry (AACAP), the Modified Checklist for Autism in Toddlers (M-CHAT) stands out, currently in its version M-CHAT-R/F (R/F: Revised with Follow-up), with sensitivity and specificity over 80%, which incorporates a follow-up interview (Volkmar et al, 2014).

PURPOSE OF THE STUDY
The aim of this research was to study the screening method M-CHAT-R for early diagnosis of autism spectrum disorder.
MATERIAL AND METHODS

The study was conducted among children visiting the ReacenterClinic in Tashkent. To achieve this goal, 27 children were examined. M-CHAT-R was created in the USA and is an extended version of the CHAT (Childhood Autism Test) screening questionnaire created in the UK. M-CHAT-R contains 20 questions. The main goal of M-CHAT-R is to maximize sensitivity, which means detecting as many cases of ASD as possible. Data obtained using M-CHAT-R can be calculated in less than two minutes.

COUNTING ALGORITHM

For all items except 2, 5 and 12, the answer “NO” indicates the risk of ASD; for clauses 2, 5 and 12, the answer “Yes” indicates the risk of ASD. The following algorithm maximizes the psychometric properties of M-CHAT-R:

Low risk: The total score is 0-2; if the baby is under 24 months old, check it again after the second year of birth. If there is no risk of ASD, no further action is required.

Medium risk level: The total score is 3-7; follow-up questions are assigned (second stage M-CHAT-R / F) for more information on the degree of risk. The following actions are required: to conduct a diagnostic assessment of the child and the acceptability of early intervention. If the subsequent count shows 0-1, the result of the inspection is considered negative. No further action is required if the risk of ASD is identified, but during subsequent visits the child should be re-checked.

High risk: The total score is 8-20; it is permissible to skip the following questions and immediately proceed to the diagnostic assessment and the appropriateness of early intervention.

RESULTS

The percentage of “Yes” and “No” ratings for the M-CHAT-R screening test are shown in Table 1.

The results of the study showed that 30% of children showed a low level of risk. Parents of children with a low risk of ASD answered “No” to questions such as “Have you ever assumed that your child might be deaf?”, ”Does your child make unusual movements with his fingers near his head and eyes?”, ”Does your child get frustrated by household sounds?” At the same time, they answered “Yes” to questions such as “If you point to an object in the room, does your child look at it?”, ”Does your child play imaginary or role-playing games”, ”Your child likes to climb objects?”, “Does your child point out something interesting with your finger to draw your attention to this?”, ”Does your child show interest in other children?”, ”Does your child show you objects by bringing them to you or holding them near you, just to share rather than ask for help?”, ”Your child responds when you call him/her name?”, ”When you smile at your child, does he / she smile at you?”, ”Does your child know how to walk?”, ”Does your child look you in the eye when you talk to him, play or dress him?”, ”Your child is trying to copy what you are doing?”.”If you turn your head to look at
something, does your child look around to see what you are looking at?"; “Does your child try to force you to look at you?"; “Does your child understand when you tell him to do something?"; “If something new happens, does your child in your face, in order to understand what you feel about it, "Loves Is your child moving activities?".

Table 1

<table>
<thead>
<tr>
<th>No</th>
<th>Questions</th>
<th>Yes (%)</th>
<th>No (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>If you point to an object in the room, is your child looking at it? (For example, if you point to a toy or animal, does your child look at the toy or animal?)</td>
<td>65</td>
<td>35</td>
</tr>
<tr>
<td>2</td>
<td>Has it ever crossed your mind that your child is deaf?</td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td>3</td>
<td>Does your child like to pretend? (For example, pretending to drink from an empty cup, talking on the phone, feeding a doll or a toy animal?)</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>Does your child like to climb objects? (For example, furniture, playground, stairs?)</td>
<td>95</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Does your child make unusual movements with his fingers near his head and eyes? (For example, shakes his fingers near his eyes?)</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>6</td>
<td>Does your child point a finger if he wants to ask for something or asks for help? (For example, indicates a snack or a toy that it cannot reach?)</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>7</td>
<td>Does the child point with one finger to something interesting that he wants to show you? (For example, a plane in the sky or a large truck on the road?)</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>8</td>
<td>Is your child interested in other children? (For example, does your child look at other children, laugh or approach them?)</td>
<td>35</td>
<td>65</td>
</tr>
<tr>
<td>9</td>
<td>Does your child bring things for you to look at, does he show them to you - not just to help him, but just to share? (For example, shows you a flower, a toy animal, a toy truck?)</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>10</td>
<td>Does your child respond when you call him by name? (For example, does he look at you, speak or babble, stop his business when he hears his name?)</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>11</td>
<td>When you smile at your child, does he smile back?</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Does your child feel frustrated by household sounds? (For</td>
<td>45</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Does your child walk?</td>
<td>100 -</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Does your child look you in the eye when you talk to him, play or dress him?</td>
<td>75 25</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Is your child trying to copy what you are doing? (For example, wave your hand, clap your hands, it’s funny to make a noise after you)</td>
<td>80 20</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>If you turn your head to look at something, is your child looking around to see what you are looking at?</td>
<td>35 65</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Does your child try to make you look at him? (For example, does your child look at you to hear praise, say “look” or “look at me”? )</td>
<td>85 15</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Does your child understand when you tell him to do something? (For example, if you don’t point to an object, can the child understand the words “put the book on a chair” or “bring me a blanket”)?</td>
<td>55 45</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>If something new happens, does your child look in your face to understand exactly what you feel about this (For example, if he hears a strange or funny noise, or sees a new toy, will he look you in the face)?</td>
<td>40 60</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Does your child like outdoor activities? (For example, when he is thrown up or rocked on his knee)</td>
<td>100 -</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>64 36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results of the study showed that 30% of children showed a low level of risk. Parents of children with a low risk of ASD answered “No” to questions such as “Have you ever assumed that your child might be deaf?”, “Does your child make unusual movements with his fingers near his head and eyes?”, ”Does your child get frustrated by household sounds?” At the same time, they answered “Yes” to questions such as “If you point to an object in the room, does your child look at it?”, “Does your child play imaginary or role-playing games”, “Your child likes to climb objects?”, “Does your child point out something interesting with your finger to draw your attention to this?”, “Does your child show interest in other children?”; “Does your child show you objects by bringing them to you or holding them near you, just to share rather than ask for help?”, “Your child responds when you call him/her name?”, “When you smile at your child, does he / she smile at you?”, “Does your child know how to walk?”; “Does your child look you in the eye when you talk to him, play or dress him
“Your child is trying to copy what you are doing?”,”If you turn your head to look at something, does your child look around to see what you are looking at?”,”Does your child try to force Look at you?”,”Does your child understand when you tell him to do something?”,”If something new happens, does your A child in your face, in order to understand what you feel about it, "Loves Is your child moving activities?".

An average risk level was detected in 45% of children. Parents of children with an average risk level for ASD answered “Yes” to questions such as “Does your child like to climb objects?”, “Does your child point to something interesting with your finger to draw attention to it?”, “Does your child points with his finger to ask for something or to get help?”,"Does your child respond when you call him/her by name?". "When you smile at your child, does he/she smile at you?"","Your Does your child know how to walk?","Does your child try to copy what you are doing?"","If you are turning you are heading to look at something, is your child looking around to see what you are looking at?"", "Does your child try to get you to look at him?","Does your child understand when you tell him something or do it?","If something new happens, does your child look in your face to understand exactly what you feel about this”, “Does your child like moving activities?”. At the same time answered “No” to questions such as “If you point to an object in the room, does your child look at it?”, “Have you ever assumed that your child might be deaf?”, “Your child points a finger to ask for something or get help?”,“Does your child points a finger at something interesting to address Is your attention to this?”,"Is your child interested in other children?","Does your child show you objects, bringing them to you or holding them near you, simply to share, rather than ask for help?”,"Does your child get frustrated by household sounds?","Does your child look you in the eye when you talk to him, play or dress him?".

The analysis revealed a high level of risk in 25% of the children surveyed whose parents answered “Yes” to questions such as “Does your child play imaginary or role-playing games”, “Does your child like to climb objects?”, “Does your child make unusual finger movements near the head and eyes?”,“Does your child respond when you call him/her by name?”,.“When you smile at your child, does he/she smile at you in return?”,”Does your child get frustrated by household sounds?”,”Does your child know how to walk?”,”Your child looks into your eyes when you are tell him, play or dress him?”,“Does your child try to copy what you are doing?”,”Does your child try to get you to look at him?”,"Does your child make unusual movements with his fingers near his head and eyes?","Is your child interested in other children?"."Does your child show you objects, bringing them to you or holding them near you, simply to share, rather than ask for help?”,"Does your child get frustrated by household sounds?"."Does your child look you in the eye when you talk to him, play or dress him?".
them near you, just to share, and not ask for help?”, “If you turn your head, to look at something, is your child looking around to see what you are looking at?”, “Does your child understand when you tell him to do something?”, “If something new happens, does your child look in your face to understand exactly what you feel about this?”.

DISCUSSIONS
Thus, the prevalence of medium and high risk of ASD was established among the examined 20 children according to the screening questionnaire M-CHAT-R (45 and 40%, respectively).

Recently, an interesting research was conducted by Coelho-Medeiros (2019) in Chili. The authors used M-CHAT-R/F to a sample of 20 children with suspected ASD and 100 randomly selected healthy control children, aged between 16-30 months. Autism Diagnostic Observation Schedule (ADOS-2), considered as reference, was applied to the 20 patients of the clinical sample, to 20 children of the healthy control sample and to those cases of the healthy control sample with M-CHAT-R/F positive. Cronbach alpha was calculated, as well as M-CHAT-R/F and ADOS-2 correlation, sensitivity, and specificity analyses. At the end, in the healthy sample, M-CHAT-R/F was positive in two patients, with one of them positive and the other one negative for ASD with ADOS-2 test. In the clinical sample, M-CHAT-R/F was positive in all cases, three of them were negative in the ADOS-2 test. The Alfa reliability of M-CHAT-R was 0.889, the discriminant sensitivity and specificity were 100% and 98%, and the concurrent ones were 100% and 87.5% respectively.

Another screening on toddlers (n=16 071) in the cities of Atlanta and Connecticut found the M-CHAT-R/F as reliable and valid. The research showed optimal scoring by using receiver operating characteristic curves. Children whose total score was ≥3 initially and ≥2 after follow-up had a 47.5% risk of being diagnosed with autism spectrum disorder (ASD; confidence interval [95% CI]: 0.41–0.54) and a 94.6% risk of any developmental delay or concern (95% CI: 0.92–0.98). Total score was more effective than alternative scores. An algorithm based on 3 risk levels is recommended to maximize clinical utility and to reduce age of diagnosis and onset of early intervention. The M-CHAT-R detects ASD at a higher rate compared with the M-CHAT while also reducing the number of children needing the follow-up. Children in the current study were diagnosed 2 years younger than the national median age of diagnosis (Robins et al, 2014).

In spite of some shortage of this study, the research has resulted in the implementation of training for health professionals in primary care to implement this adapted version of the M-CHAT-R for ASD such as children with a developmental delay in social areas, siblings and children of patients with ASD, as well as cases where there is a direct clinical suspicion. On the other hand, this study is also considered an
initial but important step for conducting studies of ASD prevalence in Uzbekistan in children. Determining the ASD prevalence, which is still unknown in our country, will allow us to measure the need and be able to distribute the necessary resources from the implementation of specialized health systems, as well as public policies that contribute to the well-being of these patients and their families.

CONCLUSIONS

All patients with suspected autism and autism spectrum disorder (ASD) should be screened for M-CHAT-R. An assessment with a suspicion of autism and autism spectrum disorder (ASD) in 64% of cases revealed the answer "Yes" to the questions and in 36% of cases revealed the answer "No". This assessment allowed us to establish the risk of developing ASD in 30% of children with a low level of risk, in 45% of children an average level of risk, and in 25% of children a high level of risk.

STUDY LIMITATIONS

We could not perform sample size calculation for this research and the number of participants to prove the null hypothesis might be less than it supposed to be. Furthermore, there was not any groups or cohorts to compare the results of children surveyed on M-CHAT-R platform. Thus, further researches may be required with an adequate sample size and with control groups to show more clear and exact results.

ACKNOWLEDGEMENTS

We are grateful to the staff members of Reacenter in Samara, Tashkent Pediatric Medical Institute, Reacenter in Tashkent for the cooperation and support in our research. The parents of the participants kindly gave full written permission for this report.

ETHICAL APPROVAL

The ethical approval for the study was granted by the Committee of Ethical Approval for Researches under the Ministry of Health of the Republic of Uzbekistan.

CONSENT

Written informed consent was obtained from all participants’ parents of the research for publication of this paper and any accompanying information related to this study. A copy of the written consent is available for review by the authors.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

FUNDING

No funding sources to declare.

REFERENCES:


Entered 08.01. 2020