RESEARCH ARTICLE

The predicted ability of the Modified Checklist (M-CHAT-R/F) to screen children for autism spectrum disorder: a sample from Iraq

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ABSTRACT

INTRODUCTION: Autism spectrum disorder (ASD) is a neuro-developmental disorder of children of increasing importance globally. Several screening instruments have been developed in recent years to screen and diagnose ASD. The Modified Checklist for Autism in Toddlers Revised with Follow-up (M-CHAT-R/F) is one of them with high sensitivity and specificity. In Iraq, we don't use screening tools frequently to identify children at risk.

OBJECTIVE: The study aimed to identify the predictive ability of the modified Arabized list (M-CHAT-R/F) in detecting children at risk of ASD at toddler age in a sample of children in Iraq.

METHODS: The study followed the analytical descriptive method. The study tool was applied to a sample of 210 children, patients of specialised clinics for children in hospitals and primary health care centres of Baghdad province in Iraq; their ages ranged from 12 months to 3 years. The researchers developed illustrations of the questions of the modified list (M-CHAT-R/F) as well as the modification of some vocabularies in these questions to have the tool matched with the Iraqi environment. The correct psychometric properties of the study tool were extracted.

RESULTS: The modified list, previously translated by Badawi and Sabri, 2016 can accurately screen children exposed to the risk of ASD in toddlers, the predictive power was obtained by using the modified list (M-CHAT-R/F) and the extraction of concurrent validity indicators and conducting the Autism Spectrum Test (CARS2) with the extraction of predictive validity coefficient. The results of the study also suggested that there are concurrent validity indicators for the study tool, whereas it was extracted by arbitrators. The (M-CHAT-R/F) exhibited acceptable internal consistency and test-retest reliability that could be adopted as a tool to detect children at risk of developing ASD in the walking stage in Iraq.

CONCLUSION: M-CHAT-R/F can be used to identify children at risk of developing ASD.

Key words: M-CHAT-R/F, Autism spectrum disorder, screen, Baghdad.

INTRODUCTION

Autism spectrum disorder (ASD) is one of the serious developmental disorders that is usually diagnosed below the age of three years. Although the severity of the disease's symptoms varies from patient to patient, the ability to communicate with others is affected in all forms of ASD.[1]

The standard criteria for the diagnosis of ASD is a comprehensive evaluation consisting of a multidisciplinary team of clinicians and is based on semi-structured direct observation of the child's behaviour and semi-structured caregiver interview. [2]

Approximately 1/100 children are diagnosed with autism spectrum disorder around the world. Synthesized estimates of the prevalence of autism is done in a systematic review by examining factors accounting for variability in estimates and critically reviewed evidence relevant to hypotheses about biological or social determinants, such as biological sex, sociodemographic status, ethnicity/race, and nativity; factors that potentially modifying prevalence estimates of autism. A search performed in November 2021 within Medline for studies estimating autism prevalence, by two

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independent researchers showed that since 2012, 99 estimates from 71 studies were published indicating a global autism prevalence that ranges within and across regions, with a median prevalence of 100/10,000 (range: 1.09/10,000 to 436.0/10,000). The median male-to-female ratio was 4.2. The median percentage of autism with co-occurring intellectual disability was 33.0%. Estimates varied, likely reflecting complex and dynamic interactions between patterns of community awareness, service capacity, help-seeking, and sociodemographic factors.[3]

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by deficits in social communication, restricted interests and repetitive behaviours. ASD is a neurobiological disorder influenced by genetic and environmental factors affecting the developing brain.[4]

Screening for ASD and early intervention is necessary as its prevalence is increasing worldwide. Several screening instruments have been developed in recent years. The Modified Checklist for Autism in Toddlers Revised with Follow-up (M-CHAT-R/F) is considered to be one of the specific measures designed to identify toddlers at risk for ASD.[5]

In Iraq, a country that faced many difficult situations of instability and humanitarian problems affecting children, the prevalence of ASD among children was remarkably observed.

M-CHAT-R/F scale were tested in many countries. A Moroccan study showed that the average score results of M-CHAT-R/F were 13.12 for category I (56 toddlers with ASD), while it was 2.24 for category II (96 toddlers with normal development). The Cronbach's alpha coefficient of the checklist was 0.929, which concludes the efficiency of the Moroccan Arabic version of the MCHAT for screening in the general population.[5]

In Brazil, the M-CHAT-R/F scale was validated and approved for use with the target population, indicating a sensitivity of 88.2% for a cutoff point greater than 2 points. Also approved by specialists, understandable by the target audience, and available for use.[6]

A Taiwanese study showed that the M-CHAT-R/F-T scores were significantly correlated with several syndrome scores of the Child Behavior Checklist for Ages 1.5-5 years. It was significantly higher among toddlers with ASD than atypical or typical developing toddlers. Furthermore, M-CHAT-R/F-T scores were negatively correlated with developmental scores in the Mullen Scales of Early Learning at 24 and 30 months and had acceptable screening predictive validity (sensitivity = 0.86; specificity = 0.96) for ASD diagnosis at 36 months.[7]

A study in a periurban community in South Africa recruited Twenty-one first-language Northern Sotho caregivers of children aged between 18 and 48 months by snowball sampling. The participants were asked to complete the Northern Sotho and the culturally adapted English M-CHAT-R/F, which were presented in random order. The study showed that the preliminary content validity and equivalence were evident for (M-CHAT-R/F) scale. All 21 toddlers aged between 18 and 48 months screened presented with a low risk for autism following the recommended execution of the Follow-Up section for the toddlers in the medium-risk category. All participants completed the two screening tests, with none indicating unfamiliar words or constructs. A higher preference for the English-adapted version was found but a need for the Northern Sotho screening test was also evident.[8]

In a study of six Chinese provinces, 7928 toddlers aged 16-30 months were screened by M-CHAT-R/F. On a cutoff value of 3, the sensitivity and specificity of M-CHAT-R were 0.963 and 0.865, with adequate inter-rater and test-retest reliability (intraclass correlation coefficients were 0.853 and 0.759, both ps < 0.01) suggesting that the Chinese version of M-CHAT-R/F is an effective tool for early detection of ASD.[9]

At the time of the study, we found few studies talking about using (M-CHAT-R/F) to detect children at risk of developing ASD in the walking stage in Iraq so this study aimed to Detect the probability of developing ASD using the modified list (M-CHAT-R/F) in the walking stage on a sample of Iraqi children visiting pedi-

atric clinics in two health facilities in Baghdad in 2019.

METHODS

Study design and the setting: A descriptive study was conducted in a specialized pediatric clinic in Baghdad medical city hospitals and Alkhadhraa healthcare centres in Baghdad from March 2019 to August 2019.

Ethical consideration: The proposal for this research was approved by the ethical committee of research of the Directorate of Health / Karkh. The objective of this study was explained to the parents of the children enrolled in this study and their consent was verbally taken before the start of the study.

Definition of the cases enrolled: Children who visited the Children Welfare Teaching Hospital, Central Teaching Hospital for Children, Ibn Rushd Centre, and the Primary Healthcare Centre in Al-Khadhraa in Baghdad, and aged between 12 months and 3 years for any reason were included in this study.

Sampling: We chose the sample (250) children out of the targeted population conveniently. We distributed 250 questionnaire forms to the health staff of the selected centres who were trained to fill out the questionnaire forms. Out of the distributed forms, 219 questionnaires were returned to the researcher with a response rate of 87.6 %. We exclude 9 because they were incomplete so the final analysis was done for 210 (84%).

Study tool: We used the Modified Checklist Autism in Toddlers Revised tool, prepared by Diana L Robins in 2009, to detect the possibility of ASD in toddlers.[10] Permission for the translation to the Arabic language was obtained from the author of the scale by email. Translation to Arabic and reverse translation were performed by the author and the translated draft was reviewed by experts in the English language, epidemiology and paediatric neurology. A preliminary version was prepared and pre-tested on a sample of 20 children, and a final version was validated with the target population. The study

Table 1 | Description of the study sample according to the demographic variables of the study individuals

Variables	Categories	Frequencies	Percentage %
Gender	Male	147	70
	Female	62	29.5
	No answer	1	0.5
	Total	210	100
Age	12 - < 18 months	31	14.8
	18 - < 24 months	32	15.2
	24 - < 30 months	147	70
	Total	210	100

tool (M-CHAT-R) was modified by adding illustrative pictures to the questions of the tool and modifying some vocabulary in accordance with the Iraqi environment.

(M-CHAT-R/F) is a two-stage screening scale for determining the risk (ASD) in toddlers. The first stage reflects the child's potential indicators for exposure to ASD or any developmental delay. It consists of twenty paragraphs representing questions that show the child's automatic behaviour. Answering "no" to items number 1, 3, 4, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, and 20, and yes to items number 2, 5, and 12 in favour of the possibility of ASD. The possibility to have ASD is divided into:

- Low probability when the total score is 0-2. No follow-up is needed unless the child is less than 24 months then a second-stage screening is needed on the baby's second-year birthday.
- Medium probability when the total score is 3-7.
- High probability when the total score is 8-20. It needs an immediate consultation and referral to specialists.

Tool stability: to ensure the reliability of the scale and the extent of its internal consisten-

Table 2 | Scores of the study sample children on the modified list of ASD (M-CHAT-R/F)

Possibility of having ASD	Score	No.	%
Low possibility	2.00	162	77.1
Medium possibility	7.00	46	21.9
High possibility	13.00	2	1
Total		210	100

Table 3 | Matching the results of the M-CHAT-R/F and CARS test on potential cases of ASD

Extent of disorder	(M-CHAT-R/F)			(CARS)		
	Score	No.	%	Score	No.	%
Behaviour is abnormal, inappropriate, or severely disabling	11.00	1	0.5	4	1	0.5
Behaviour is abnormal, inappropriate, or severely disabling	13.00	1	0.5	4	1	0.5

Table 4 | T-test for upper and lower score of M-CHAT-R/F Scale

Groups		Mean	SD	T value	P- value
Scale	Lower	2.265	1.189	4.477	0.000
	Upper	3.235	0.431		

cy, we used Cronbach alpha; a range between 0.65 to 0.92 is accepted to show internal consistency.[11]

Statistical analysis: SPSS program was used to analyze the data. The results were shown by frequencies and percentages.

RESULTS

Table 1 shows the age and the gender of the children. Males are seen in 147 (70 %), and the majority, 147 (70%), were between 24 - < 30 months.

Table 2 shows that 162 children (77.1%) have a low possibility of developing ASD, 46 (21.9 %) have a medium probability, and 2 (1%) have a high probability of developing ASD. Researchers followed up children with a medium possibility of developing ASD periodically to ascertain the extent of the development of their condition.

For the two children who have a high possibility of developing ASD, we applied the Childhood Autism Rating Scale (CARS). CARS2 is based on the following assessment:

1 = Normal or normal behaviour appropriate to the child's age.

2 = The behaviour is slightly abnormal.

3 = The behaviour is moderately abnormal.

4= The behaviour is severely abnormal.

Table 3 shows the matching the results of the M-CHAT-R/F and CARS test on potential cases of ASD. The results of the study tool (M-CHAT-R/F) are consistent with the results of (the Childhood Autism Rating Scale CARS), which indicates the ability of (M-CHAT-R/F to detect children at risk of developing ASD.

Table 4 shows that the arithmetic Mean of the upper group on the (M-CHAT-R/F) scale was (3.235) with a standard deviation of (0.431), while the arithmetic Mean of the lower group was (2.265) with a standard deviation of (1.189). The value of the test (t) for the differences between the two groups was (4.477) at the level of statistical significance (0.00), which is < (0.05), indicating the presence of statistically significant differences between the upper group and the lower group, which approve that the scale has discriminatory validity. The internal consistency coefficient (Cronbach's Alpha) was used to ensure the stability of the scale items, as the internal consistency coefficient of the sample (Cronbach's Alpha) was (78.2%), which indicates the stability and internal consistency of the study tool.

DISCUSSION

The (M-CHAT-R/F) tool, which was adopted by the two researchers, can accurately predict children at risk of developing ASD. The modified Arabic tool used in this study contained all the behavioural and emotional aspects characterizing people with ASD; therefore, able to predict children at risk of disorder or developmental delay. This finding is consistent with the studies that were conducted using the scale in other countries.[6,7,8,9]

The study showed that the scale has content validity, and discriminatory validity, which were considered one of the best methods to detect the validity of tools, and increases the reliability of its psychometric properties.

The internal consistency coefficient (Cronbach's Alpha) equal to (78.2%) was extracted for the total sample of (210) children, which indicates the stability of the study tool and its

internal consistency. This result was also consistent with the results of studies that worked on applying this tool in other countries such as the Moroccan Arabic version of the MCHAT for screening in the general population.[5] as well as the study of Seung, Kim, Sung, Youn, Hong, & Youm.[12]

Limitation of the study: The (M-CHAT-R/F) should be applied to a larger sample size to assess its ability to detect children at risk, also it needs to be applied in a comparative study on children already diagnosed with ASD.

CONCLUSION

M-CHAT-R/F is a valid and reliable tool for the developmental screening of low- and high-risk Iraqi toddlers for ASD in the community and clinical settings.

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Abbreviations list: Autism spectrum disorder (ASD), Childhood Autism Rating Scale (CARS), The Modified Checklist for Autism in Toddlers Revised with Follow-up (M-CHAT-R/F).

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