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**Original Research Article**

# Translating and validating the modified checklist for autism in toddlers (M-CHAT-R/F) into Malayalam for effective utilization of it in the clinical setting

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## ABSTRACT

**Background:** Early intervention strategies significantly improve developmental outcomes for children with autism spectrum disorders. In this background, this study was conducted to translate and validate Malayalam version of Modified Checklist for Autism in Toddlers (M-CHAT-R/F).
**Methods:** This cross-sectional study was conducted in four steps. The original version of MCHAT-R/F was translated into Malayalam, and back translated by bilingual experts followed by pilot testing. Finally, the translated tool was administered to 100 children for evaluation of psychometric properties which included reliability and validity assessment. The statistical analysis was conducted using IBM SPSS version 25.
**Results:** The internal consistency of the items as per parent confirmed stage of screening and flow chart interview stage of screening was 0.539 and 0.731 respectively. The level of agreement in categorizing the children according to the risk of ASD by two raters during first and second screening stage was 0.647 and 0.432 respectively. The test-retest reliability analysis showed that all the items had a moderate level of agreement between test and retest. All the items had an I-CVI more than 0.90. There was strong positive correlation between the score obtained during first stage (r: 0.562) and second stage (r: 0.529) with CARS score which indicates high convergent validity.
**Conclusions:** The newly translated tool with high reliability and validity could enable in screening symptoms of autism among children belonging to lower age group, which would facilitate in providing appropriate intervention as early as possible.

**Keywords:** Autism spectrum disorder, MCHAT-R/F, Validity, Reliability, Malayalam

## INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder, identified by deficits in social communication along with restricted interests and repetitive behaviors.[1] Globally, it is estimated that about one in 100 children is diagnosed with autism while in India one in 89 children is affected.[2,3] The signs and symptoms of ASD may start to appear during early childhood but the disorder may not be identified at an early age; hindering timely intervention.[2] Early interventions can greatly improve the development and quality of life of children with ASD.[4] The American Academy of Pediatrics recommends that routine screening assessment for ASD need to be carried out at a consultation between 18 and 24 months.[5] Screening tools were therefore developed with the intention of early symptom identification and to enhance surveillance of high-risk children.[6] The most widely used screening tool is the M-CHAT (Modified Checklist for Autism in Toddlers), a two-step assessment among children aged 18 to 30 months that includes a 23-item parent questionnaire

and a follow-up interview for certain cases aimed at reducing the number of false positive results.[7] The Modified Checklist for Autism in Children, Revised, with Follow-up (M-CHAT–R/F) shares the same objective as the M-CHAT, but it has been revised and a new scoring criteria based on follow-up assessment adopted.[8] This amended version of M-CHAT, detects ASD symptoms among children aged 16 to 30 months in two stages using 20 items.8 During the first stage, the parents report as 'Yes' or 'No' for the items.8 During the second stage, a flow chart interview is carried out with the parents of children, who may have screened positive for three or more items in the first stage.[8] This M-CHAT-R/F tool was found to have higher reliability as well as validity for screening ASD among toddlers.[9]

Early intervention strategies have been shown to significantly improve developmental outcomes for children with ASD emphasizing the significance of reliable screening tools.[10] In this background, this study was conducted to translate and validate MCHAT-R/F tool in Malayalam language.

This could ensure its applicability in clinical and research settings for identifying early signs of ASD among toddlers. This study would be crucial in overcoming language barriers and to aid in the early identification of autism spectrum disorders among children in Kerala. Furthermore, translating the tool into Malayalam language would enhance its effectiveness and acceptability. The main objective of this study was to translate the M-CHAT-R/F tool to Malayalam language and to validate the translated version of M-CHAT-R/F.

## METHODS

This research employed a cross-sectional study design. The study took place from September 2022 to August 2023 at Child Development Centre (CDC), a tertiary care centre in Kerala. Children aged 18 to 24 months suspected to have ASD symptoms during their initial visit in this period in CDC autism evaluation clinics were included. The MCHAT-R/F tool was administered to 100 children visiting the clinics, all of whom were included consecutively in the evaluation. The parents who were not willing to provide written consent were excluded. The study was conducted after getting the approval from Institutional Ethics Committee of CDC. Data collection was done after getting written informed consent from parents of the children. The translation and validation of the tool was completed in 4 steps.

### *Step 1: Translation and back translation of MCHAT-R/F*

The permission to translate the tool and modify it for adapting the culture of local population was obtained from the author. Two bilingual persons (Malayalam and English speaking) translated the English version of MCHAT-R/F into Malayalam. These two translated versions were evaluated by an expert panel consisting of health care managers and researchers for ensuring that the translated tool is clinically useful. Another two bilingual persons, who were unaware of the original MCHAT-R/F back translated the accepted Malayalam version.

### *Step 2: Pilot testing*

The pilot testing of the translated tool was conducted with ten parents of children diagnosed with ASD. This process aimed to evaluate the acceptability and clarity of the language used in the tool, as well as the comprehensibility of the questions. Based on their feedback, necessary modifications were made.

### *Step 3: Final administration of tool and scoring*

The MCHAT-R/F parent confirmed stage was administered by a trained developmental therapist to the parents of children suspected to have ASD signs. The flow chart interview was conducted among all these parents regardless of the number of positive responses. As per the original version of MCHAT- R/F, all the items of the tool could have two responses 'Yes' or 'No'. Among the 17 items, 'No' response indicate risk for autism. The remaining three items are scored in reverse direction. The number of "at risk responses" are calculated to yield the final score. The children could be classified into three categories based on this score; low risk (0-2), medium risk (3-7) and high risk (8-20) categories.[8]

### *Step 4: Assessing psychometric properties of tool*

The interrater reliability and test-retest reliability was assessed by administering the tool to 20 children. The test- retest reliability was assessed at 2 weeks interval. The face validity was evaluated based on the review of respondents and content validity was assessed through the review of panel of six experts. The Item-Content Validity Index (I-CVI) and the Scale-Content Validity Index (S-CVI) were also evluated.[11]

The convergent validity of the translated tool with the diagnostic tool Childhood Autism Rating Scale (CARS) was assessed among 30 children.[12] Discriminant validity of the translated tool was also assessed in the main sample by comparing the mean scores of subjects above and below the median cut off level.

### *Statistical analysis*

The statistical analysis was conducted in IBM SPSS for windows version 25. The internal consistency of the items was assessed using Cronbach's alpha The Cohen's kappa statistic was used for assessing interrater and test re test reliability. Pearson correlation coefficient was used to assess convergent validity. Discriminant validity was assessed using independent sample t test.

## RESULTS

The Malayalam version of MCHAT-R/F was administered to 100 children. The mean age of the children was 24.75 (3.7) months. About 79% of the children were boys. More than half of the children (55%) were from urban areas. Seventy-two percent of the children belonged to Hindu religion. About sixty percent of the children were from extended families. Nearly three fourth of the children's mothers (74%) were unemployed. About 44% of fathers had completed their undergraduate or graduate degrees.

Around 63% of the respondents hailed from upper middle-class family. The socio-demographic characteristics of study participants are presented in table 1. According to the first stage of MCHAT-R/ F screening, about 59% of children were at high risk of ASD, 36% were at medium risk and 5% were at lower risk of ASD. Based on the flow chart interview, 45% were at high risk, 48% were at medium risk and 7% were at low risk for ASD. The internal consistency of the items of Malayalam version of MCHAT-R/F as per first stage of screening and flow chart interview stage of screening was 0.539 and 0.731 respectively, showing an acceptable level of internal consistency (Table 2).

The interrater reliability analysis confirmed that all the 20 items in the tool had moderate level of agreement between two raters. In the first stage screening, substantial level of agreement was identified between raters on categorizing children into two categories (low to medium risk and high risk) based on the parent confirmed method. In the second stage screening, moderate level of agreement was found between the two raters on categorizing children into two categories (low to medium risk and high risk) based on flow chart interview (Table 3). The test-retest reliability analysis showed that all the items had a moderate level of agreement between test and retest.

There was moderate level of agreement on categorizing children into ASD risk as per parent confirmed first stage screening and substantial level of agreement as per flow chart interview screening stage (Table 4). All the 20 items were retained in the Malayalam version of MCHAT-R/F tool as all the items had an item content validity index (I-CVI) more than 0.90.

We found significant strong positive correlation between total score obtained from both first stage screening stage (r=0.562, p=0.001) and flow chart screening stage (r=0.529, p=0.003) with the CARS score; which indicates high convergent validity. The children were divided into two groups based on the median score. The mean difference between the two groups were significant as per both parents confirmed screening stage and flow chart interview screening stage, indicating high discriminant validity (Table 5).

**Table 1: Socio-demographic characteristics of study participants.**

| Characteristic | Category | Frequency (%) |
|---|---|---|
| **Gender** | Male | 79 |
| | Female | 21 |
| **Place of residence** | Rural | 45 |
| | Urban | 55 |
| **Religion** | Hindu | 72 |
| | Muslim | 17 |
| | Christian | 11 |
| **Type of family** | Nuclear | 36 |
| | Extended | 60 |
| | Joint | 4 |
| **Educational status of head of family** | Primary school | 1 |
| | High school | 4 |
| | Plus two/post high school diploma | 17 |
| | Graduate/PG | 51 |
| | Professional/ Honors | 27 |
| **Educational status of father** | High school | 7 |
| | Plus two/ post high school diploma | 24 |
| | Graduate/PG | 44 |
| | Professional/ Honors | 25 |
| **Occupation of head of family** | Unemployed | 3 |
| | Unskilled worker | 6 |
| | Semi-skilled worker | 12 |
| | Skilled worker | 12 |
| | Clerical or shop owner | 28 |
| | Semi professional | 12 |
| | Professional | 17 |
| **Monthly income of family (₹)** | <2091 | 1 |
| | 10357-15535 | 13 |
| | 15536-20714 | 22 |
| | 20715-41429 | 34 |
| | >41430 | 30 |
| **Socio economic position** | Upper | 14 |
| | Upper middle | 63 |
| | Lower middle | 19 |
| | Upper lower | 4 |
| **Occupation of mother** | Unemployed | 74 |
| | Skilled worker | 4 |
| | Clerical or shop owner | 5 |
| | Semi professional | 8 |
| | Professional | 9 |

**Table 2: Analysis of Internal consistency.**

| Stage of MCHAT-R/F | Cronbach's alpha |
|---|---|
| **Parents reported (first stage)** | 0.539 |
| **Flow chart interview (second stage)** | 0.731 |

**Table 3: Inter-rater reliability assessment on categorizing children as per ASD risk.**

| Stage of MCHAT-R/F | Cohen's kappa statistic | P value |
|---|---|---|
| **Parent confirmed method** | 0.647 | 0.001 |
| **Flow chart interview method** | 0.432 | 0.02 |

**Table 4: Test-retest reliability assessment on categorizing children as per ASD risk.**

| Stage of MCHAT-R/F | Cohen's kappa statistic | P value |
|---|---|---|
| **Parent confirmed method** | 0.6 | 0.006 |
| **Flow chart interview method** | 0.706 | 0.001 |

**Table 5: Group difference as per parent confirmed and follow up interview stages of MCHAT.**

| Category | Mean (SD) | Mean difference (95% CI) | P value |
|---|---|---|---|
| **Parent confirmed stage** | | | |
| **Score of 9 (median) or less (n=55)** | 5.545 (2.448) | -6.52121 | 0.001 |
| **Score greater than 9 (n=45)** | 12.06 (1.67) | (-7.37259 to -5.66983) | |
| **Follow up interview stage** | | | |
| **Score of 7 (median) or less (n=55)** | 4.43 (1.86) | -6.05253 | 0.001 |
| **Score greater than 7 (n=45)** | 10.4 (1.67) | (-6.75530 to-5.34975) | |

## DISCUSSION

The MCHAT-R/F is the commonly used tool for screening autism among lower age group. To the best of our knowledge, it has not yet been translated into Malayalam and the appropriateness of this tool for utilization among the local population of Kerala is still uncertain. Therefore, the focus of this study was to translate and validate the MCHAT-R/F into Malayalam language. This Malayalam version of MCHAT-R/F followed all the steps of translational validity. This translated tool was found to have acceptable level of internal consistency as well as high interrater and test-retest reliability like the original MCHAT-R/F.[9] The translated tool has good convergent validity with the diagnostic tool CARS and the discriminative power of the translated tool was also found to be high.

The diagnostic tool CARS was not administered to all children due to the age limit for diagnosis.[12] Hence the criterion validity of Malayalam MCHAT-R/F could not be evaluated. Future studies should aim to administer the CARS diagnostic tool to a broader age range to assess the criterion validity of the Malayalam M-CHAT-R/F. Additionally, exploring the tool's applicability in various socio-economic settings within Kerala could further validate its effectiveness. However, the availability of a reliable and valid screening tool in Malayalam is a significant advancement for early ASD detection in Kerala, addressing the language barrier in clinical settings.

## CONCLUSION

The newly translated Malayalam version of MCHAT-R/F tool was found to have adequate validity and reliability. This tool would help deliver appropriate and timely interventions at the right age, thereby enhancing the quality of life of children with ASD. The Malayalam version of MCHAT-R/F tool could be used for improvement of autism diagnosis by clinicians serving Malayalam -speaking populations in India and other South Asian countries.

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