ORIGINAL ARTICLE

Validation of the Hindi Versions of Three Autism Specific Screening Tools (M-CHAT-R/F, RBSK-ASQ and TABC) Widely Used in India in 16-30-Month-Old Children

Sharmila B Mukherjee, Dhanasangari Manivannan, Suvasini Sharma

Department of Pediatrics, Lady Hardinge Medical College and Associated Kalawati Saran Children's Hospital, New Delhi, India

ABSTRACT

Objective: To determine the diagnostic accuracy of MCHAT-R/F, RBSK-ASQ and TABC for screening children aged 16 to 30 months for autism spectrum disorder (ASD).

Method: Children aged 16 to 30 months were recruited from the pediatrics department. Those with known neurodevelopmental disorders, disabilities, severe medical illnesses, unavailable mothers, or lack of maternal understanding of Hindi, were excluded. The three index tools were translated into Hindi; each tool was piloted on 25 mothers and modified accordingly. The researcher was trained in administration, scoring and interpretation of the three tools. After enrollment the index tools and Developmental Profile (DP-3) were administered to each participant. The reference tool was a comprehensive assessment by experts that included clinical evaluation, computation of DP-3 scores, and application of diagnostic criteria of ASD; the final diagnosis being ASD or Non-ASD.

Results: Sensitivity and specificity of M-CHAT-R/F were 95.2% and 94.4%, of RBSK-ASQ were 100% and 93.9%, and of TABC were 100% and 94.4%, respectively. Convergent validity was high (Spearman's correlation coefficient 0.98). Test-retest and inter-rater reliability of each tool was excellent (Intra-class correlation coefficient 1.00).

Conclusion: All three tools had acceptable psychometric properties, high convergent validity and excellent test-retest and inter-rater reliability.

Keywords: *Developmental screening, Diagnostic accuracy, LMIC, Psychometric properties, Reliability*

Published online: March 07, 2024; ***PII:*** S097475591600609

INTRODUCTION

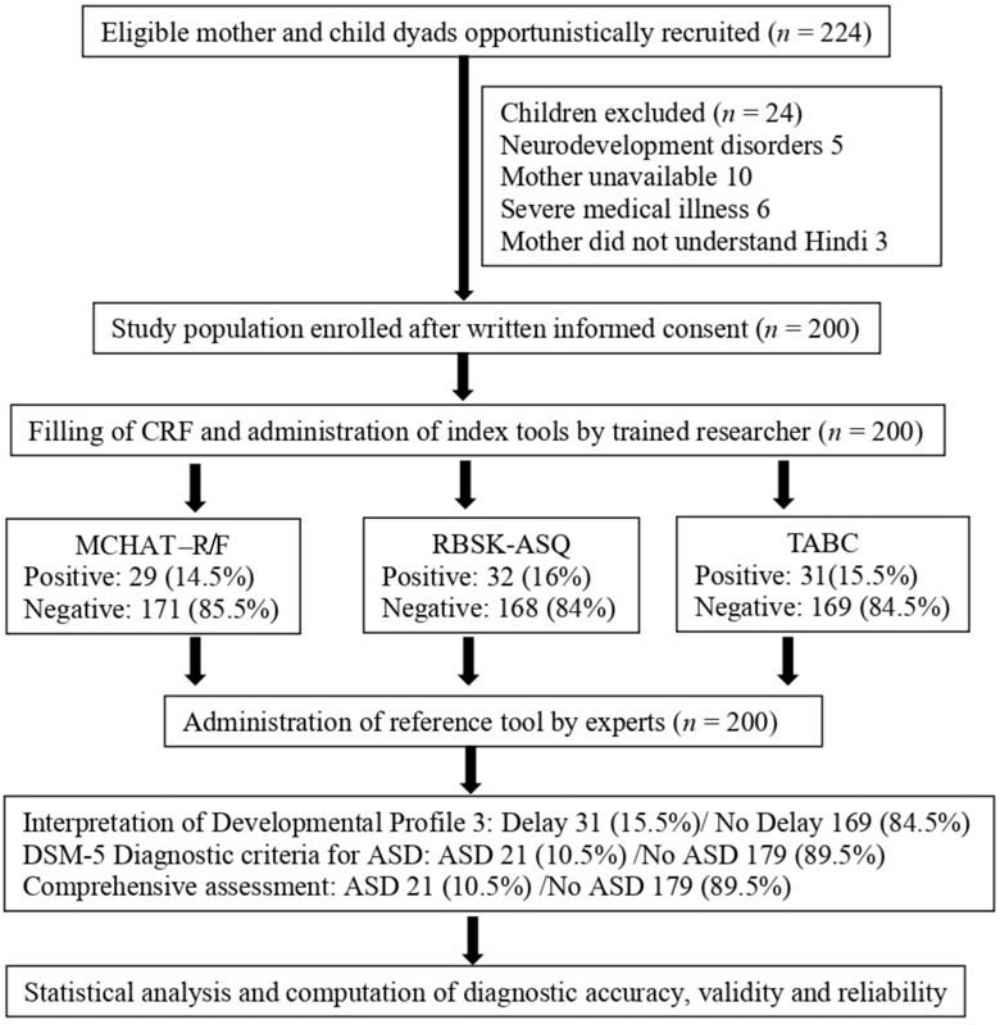
Autism spectrum disorder (ASD) is a common neuro-developmental disorder of childhood characterized by difficulties in social communication and social interaction, and the presence of restricted and repetitive patterns of behaviors, interests, and activities [1]. A community-based study from India reported a prevalence of 0.8-1.3% in children aged 2-9 years [2]. Manifestations may be so subtle in the early years that they fail to elicit serious concerns in caregivers and are disregarded as 'shyness' typically associated with young children. Early detection is low unless actively sought by using ASD-specific screening tools. Screen positive children identified as 'at high risk for ASD' warrant further in-depth evaluation. If ASD gets diagnosed subsequently, timely holistic intervention translates into better outcomes. Thus, ASD is a public health problem that requires 'universal' screening i.e., it should be done for all children, even if they appear to be developing typically.

Screening for a specific disorder like ASD requires the administration of a narrow band screening tool with 'acceptable' psychometric properties. This has been defined as a combined sensitivity and specificity of >70% in the intended population [3]. Lower sensitivity means children with ASD will be missed; whereas lower specificity would result in misdiagnoses with unwarranted parental stress and expenditure. A systemic review on suitable screening tools for developmental delay and ASD for low- and middle-income countries (LMIC) identified certain optimal features for ASD specific tools [4] which include under 30 minutes needed to administer, easily accessible, free or inexpensive, suitable for use by community health workers (CHW) or para-professionals without requiring extensive training, and successful use in at least one LMIC. Only three of the 34 tools in use globally that were reviewed, satisfied these criteria [4], *viz.*, Modified Checklist for Autism in Toddlers, Revised with Follow-up (M-CHAT-R/F) [5]; Pictorial Autism Assessment Schedule (PAAS), and Three Item Direct Observation Screen (TIDOS).

Correspondence to: Dr. Sharmila B Mukherjee, Department of Pediatrics, Kalawati Saran Children's Hospital, Bangla Sahib Marg, New Delhi, India.
theshormi@gmail.com
Received: July 19, 2023; Initial review: Sep 04, 2023; Accepted: Jan 16, 2024

The 2016 UNICEF model on developmental screening states that a country should use tools appropriate for their needs and population [6]. Indian Academy of Pediatrics (IAP) advises universal screening for ASD at 18 and 24/30 months along with developmental screening [7,8], and recommends M-CHAT-R/F [5], Trivandrum Autism Behavioural Checklist (TABC) [9], and Social Communication Questionnaire (SCQ). Rashtriya Bal Swasthya Karyakram (RBSK), an initiative of the Government of India to screen for diseases, deficiencies, defects at birth and developmental disabilities in children uses RBSK–Autism Specific Questionnaire (RBSK-ASQ) to screen for Autism across India [10]. PAAS and TIDOS are generally not used in India.

MCHAT-R/F is used for toddlers between 16 and 30 months of age. It can be administered by parents (with education level > 6th standard) or service providers. Though translated into several Indian languages, these versions are neither culturally adapted, nor validated [11]. The tool is primarily used by pediatricians and has gained popularity after IAP NURTURE started training pediatricians to administer it at the age-appropriate well child visits [12]. TABC is an indigenous tool available in Malayalam and English and used by CHW in Kerala for children aged 2 to 6 years [9]. The RBSK-ASQ has two versions for use in children aged 15-18 and 18-24 months. The English format is available in the public domain [10], but translations are being used locally. SCQ has not been



ASD Autism spectrum disorder, CRF case recording form, DSM-5 Diagnostic and Statistical Manual of Mental Disorders, 5th edition, MCHAT-R/F Modified Checklist for Autism in Toddlers, Revised/ Follow-up, RBSK-ASQ Rashtriya Bal Swasthya Karyakram - Autism Specific Questionnaire, TABC Trivandrum Autism Behavioural Checklist

Fig. 1 Flow of participants from recruitment, through enrollment, administration of index tools and reference tool to statistical analysis

translated, adapted or validated for Indian settings. Additional drawbacks are expense, copyright issues, and restricted use by professionals who do not usually come in contact with typically developing children.

A critical research lacuna identified on applying the LMIC parameters to three commonly used tools (**Table I**) was the lack of robust scientific literature pertaining to validation. Thus, we aimed to determine the diagnostic accuracy of Hindi versions of M-CHAT-R/F, TABC, and RBSK-ASQ for screening children aged 16 to 30 months for ASD.

METHODS

A hospital-based study of diagnostic accuracy was conducted over 18 months (January 2021 to June 2022) after obtaining approval from the Institutional Ethics Committee. In the preliminary phase we translated the index tools (M-CHAT-R/F, TABC and RBSK-ASQ) into Hindi after obtaining permission from the competent authorities for each tool. The standard WHO protocol was used involving adaptation, translation and back-translation by language and subject experts [13]. The following modifications were made by group consensus ensuring maintenance of context (i.e. no change in face validity): the language of M-CHAT-R/F was made simpler than the Hindi version available on the website, and culturally acceptable examples were included (i.e., vacuum cleaner replaced by whistle of a pressure cooker). We used the provider completed format rather than the parent completed one, as developmental awareness of caregivers from LMIC is not considered optimal, irrespective of educational level [4]. No changes were required in RBSK-ASQ or TABC. The tools were piloted on 25 mothers to identify the possible difficulties in maternal understanding and/or issues in administration of the tools by the researcher. No issues were identified with M-CHAT-R/F or RBSK-ASQ, but it was observed that understanding and ease of administration improved on converting the phrases of TABC into questions. TABC was administered to a different set of 25 mothers within a week in the revised format, and no difficulties were detected.

The researcher was trained to administer, score and interpret each index tool as per the operational guidelines, until deemed competent by the experts. In M-CHAT-R/F (comprising of 20 questions) atypical behaviors are scored '1'and typical behaviors '0'. A child is considered 'at low risk', 'at medium risk' and 'at high risk' if the total score is 0-2, 3-7, and 8-20, respectively [11]. In the 20-item TABC, symptoms are organized into four domains: social interaction, communication, behavioral characteristics, and sensory integration. Scoring is based on frequency by a Likert scale: never 1, sometimes 2, often 3, and, always 4. A child is considered 'non-autistic' if the total score is 20-35; 'mild autistic' if 36-43, and 'severe autistic' if ≥ 44 [9]. Both the RBSK-ASQ versions have three questions with dichotomous answers (Yes/No). For the purpose of the study, a child was considered screen positive for ASD based on satisfaction of the standard operating procedure for each tool: M-CHAT R/F -'at high risk', or persistence of 'at medium risk' on re-evaluation after a month; TABC - total score > 35, and; RBSK-ASQ - if the response was 'no' for items 1 and 2, and 'yes' for item 3 (15-18 months format); and 'no' for items 1 and 3, and 'yes' for item 2 (18-24 months format) [10].

The reference tool was a comprehensive assessment for ASD based on history, clinical evaluation and

Table I Psychometric Properties of Modified Checklist for Autism in Toddlers, Revised with Follow-up, Rastriya Bal Swasthya Karyakram –Autism Specific Questionnaire, and Trivandrum Autism Behavioral Checklist

Psychometric properties	*M-CHAT-R/F*	*RBSK-ASQ*	*TABC*
Sensitivity (%) (95% CI)	95.2 (77.3, 99.2)	100 (84.5, 100)	100 (84.5, 100)
Specificity (%) (95% CI)	94.4 (90.0, 96.9)	93.9 (89.3, 96.5)	94.4 (90.0, 96.9)
Positive Predictive Value (%) (95% CI)	66.7 (48.9, 80.8)	65.6 (48.3, 79.6)	67.4 (50.1, 81.4)
Negative Predictive Value (%) (95% CI)	99.4 (90.4, 96.9)	100 (97.8, 100)	100 (97.8, 100)
Positive Likelihood Ratio (95% CI)	17.1 (13.9, 20.8)	16.3 (13.6, 19.5)	17.9 (14.7, 21.8)
Negative Likelihood Ratio (95% CI)	0.05 (0.01, 0.4)	0	0
Convergent Validity (SCC)	0.9	1.00	1.00
Test-retest Reliability (ICC)	0.9	1.00	1.00
Inter-rater Reliability (ICC)	0.9	1.00	1.00

CI Confidence interval, ICC Intra-class correlation coefficient, M-CHAT-R/F Modified Checklist for Autism in Toddlers, Revised with Follow-up, RBSK-ASQ Rashtriya Bal Swasthya Karyakram-Autism Specific Questionnaire, SCC Spearman Correlation Coefficient, TABC Trivandrum Autism Behavioural Checklist

Note: Cronbach's alpha was the reliability coefficient used to express ICC and SCC

observation, assessment of developmental status by 'Developmental Profile, 3rd edition' (DP-3) [14] and, application of Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) diagnostic criteria for ASD. These criteria are considered fulfilled when all three deficits in social communication (A); at least 2 of 4 criteria of repetitive behaviors, activities or interests (B); and criteria C (since early developmental period), D (causing significant functional impairment), and E (not better explained by other conditions) are present [1]. DP-3 assesses acquisition of skills in five developmental domains (physical, socio-emotional, communication, cognition, and adaptive behavior) on the basis of which domain-wise standard scores (SS) and an overall General Developmental Score (GDS) are computed; in either < 70 is considered as 'delay'. The study definition of ASD was a clinical diagnosis ascertained by expert evaluation based on the comprehensive assessment. In children < 24 months if the DSM-5 criteria were not satisfied, delay or dissociation in social-emotional and communication domains compared to the other domains was considered diagnostic.

The study population included children aged 16 to 30 months who were opportunistically recruited from the pediatric outpatient (i.e. those presenting with minor illnesses or coming for immunization) and inpatient departments (at discharge). Children with known neuro-developmental disorder/ disability, any severe medical illness, absence of mothers, or lack of maternal understanding of Hindi were excluded. We calculated a sample size of 200, assuming 10% prevalence of children 'at risk of ASD', sensitivity and specificity of M-CHAT-R/F of 50% [15] and 80% [16] respectively (as reported in earlier validation studies from LMIC), 5% alpha error, and power of 80% [17].

Each eligible child underwent evaluation after obtaining written informed consent from the mother. Relevant study specific demographic and clinical details were documented. The researcher administered each index tool to the mother in no particular sequence followed by items of DP-3 (without scoring). The comprehensive assessment was performed by neurodevelopmental experts with 15-20 years of experience within a week. This included parental interview, observation of the child, review of videos of play, social interaction and repetitive activities at home (which the parents were asked to make at enrollment), computation of SS and GDS from the DP-3 records, and application of the DSM-5 diagnostic criteria for ASD. Administration of the index tools were repeated by the researcher in 20 mother-child dyads (10% sample size), and by the expert in 20 different mothers, selected as per convenience both within a week of initial screening.

Statistical Analysis: We used Statistical package for social science (SPSS) software version 28. Parameters of diagnostic accuracy (sensitivity, specificity, positive and negative predictive value, positive and negative likelihood ratio), convergent validity (using spearman correlation coefficient), test-retest and inter-rater reliability (by intra-class correlation coefficient) were computed.

RESULTS

We assessed 224 children out of which 24 were excluded and 200 were enrolled as depicted in **Fig. 1**. The mean (SD) age of the study population was 22.7 (4.2) months; with boy to girl ratio of 1.2:1. Most children belonged to the lower middle (50%) and upper lower (35.5%) socioeconomic class as per modified Kuppuswamy classification. Clinical pallor was detected in 112 (56%), wasting in 29 (14.5%), underweight in 16 (8%), and stunting in 25 (12.5%) children.

The number of children who screened positive according to M-CHAT-R/F, RBSK and TABC were 29 (14.5%), 32 (16%) and 31 (15.5%), respectively. Thirty one (15.5%) children had delay as per DP-3 GDS. Twenty one (10.5%) children were diagnosed as ASD based on the DSM-5 criteria. These included 13 boys and 8 girls, all of whom were low functioning (GDS < 70). We did not find any child < 24 months who failed to satisfy the criteria for ASD, but exhibited delay or dissociation in the socioemotional and communication domains of DP-3. Comprehensive assessment yielded ASD in 21 (10.5%) children while 179 children (89.5%) did not have ASD. The parameters of diagnostic accuracy, and correlation coefficients for convergent validity and reliability are given in **Table I**.

DISCUSSION

We conducted this study to assess the diagnostic accuracy of the Hindi versions of M-CHAT-R/F, TABC, and RBSK-ASQ. Though M-CHAT-R/F reports acceptable sensitivity and specificity in high income countries (HIC) and some LMIC [15,16], there was no published research from India. The primary validation of the Malayalam version of TABC was conducted in 2-6-year-old children from Kerala [9]. However, its accuracy in children less than 2 years (and hence the first screening age of 18 months) was undetermined. RBSK-ASQ had never been validated.

A sensitivity and specificity of >70% is considered to be an acceptable trade off when it comes to the diagnostic accuracy of any developmental or ASD specific screening tool for young children. That equates to a realistic but fair balance between children incorrectly identified as false positive or false negative ASD. However, children who are screen positive but eventually get an alternative

WHAT THIS STUDY ADDS?

- The overall sensitivity and specificity of Hindi versions of M-CHAT-R/F was 95.2% and 94.4%; TABC was 100% and 94.4% and RBSK- ASQ was 100% and 93.9%, respectively.
- All three tools had high convergent validity and excellent test-retest and inter-rater reliability.
- Hindi versions of M-CHAT-R/F and RBSK-ASQ satisfy the suitability criteria for screening tools for ASD in LMIC.

diagnosis benefit from the in-depth evaluation, establishment of diagnosis, and appropriate intervention. The strategy of administering a second screening at 24/30 months increases the likelihood of identification of ASD, if the diagnosis was missed at first.

All the three tools had acceptable psychometric properties. We performed an exhaustive literature search to compare our results with validation studies in comparable populations originating from LMIC. Those in which the reference tool used was not suitable (i.e., another screening tool used instead of a diagnostic tool or comprehensive assessment) were excluded. Only three papers were found; two for M-CHAT-R/F and one for TABC. The first was a hospital-based study of 110 apparently typically developing Indonesian children aged 18 to 24 months [18]. The reference tool was DSM-5 criteria and the sensitivity and specificity were 88.9% and 94.6%, respectively. The second was a community-based study of 6,712 asymptomatic children between 16-36 months from Turkey [19]. A combination of DSM-5 criteria and Autism Diagnostic Observation Schedule was used as the reference tool, and 100% sensitivity and 67% specificity was demonstrated. TABC was recently validated against Childhood Autism Rating Scale, second edition (CARS2) in 65 children aged 2 to 6 years with suspected autism [20]. The psychometric properties were: sensitivity 96.3%; specificity 81.6%; positive predictive value 78.8%; negative predictive value 96.8%; positive likelihood ratio 5.22; and negative likelihood ratio 0.045.

The high convergent validity of all three tools reiterates the similarity of content with the clinical construct of ASD, even in the early stages. Tsai et al found moderate correlation (r 0.63) in the convergent validity of M-CHAT-R/F with Childhood Behaviour Checklist in 1.5- to 5-year-old children from Taiwan [21], probably because the latter evaluates non-ASD behaviors as well. Both test-retest and inter-rater reliability were excellent in our study. Studies of test-retest reliability from Serbia and China reported good correlation, 0.81 and 0.76, respectively [22,23]. We were unable to find research on inter-rater reliability from LMIC. Comparable data for TABC and RBSK-ASQ were unavailable. Taking everything into consideration, M-CHAT-R/F and RBSK-ASQ satisfy the suitability criteria for ASD specific screening tool in LMIC (**Table II**). Though M-CHAT-R/F is not being used by CHW or para-professionals, it can be administered by anyone with an educational level of higher than sixth standard and extensive training is not required.

The diagnosis of ASD is clinical based on observation of the behavioral and developmental phenotype. We used comprehensive assessment as the gold standard that would

Table II Comparison of Index Tools as per for Suitability Criteria for ASD Specific Screening Tools in Low- and Middle-Income Countries (LMIC)

Parameters	*RBSK-ASQ*	*M-CHAT-R/F*	*TABC*
Time taken	3-5 min	3-5 min	3-5 min
Cost	Free	Free	Free
Availability	Online [10]	Online [11]	CDC, Trivandrum
Administrating personnel	RBSK team	Pediatricians/ clinical psychologists[a]	CHW
Areas where used	India	India & few LMIC	Only in Kerala, India
Psychometric properties (primary validation study)	Not done	Sensitivity 66.7.% & Specificity 99.5% [5]	Sensitivity 80% & Specificity 91.1% [9]
Validation in Indian population	Not done	Unavailable	Community based study in Kerala

ASD Autism spectrum disorder, CDC Child Development Clinic, CHW Community Health Workers, LMIC Low and Middle Income Countries, M-CHAT-R/F Modified Checklist for Autism in Toddlers, Revised with Follow-up, RBSK–ASQ Rashtriya Bal Swasthya Karyakram- Autism Specific Questionnaire, TABC Trivandrum Autism Behavioural Checklist

Note: [a]As per the LMIC suitability criteria, the tool can be administered by a CHW or a para-professional

also be suitable for children aged 16 to 30 months. Though DSM-5 criteria have not set any basal age for application, it is well recognized that identifying autistic features in younger children is more challenging compared to older ones. Indirect evidence can be inferred from the lower age limits set for standard diagnostic tools for ASD; two years for CARS-2, 18 months for Autism Diagnostic Observation Schedule, and four years for Autism Diagnostic Interview-Revised. Therefore, examination of the developmental profile was included for children between 16 and 24 months, a priori, in case any child failed to satisfy the DSM5 criteria (though all of them did). Double blinding of DP-3 was not possible due to logistic issues. Though the items of DP-3 were asked by the researcher who administered the index tools, we tried to minimize bias by scoring and interpreting the responses by the experts afterwards. The possible respondent bias that may have arisen due to the hospital-based setting was alleviated by the strategy used for recruitment i.e. including stable children whose mothers were interested in their children benefitting from universal screening and developmental assessment, and therefore considered reliable. The fact that the sequence of administration of the tools was not randomized may be considered a limitation due to possible information bias.

Our study provides robust scientific evidence to support the use of Hindi translations of three popular tools used for screening Indian children for ASD at 18 and 24/30 months. This means expanding the coverage of screening to a larger population i.e. Hindi speaking respondents, by cadres of health care personnel who routinely come into contact with apparently typically developing young children. Each tool is easy to administer, score and interpret, and requires minimal training. Successful community-based administration of RBSK-ASQ by paraprofessionals, TABC by CHW and M-CHAT-R/F by nursing staff [24, 25] dispels the mistaken belief that screening should be restricted to medical professionals.

The next logical step would be to conduct a multicentric, community-based validation study of these tools in similar populations using appropriately translated versions, and administered by CHW or para-professionals. If found acceptable, competent authorities may consider incorporation into the curriculum and pre-service training of all concerned genres of health personnel, and we may find ourselves closer to the ultimate goal of universal screening.

Ethics clearance: Institutional Ethics Committee, Lady Hardinge Medical College New Delhi; No. LHMC/IEC/Thesis/2019/95, dated Oct 28, 2019.
Contributors: SBM conceptualized the study; SBM, SS planned the design of the study; DM was the researcher; SBM and SS were the neuro-developmental experts; DM, SBM and SS were involved in collection and analysis of data; SBM and DM prepared the preliminary draft. All authors gave their intellectual inputs during critical revision and approved the final manuscript.
Funding: None; Competing interest: None stated.

REFERENCES

1. American Psychiatric Association. Autism Spectrum Disorder. In: Diagnostic and Statistical Manual of Mental Disorders, 5th ed. Arlington, VA: American Psychiatric Publishing; 2013.p50-59.
2. Arora NK, Nair MKC, Gulati S, et al. Neurodevelopmental disorders in children aged 2-9 years: Population-based burden estimates across five regions in India. PLoS Med 20181;5: e1002615.
3. Dworkin PH. British and American Recommendations for Developmental Monitoring: The Role of Surveillance. Pediatrics. 1989;84:1000-10.
4. Marlow M, Servili C, Tomlinson M. A review of screening tools for the identification of autism spectrum disorders and developmental delay in infants and young children: recommendations for use in low and middle income countries. Autism Res. 2019;12:176-99.
5. Robins DL, Casagrande K, Barton M, et al. Validation of the modified checklist for autism in toddlers, revised with follow-up (M-CHAT-R/F). Pediatrics. 2014;133:37-45.
6. Mukherjee SB, Aneja S, Sharma S, Kapoor D. Early childhood development: a paradigm shift from developmental screening and surveillance to parent intervention programs. Indian Pediatr. 2021;58: S64-8.
7. Dalwai S, Ahmed S, Udani V, et al. Consensus statement of the Indian Academy of Pediatrics on Evaluation and Management of Autism Spectrum Disorder. Indian Pediatr. 2017;54:385-93.
8. Mukherjee SB, Agrawal D, Mishra D, et al. Indian Academy of Pediatrics position paper on nurturing care for early childhood development. Indian Pediatr. 2021;58:962-9.
9. Nair MKC, George B, Purandare S, *et al*. Development of Trivandrum Autism Behaviour Checklist (TABC) for community screening of autism. TEENS. 2013;7:4-8.
10. National Health Mission, MoHFW. Rastriya Bal Swasthya Karyakram: Participant manual. Accessed on Dec 27, 2020. Available from: *https://nhm.gov.in/images/pdf/programmes/RBSK/Resource_Documents/participants_manual_full.pdf*
11. Robins DL. MCHAT R/F. Accessed Nov 06, 2019. Available from: *https://mchatscreen.com/mchat-rf/*
12. Mukherjee SB (Ed). IAP NURTURE Nurturing Care for Early Childhood Development Module 2 Companion for Pediatricians. New Delhi: Jaypee Brothers; 2021.
13. World Health Organization. Process of translation and adaptation of instruments. Accessed on Dec 03, 2020. Available from: *https://www.who.int/substance_abuse/research_tools/translation/en/#*
14. DP3 Alpern GD. Developmental profile 3 (DP-3). Los Angeles, CA: Western Psychological Services.2007.
15. Sangare M, Toure HB, Karambe A, et al. Validation of two parent reported autism spectrum disorder screening tools MCHAT-R and SCQ in Bamako, Bali. E Neurological Sci. 2019;15:100188.

16. Oner P, Oner O, Munir K. Three-item Direct Observation Screen (TIDOS) for autism spectrum disorder. Autism. 2014;18:733-42.
17. Bujang MA, Sa'at N, Sidik TMITAB, et al. Sample size guidelines for logistic regression from observational studies with large population: emphasis on the accuracy between statistics and parameters based on real life clinical data. Malays J Med Sci.2018;25:122-30.
18. WindianiI GAT, Soetjiningsih S, Adnyana IGAS, et al. Indonesian Modified Checklist for Autism in Toddler, Revised with Follow-Up (M-CHAT-R/F) for autism screening in children at Sanglah General Hospital, Bali-Indonesia. Bali Medical Journal. 2016;5:311-5.
19. Oner O, Munir KM. Modified Checklist for Autismin Toddlers Revised(MCHAT-R/F) in an Urban Metropolitan Sample of Young Children in Turkey. J Autism Dev Disord. 2020;50:3312-9.
20. Nair MKC , Kumar S, Lukose R, et al. Diagnostic validation of Trivandrum Autism Behavior Checklist (TABC) a screening checklist for autism spectrum disorder (ASD) against Childhood Autism Rating Scale-2-Standard Version (CARS-2-ST). International Journal of Pharmaceutical and Clinical Research 2023;15; 7-19.
21. Tsai JM, Lu L, Jeng SF, et al. Validation of the modified checklist for autism in toddlers, revised with follow-up in Taiwanese toddlers. Res Dev Disabil. 2019;85:205-16.
22. Kerub O, Haas EJ, Meiri G, et al. A comparison between two screening approaches for asd among toddlers in Israel. J Autism Dev Disord. 2020;50:1553-60.
23. Guo C, Luo M, Wang X, et al. Reliability and validity of the Chinese version of Modified checklist for autism in toddlers, Revised, with Follow-Up(M-CHAT-R/F). J Autism Dev Disord. 2019;49:185-96.
24. Jaisoorya TS, Jacob P, Srinath S, et al. Toddlers at risk for Autism Spectrum Disorders from Kerala, India – A community based screening. Asian J Psychiatr. 2018;31:10-12.
25. Joseph J, Arora D, Dangi K, et al. Toddlers at risk for autism in a semi-urban community of north India: A cross-sectional study. Medical Journal of Dr. D.Y. Patil Vidyapeeth 2021;14:333-6.