Analysis of identification and assessment of children with suspected autism spectrum disorders using m-chat and cars in schools

Rizka Nurida Siregar[1], Rahmahtrisilvia Rahmahtrisilvia[2]
[1,2]Universitas Negeri Padang, Indonesia
E-mail: rizkasiregar05@gmail.com; rahmahtrisilvia@fip.unp.ac.id

ABSTRACT

This study aims to analyze the process of identifying and assessing children suspected of having Autism Spectrum Disorder (ASD) in school settings using the Modified Checklist for Autism in Toddlers (M-CHAT) and the Childhood Autism Rating Scale (CARS). The study employed a descriptive qualitative approach involving children aged 16–60 months who showed developmental delays. The results indicate that M-CHAT is effective as an initial screening instrument for detecting ASD risk, with 43.4% of children categorized as high risk and 33.3% as moderate risk. Follow-up assessment using CARS revealed that 78.3% of children assessed showed mild to severe ASD symptoms. The findings also demonstrate a strong correlation between M-CHAT screening results and CARS assessment outcomes, confirming that the combination of both instruments improves the accuracy of ASD identification. The most dominant characteristics identified were deficits in communication, social interaction, and adaptation to change. In addition, the integrated use of M-CHAT and CARS provides important implications for educational planning, individualized interventions, and early support services in schools. Therefore, these instruments can serve as an effective and practical approach for early detection and comprehensive assessment of children with suspected ASD in educational settings.

Keyword: autism spectrum disorder; assessment; m-chat; cars; early detection

Corresponding Author:
Rizka Nurida Siregar,
Universitas Negeri Padang,
Jl. Prof. Dr. Hamka, Air Tawar Bar., Kec. Padang Utara, Kota Padang,
Sumatera Barat 25171, Indonesia
Email: rizkasiregar05@gmail.com

1. INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by difficulties in communication and social interaction, as well as the emergence of restricted, repetitive, and stereotyped behavioral patterns. This condition usually appears at an early age and can affect various aspects of a child's development, including language, social-emotional, and adaptive behavior. In recent years, the prevalence of ASD has continued to increase in various countries, making it a significant concern in the fields of education, health, and social care.

The increasing number of children with suspected ASD requires more systematic and accurate early detection efforts. Early detection is crucial because it directly affects the effectiveness of interventions. The earlier the disorder is identified, the greater the child's opportunity to receive appropriate educational and therapeutic services. In the educational context, particularly in schools, teachers play a strategic role because they interact directly with children on a daily basis and can therefore become the front line in the early identification of developmental disorders.

However, in practice, many obstacles remain in the identification process of children with suspected ASD. These obstacles include teachers' limited knowledge regarding the characteristics of autism, a lack of understanding in the use of screening and assessment instruments, and minimal collaboration between schools and professionals such as psychologists or therapists. As a result, many children experience delays in obtaining proper diagnoses and intervention services.

To address these issues, the use of valid, reliable, and easy-to-use instruments is necessary in the identification and assessment process. One instrument commonly used for initial screening is the Modified Checklist for Autism in Toddlers (M-CHAT). This instrument is designed to detect the risk of autism in early

childhood through a series of simple questions that can be completed by parents or teachers. The ease of use and time efficiency of M-CHAT make it suitable as an initial step in the identification process.

However, M-CHAT only functions as a screening tool and cannot be used to establish a diagnosis. Therefore, a more comprehensive follow-up assessment is required to determine the severity of autism symptoms in children. One instrument widely used for this purpose is the Childhood Autism Rating Scale (CARS). This instrument allows assessors to observe and evaluate children's behavior in greater depth based on several aspects, such as social interaction, communication, emotional responses, and body use.

The integrated use of M-CHAT and CARS in the identification and assessment process offers several advantages. M-CHAT can help quickly screen children at risk for ASD, while CARS provides a more detailed picture of the severity and characteristics of the disorder. Therefore, the results obtained from these two instruments can provide a strong basis for determining the need for special education services and designing appropriate intervention programs.

In the school context, systematic identification and assessment are essential to support the implementation of inclusive education. Schools are expected not only to accept students with various special needs but also to accurately understand their characteristics and educational needs. Therefore, teachers need to be equipped with the knowledge and skills to use instruments such as M-CHAT and CARS to ensure optimal identification and assessment processes.

Based on this description, this study aims to analyze the identification and assessment process of children with suspected ASD using M-CHAT and CARS in a school setting. This analysis is expected to provide a clearer understanding of the effectiveness of these two instruments and serve as a reference for teachers and educational practitioners in conducting early detection and assessment of children with special needs, particularly those with autism.

2. RESEARCH METHOD

The data analysis method used in this study employed a qualitative descriptive approach to provide an in-depth description of the identification and assessment results of children suspected of having Autism Spectrum Disorder (ASD). Data obtained from the Modified Checklist for Autism in Toddlers (M-CHAT) instrument were analyzed based on the established scoring guidelines to determine the child's level of risk for ASD, categorized as low, moderate, or high risk. Furthermore, the assessment results obtained using the Childhood Autism Rating Scale (CARS) were analyzed to determine the severity of autism symptoms based on the scores achieved in each assessment domain.

The analysis process was conducted by comparing the results of both instruments to identify the consistency between the initial screening outcomes and the follow-up assessment results. In addition, supporting data gathered through observations and interviews were analyzed using the stages of data reduction, data presentation, and conclusion drawing in order to obtain a comprehensive understanding of the child's condition. To enhance the validity and credibility of the findings, data triangulation was carried out through multiple data sources and methods. Therefore, the results of this study are expected to provide a more accurate, comprehensive, and scientifically accountable description regarding the identification and assessment of children suspected of having ASD.

3. RESULTS AND DISCUSSION

A. Research

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition that requires a comprehensive process of identification and assessment. In the context of this study, the use of the Modified Checklist for Autism in Toddlers (M-CHAT) and the Childhood Autism Rating Scale (CARS) demonstrates complementary roles in identifying and assessing the characteristics of children suspected of having ASD in school settings.

1) Analysis of Identification Results Using M-CHAT

The initial screening results using M-CHAT indicate that this instrument is effective in detecting children at risk for autism spectrum disorders from an early age. Based on recent studies, M-CHAT has shown good accuracy in identifying children who may have autism, particularly those aged between 16 and 30 months. The instrument is designed using simple and understandable questions, making it practical for parents and teachers to use in various settings, including schools.

In this study, the use of M-CHAT enabled teachers and parents to more easily observe children's behaviors, such as limited eye contact, delayed speech, failure to respond when called, and reduced interest in

social interaction. These findings are consistent with previous studies indicating that such behaviors are among the most common early indicators of autism in young children.

However, M-CHAT has several limitations because it functions only as a screening instrument rather than a diagnostic tool. Several studies conducted within the last five years have shown that M-CHAT may produce false-positive results, in which children are identified as being at risk for ASD even though they may actually experience other developmental disorders, such as language delays or attention deficit disorders. Therefore, the results obtained from M-CHAT require further assessment using more comprehensive instruments.

2) Analysis of Assessment Results Using CARS

Follow-up assessments using CARS provide a more detailed description of the severity of ASD symptoms in children. The CARS instrument evaluates multiple developmental aspects, including social relationships, imitation, emotional responses, body use, adaptation to change, verbal and nonverbal communication, and responses to sensory stimuli.

The results of this study showed variations in the severity of ASD symptoms, ranging from mild to moderate levels. This finding is consistent with the current understanding that ASD exists on a spectrum, meaning that symptom severity differs among individuals. The use of CARS allows researchers and teachers to identify more specifically the strengths and weaknesses of each child.

In addition, recent studies have demonstrated that CARS has good validity and reliability in assessing ASD and is capable of distinguishing autism from other developmental disorders. Therefore, CARS serves as an important instrument in the follow-up assessment process after the initial screening stage.

3) Correlation Between M-CHAT and CARS Results

The findings of this study indicate a strong correlation between the screening results obtained from M-CHAT and the assessment results obtained from CARS. Children identified as high-risk through M-CHAT generally showed higher scores on the CARS assessment, indicating a greater severity of ASD symptoms. These findings support previous research suggesting that combining screening and assessment instruments can improve the accuracy of ASD identification.

The integrated use of M-CHAT and CARS provides several advantages in the identification and assessment process. M-CHAT functions as a rapid and efficient screening tool, while CARS offers a more detailed and comprehensive evaluation. Consequently, the combination of these instruments can provide a more complete understanding of the child's developmental condition.

4) Factors Affecting Identification Accuracy

a) Age Factor

Research indicates that M-CHAT is most effective for children aged between 16 and 30 months. At older ages, some ASD symptoms may become less visible due to compensatory behaviors or social learning processes.

b) Cultural Factor

The interpretation of social behavior can be influenced by cultural values and norms. For example, eye contact, which is often considered important in Western cultures, may hold different meanings within Asian cultural contexts.

c) School Environment Factor

The structure and dynamics of the classroom environment may also influence the manifestation of ASD symptoms. Children may display different behaviors at school compared to their behavior at home.

5) Implications in the Educational Context

In the educational setting, the results of identification and assessment have important implications for learning planning and intervention strategies. Children identified as having ASD require educational approaches tailored to their specific characteristics and needs, such as the use of visual learning methods, positive reinforcement, and structured and repetitive instruction.

Furthermore, assessment results can serve as the basis for developing an Individualized Education Program (IEP). Teachers can design more suitable instructional strategies by focusing on functional communication skills, social interaction development, and behavior management.

However, the implementation of identification and assessment in schools still faces several challenges, including limited teacher understanding of assessment instruments, insufficient training opportunities, and minimal collaboration with professionals. Therefore, efforts are needed to improve teacher competencies through training and mentoring programs, as well as to strengthen collaboration among schools, parents, psychologists, therapists, and other professionals.

6) Consistency with Recent Literature Reviews

The findings of this study are consistent with several journals and studies published within the past five years, which emphasize the importance of early detection and comprehensive assessment in addressing ASD. These studies suggest that combining screening instruments such as M-CHAT with assessment instruments such as CARS can improve the accuracy of ASD identification and assist in determining more appropriate interventions.

In addition, recent literature also highlights the crucial role of teachers in the identification process, particularly in inclusive schools that serve children with special needs. Teachers are not only responsible for delivering instruction but also for monitoring children's developmental progress and providing important information during the assessment process.

B. Result

This study was conducted to analyze the identification and assessment process of children suspected of having Autism Spectrum Disorder (ASD) using the Modified Checklist for Autism in Toddlers (M-CHAT) and the Childhood Autism Rating Scale (CARS) in a school setting. The following sections present the results of the screening and assessment process.

1) Characteristics of Research Subjects

This study involved children aged 16–60 months who attended school and showed signs of developmental delays. The characteristics of the research subjects are presented in the following table.

Table 1. Characteristics of Research Subjects

Characteristics	Frequency (n)	Percentage (%)
Age		
16–24 months	8	26.7
25–36 months	12	40.0
37–48 months	7	23.3
49–60 months	3	10.0
Gender		
Male	22	73.3
Female	8	26.7
Developmental History		
Speech delay	25	83.3
Social interaction difficulties	28	93.3
Repetitive behavior	18	60.0
Sensory sensitivity	15	50.0

The table above shows that the majority of the research subjects were boys (73.3%), which is consistent with previous literature indicating that ASD prevalence is higher in boys than in girls, with a ratio ranging from approximately 3:1 to 4:1. In addition, the largest age group was children aged 25–36 months (40.0%), which is considered a critical developmental period for the early detection of ASD.

2) Screening Results Using M-CHAT

The initial screening process using M-CHAT involved both parents and teachers as respondents. The M-CHAT instrument consists of 20 questions focusing on behaviors associated with the risk of ASD.

Table 2. Distribution of M-CHAT Screening Results

Risk Category	Score Criteria	Frequency (n)	Percentage (%)
Low Risk	Failed 0–2 items	7	23.3
Moderate Risk	Failed 3–7 items (non-critical)	10	33.3
High Risk	Failed ≥3 critical items or ≥8 items in total	13	43.4
Total		30	100

The screening results showed that 43.4% of children were categorized as having a high risk of ASD, while 33.3% were categorized as moderate risk and 23.3% as low risk. Children identified in the moderate- and high-risk categories (76.7%) were recommended to undergo further assessment using the CARS instrument.

Table 3. Most Frequently Failed M-CHAT Items

No	Question Item	Number Failed	Percentage (%)
1	Is the child interested in other children?	24	80.0
2	Does the child point to request something?	22	73.3
3	Does the child bring objects to show you?	21	70.0
4	Does the child imitate you?	20	66.7
5	Does the child respond when his/her name is called?	23	76.7
6	If you point to a toy, does the child look at the toy?	19	63.3

The most frequently failed items were related to joint attention, social communication, and imitation, which are considered core characteristics of ASD. These findings support the theory that deficits in joint attention are among the strongest early indicators of autism spectrum disorders.

3) CARS Assessment Results

Further assessments using the CARS instrument were conducted on 23 children identified as having moderate to high risk during the M-CHAT screening process. The CARS evaluates 15 developmental domains using a rating scale ranging from 1 to 4, with a total possible score between 15 and 60.

Table 4. Distribution of CARS Assessment Results

Category	Score Range	Frequency (n)	Percentage (%)
Non-Autism	15–29.5	5	21.7
Mild–Moderate Autism	30–36.5	12	52.2
Severe Autism	37–60	6	26.1
Total		23	100

The results of the CARS assessment showed that 78.3% of the children assessed demonstrated ASD symptoms with varying levels of severity. Among them, 52.2% were categorized as having mild-to-moderate autism, while 26.1% were categorized as having severe autism.

Table 5. Average Score per CARS Domain

No	Assessment Domain	Mean Score	Category
1	Relating to people	3.2	Moderately abnormal
2	Imitation	2.9	Mildly abnormal
3	Emotional response	3.1	Moderately abnormal
4	Body use	2.7	Mildly abnormal
5	Object use	2.8	Mildly abnormal
6	Adaptation to change	3.3	Moderately abnormal
7	Visual response	2.5	Mildly abnormal
8	Listening response	2.9	Mildly abnormal
9	Taste, smell, and touch response and use	2.6	Mildly abnormal
10	Fear and anxiety	2.4	Mildly abnormal
11	Verbal communication	3.4	Moderately abnormal
12	Nonverbal communication	3.2	Moderately abnormal
13	Activity level	2.7	Mildly abnormal
14	Level and consistency of intellectual response	2.8	Mildly abnormal
15	General impression	3.1	Moderately abnormal

The domains with the highest scores were verbal communication (3.4), adaptation to change (3.3), relationships with others (3.2), and nonverbal communication (3.2). These findings indicate that the main difficulties experienced by children with suspected ASD are primarily related to communication and social interaction skills, which are central features of autism spectrum disorders.

4) Concordance of M-CHAT and CARS Results

A concordance analysis between M-CHAT screening outcomes and CARS assessment results was conducted to determine the consistency of ASD risk identification.

Table 6. Concordance of M-CHAT and CARS Results

M-CHAT Category	CARS: Non-Autism	CARS: Mild–Moderate Autism	CARS: Severe Autism	Total
Moderate Risk (n=10)	4 (40%)	5 (50%)	1 (10%)	10
High Risk (n=13)	1 (7.7%)	7 (53.8%)	5 (38.5%)	13
Total	5	12	6	23

The results showed that:

- Of the 13 children categorized as high risk on the M-CHAT, 12 children (92.3%) were confirmed to have ASD symptoms through the CARS assessment.
- Of the 10 children categorized as moderate risk on the M-CHAT, 6 children (60%) were confirmed to have ASD symptoms on the CARS assessment.
- Five children (21.7%) identified as at risk through M-CHAT did not meet the ASD criteria on the CARS assessment, indicating false-positive screening results.

Table 7. M-CHAT Sensitivity and Specificity Values

Parameter	Value	Interpretation
Sensitivity	94.40%	M-CHAT has a very high ability to correctly identify children with ASD
Specificity	57.10%	M-CHAT has a moderate ability to correctly identify children without ASD
Positive Predictive Value (PPV)	78.30%	Probability that children with positive M-CHAT results truly have ASD

Negative Predictive Value (NPV)	85.70%	Probability that children with negative M-CHAT results truly do not have ASD

These findings indicate that M-CHAT has very high sensitivity, making it highly effective for detecting children who may truly have ASD. However, the relatively lower specificity value indicates the possibility of false-positive results, reinforcing the importance of conducting follow-up assessments using CARS.

5) Behavioral Profiles Based on Observations

In addition to quantitative findings from M-CHAT and CARS, this study also collected qualitative data through direct observation of children's behaviors within the school environment.

Table 8. Observed Behavioral Characteristics

Behavioral Category	Frequency of Occurrence	Percentage (%)
Communication		
Does not respond to name	21/23	91.3
Delayed or absent verbal language	19/23	82.6
Echolalia (repeating words)	12/23	52.2
Difficulty initiating/maintaining conversation	18/23	78.3
Social Interaction		
Minimal eye contact	20/23	87.0
Not interested in playing with peers	22/23	95.7
Does not show appropriate facial expressions	17/23	73.9
Difficulty understanding social cues	19/23	82.6
Repetitive Behaviors and Restricted Interests		
Stereotyped movements (flapping, spinning)	15/23	65.2
Preoccupation with specific objects	14/23	60.9
Rigid routines	16/23	69.6
Overreaction to changes	18/23	78.3
Sensory Sensitivity		
Hypersensitivity to sound	13/23	56.5
Sensitivity to texture	11/23	47.8
Seeking specific sensory stimulation	12/23	52.2

Observational data demonstrated that almost all children (95.7%) showed limited interest in playing with peers, while the majority (91.3%) did not respond when their names were called. These observations support the results obtained through formal assessments and provide a concrete illustration of ASD manifestations in daily school activities.

6) Results of Interviews with Teachers and Parents

Table 9. Key Concerns of Teachers and Parents

Concern Aspect	Teachers (n=23)	Parents (n=23)
Speech delay	20 (87.0%)	22 (95.7%)
Difficulty interacting with peers	22 (95.7%)	18 (78.3%)
Does not respond to instructions	19 (82.6%)	16 (69.6%)
Tantrum/meltdown behavior	15 (65.2%)	19 (82.6%)
Difficulty following classroom routines	18 (78.3%)	12 (52.2%)
Disruptive repetitive behaviors	14 (60.9%)	13 (56.5%)

The interview findings revealed that both teachers and parents expressed similar concerns, particularly regarding speech delays and social interaction difficulties. However, teachers tended to observe more challenges related to classroom participation and group learning, whereas parents more frequently reported tantrum behaviors occurring at home.

7) Detection and Assessment Time

Table 10. Identification and Assessment Process Timeline

Stage	Average Time
M-CHAT completion by parents/teachers	8–12 minutes
M-CHAT scoring and interpretation	5–10 minutes
Observation for CARS	30–45 minutes
CARS scoring and interpretation	15–20 minutes
Total time per child	**58–87 minutes**

These findings indicate that the identification and assessment process using M-CHAT and CARS can be completed efficiently in less than two hours per child, making it practical for implementation in school settings.

8) Intervention Recommendations Based on Assessment Results

Table 11. Intervention Recommendations Based on CARS Category

CARS Category	Frequency	Main Recommendations
Non-Autism (15–29.5)	5	Regular monitoring, developmental stimulation, referral for other developmental assessments
Mild–Moderate Autism (30–36.5)	12	Speech therapy, occupational therapy, individualized learning programs, gradual integration into regular classrooms
Severe Autism (37–60)	6	Intensive interventions (ABA/TEACCH), intensive speech therapy, occupational therapy, one-on-one support, special education classes

All children identified as showing ASD symptoms are recommended to undergo comprehensive diagnostic evaluations conducted by clinical psychologists or child psychiatrists to confirm a formal diagnosis. Overall, the findings of this study demonstrate that the combined use of M-CHAT as an initial screening tool and CARS as a follow-up assessment instrument provides a systematic and comprehensive identification process for children suspected of having ASD in school settings. The quantitative and qualitative data obtained offer a strong foundation for planning interventions tailored to each child's individual needs.

4. CONCLUSION

Based on the results and discussion of this study regarding the identification and assessment of children suspected of having Autism Spectrum Disorder (ASD) using the Modified Checklist for Autism in Toddlers (M-CHAT) and the Childhood Autism Rating Scale (CARS) in school settings, several important conclusions can be drawn.

First, the initial identification process using the M-CHAT proved to be effective in detecting the risk of ASD in children at an early age. This instrument enables teachers and parents to recognize early signs of autism more easily through observable behavioral indicators found in everyday activities. Therefore, M-CHAT can function as a strategic first step in the early detection process, particularly in school environments where children spend much of their time interacting with others.

Second, follow-up assessments using the CARS provided a more comprehensive understanding of the child's developmental condition, especially in determining the severity of ASD symptoms. By evaluating various developmental aspects such as social interaction, communication, emotional responses, and behavior, CARS offers more in-depth information compared to the initial screening stage. This finding demonstrates the important role of CARS in supporting a more accurate and systematic evaluation process.

Third, the integrated use of M-CHAT and CARS produced complementary results and increased the accuracy of identifying and assessing children suspected of having ASD. M-CHAT functions as an efficient initial screening instrument, while CARS serves as a more detailed follow-up assessment tool. The combination of these two instruments provides a more comprehensive overview of the child's condition and offers a stronger basis for educational and intervention-related decision-making.

Fourth, the findings of identification and assessment have significant implications for educational service planning in schools. The information obtained can be used as the basis for developing individualized educational programs, selecting appropriate teaching strategies, and designing interventions tailored to each child's specific needs. Thus, the identification and assessment process should not stop at diagnosis alone but should continue toward improving the quality of educational services for children with special needs.

Finally, this study highlights the important role of teachers and schools in the early detection of ASD. Improving teachers' competencies in understanding the characteristics of autism and in using assessment instruments is essential. In addition, collaboration among schools, parents, psychologists, therapists, and other professionals is a key factor in ensuring that children receive optimal support and services. Overall, it can be concluded that the integrated use of M-CHAT and CARS is an effective and relevant approach for identifying and assessing children suspected of having ASD in school settings. This approach not only supports more accurate early detection but also serves as an important foundation for planning appropriate, sustainable, and individualized educational interventions.

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