M-CHAT-R: UTILIZING FOR SCREENING AUTISM SPECTRUM DISORDER

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ABSTRACT

***Background**: Autism Spectrum Disorder (ASD) is a multifaceted condition marked by challenges in communication and social interactions, behavioral restrictions, and repetitive actions. Identifying children who may be at risk of ASD early on is crucial for prompt consultation, monitoring, and intervention.* ***Objectives**: Determine the rate of Autism Spectrum Disorder in children between the ages of 18 and 36 months by utilizing the M-CHAT-R scale at the clinic of Can Tho Children's Hospital. And identify the associated risk factors for that rate of Autism Spectrum Disorder.* ***Materials and methods**: A descriptive cross-sectional study conducted on 608 children aged 18-36 months who were examined at the clinic of Can Tho Children's Hospital.* ***Results**: The majority of children in the study, comprising 88.3%, fell within the age range of 24-36 months, with proportions of boys and girls at 57.6% and 42.4%, respectively. Among the children, 94.7% (576/608 children) were classified as low risk, while medium risk and high risk accounted for 4.28% (26/608 children) and 1.02% (6/608 children), respectively. Questions with notably high positive rates among at-risk children were item 2 (38.9%), item 5 (15.2%), item 12 (16.2%), item 11 (4.8%). Conversely, the least common symptom was indicated in question 9, where children showed a preference for moving activities, accounting for only 2.7%. Associations were observed between the risk of Autism Spectrum Disorder and factors such as gender (p=0.04), father'age (p=0.024), alcohol consumption (p=0.047), birth asphyxia (p=0.036), seizures due to high fever/unknown cause (p=0.035).* ***Conclusion**: In the study, the rate of positive M-CHAT-R was 5.3% (32 out of 608 children), predominantly observed in the low-risk group, accounting for 94.7%. The majority of positive cases fell within the 24-36 month age group, comprising 26 out of the 32 children. The risk of Autism Spectrum Disorder showed correlations with gender, father's age older or equal to 35 years old, alcohol consumption, birth asphyxia and seizures triggered by high fever or unknown causes. However, there was no observed relationship between the risk of Autism Spectrum Disorder and age group factors.*

***Keywords**: Autism Spectrum Disorder, ASD, -M-CHAT-R, children.*

I. INTRODUCTION

Autism Spectrum Disorder is a developmental disorder of the brain, the term "spectrum" refers to a variety of symptoms and degrees of disorder, characterized by difficulties with communication and social reflexes, as well as restrictions on repetitive behavior and operations [1], [2]. Autism Spectrum Disorder leaves many serious consequences and burdens for the child, his or her family, and society. According to the United States CDC, the current rate of autism spectrum disorder is 1/36 [3], and in Can Tho, screening research showed that 2% of children examined at Can Tho Children's Hospital showed signs of disorder [4].

According to scientists, the first 3 years of life are the most important period for parents to focus on investing in their children's learning ability [5]. Early intervention will help support children's maximum development to integrate into society and improve their quality of life and long-term development. The M-CHAT-R has high sensitivity and specificity and is widely used in many countries as a tool to help early screen children at risk of autism spectrum disorders because it is easy to perform and inexpensive, helping parents easily evaluate their children's abilities [6]. Additionally, to gain knowledge of the risk of children with Autism Spectrum Disorder at Can Tho Children's Hospital, to help early screen children at risk of Autism Spectrum Disorder, we conducted research "*M-CHAT-R: utilizing for screening autism spectrum disorder"* with 2 object: (1) Determine the rate of Autism Spectrum Disorder in children between the ages of 18 and 36 months by utilizing the M-CHAT-R scale at the clinic of Can Tho Children's Hospital. (2) Identify the associated risk factors for that rate of Autism Spectrum Disorder.

II. MATERIALS AND METHODS

2.1. Research subjects

A total of 608 children, aged between 18 and 36 months, were evaluated at the clinic of Can Tho Children's Hospital, with a gender distribution of 350 boys and 258 girls

Location: Can Tho Children's Hospital.

Inclusion criteria:

- All toddlers aged 18-36 months undergo Autism Spectrum Disorder risk screening using the M-CHAT-R at Can Tho Children's Hospital.

Exclusion criteria:

Children previously diagnosed with Autism Spectrum Disorder.

Families refusing to participate in the survey.

Families do not providing sufficient information.

Only one sample will be taken for children who undergo multiple examinations.

2.2. Research methods

2.2.1. Research design: A descriptive cross-sectional study was conducted to determine the prevalence of children who tested positive on the M-CHAT-R.

2.2.2. Sample size: The sample size estimation formula based on estimating a proportion, with absolute, can be expressed as follows:

$$n = \frac{Z^2_{1-\alpha/2} p(1-p)}{d^2}$$

With:

n is the required sample size. Z is the z-score corresponding to the desired level of confidence. With a = 0.05 => Z = 1.96

p is the estimated rate of children positive for M-CHAT-R with p=0.0821 from Pham Thi To Uyen (2021) [7]. d is the margin of error (chosen d=0.025).

n = 463 (children) ⇨ Actually collected 608 samples (children)

2.2.3. Sampling method: Convenient sampling was employed, selecting children aged 18 to 36 months attending the Can Tho Children's Hospital during the study period until a satisfactory sample size was achieved.

2.2.4. Research content:

Determine the rate of Autism Spectrum Disorder in children between the ages of 18

and 36 months by utilizing the M-CHAT-R scale at the clinic of Can Tho Children's Hospital. And identify the associated risk factors for that rate of Autism Spectrum Disorder.

The M-CHAT-R is an autism test that asks 20 questions about your toddler's behavior to screen for autism. The survey consists of 20 questions that should take 5 – 10 minutes to complete. If the total score is 3 points or more, the child is at risk of autism.

General characteristics of research subjects: age, gender, order of children in the family, parental age.

ASD risk factors: alcohol consumption, father's age older than 35 years old, birth asphyxia and seizures triggered by high fever or unknown causes, low birth weight.

2.3. Data collection

Medical students conducted face-to-face interviews with parents of children aged 18-36 months using the M-CHAT-R questionnaire, which comprises 20 items.

How to evaluate: M-CHAT-R positive = Suspected autism: when there are at least 3 unusual items.

2.4. Statistical analysis

Data are entered and processed using SPSS 20.0 software.

The $\chi 2$ test is employed to examine the relationship between factors at the significance level of α=0.05. Odds ratios (OR) are calculated with a 95% confidence interval.

2.5. Ethics approval

The subject's personal information and research data will be encrypted after data collection to ensure privacy for study participants. This study was approved by the Ethics Committee in Biomedical Research of Can Tho University of Medicine and Pharmacy.

III. RESULTS

3.1. General characteristics of research subjects

Table 1. Distribution of age and gender among study participants (n=608)

Child characteristics		Frequency (n)	Percentage (%)
Age	18-24 months	71	11.7
	24-36 months	537	88.3
Gender	Boys	350	57.6
	Girls	258	42.4

The majority of children are concentrated in the age range of 24-36 months, comprising 88.3% in total. Gender distribution with boys accounting for 57.6% and girls for 42.4%.

3.2. The proportion of children aged 18 to 36 months at risk of Autism Spectrum Disorder and distribute the risk level using the M-CHAT-R scale.

Table 2. Proportion of positive children according to the M-CHAT-R scale and risk distribution of risk levels for with Autism Spectrum Disorder (n=608)

M-CHAT-R risk sample	Frequency	Prevalence	
Low-risk (score 0-2)	576	94.7%	M-CHAT-R Positive Prevalence: **5.3%**
Moderate-risk (score 3-7)	26	4.28%	
High-risk (score 8-20)	6	1.02%	
Total	**608**	100%	

Within the study population, we observed a positive screening rate for children at 10.5%. Among them, the low-risk category constituted 94.7% (576 out of 608 children), while the medium-risk category comprised 4.28%, and the high-risk category constituted 1.02%.

3.3. Frequency and positive rate of each item

Table 3. The frequency and positive rate of each item on M-CHAT-R scoring sheet

	M-CHAT-R Scoring Sheet	M-CHAT-R Positive	M-CHAT-R Negative
		n (%)	n (%)
1	If you point at something across the room, does child look at it?	4 (12.5)	28 (87.5)
2	Have you ever wondered if your child might be deaf?	7 (21.88)	25 (78.12)
3	Does your child play pretend or make-believe?	11 (34.3)	21 (65.6)
4	Does your child like climbing on things?	2 (6.25)	30 (93.75)
5	Does child make unusual finger movements near his or her eyes?	10 (31.25)	22 (68.75)
6	Does hild point with one finger to ask for something?	12 (37.5)	20 (6.25)
7	Does child point with one finger to show something interesting?	9 (28.12)	23 (71.88)
8	Is your child interested in other children?	7 (21.88)	25 (78.12)
9	Does your child show you things by bringing them to you or holding them up for you to see not to get help, just to share?	16 (50)	16 (50)
10	Does your child respond when you call his or her name?	7 (21.88)	25 (78.12)
11	When you smile at your child, does he or she smile back?	3 (9.38)	29 (90.62)
12	Does your child get upset by everyday noises?	16 (50)	16 (50)
13	Does your child walk?	6 (18.75)	26 (81.25)
14	Does your child look you in the eye when you are talking to him or her, playing with him or her, or dressing him or her?	6 (18.75)	26 (81.25)
15	Does your child try to copy what you do?	5 (15.62)	27 (84.38)
16	If you turn your head to look at something, does your child look around to see what you are looking at?	14 (43.8)	18 (56.25)
17	Does your child try to get you to watch him or her?	13 (40.63)	19 (59.38)
18	Does child understand when you tell him to do something?	6 (18.75)	26 (81.25)
19	Does your child look at your face to see how you feel about it?	12 (37.5)	20 (6.25)
20	Does your child like movement activities?	3 (9.38)	29 (90.62)

Our findings on the positive rate in the items are displayed in Table 3. The items with the highest positive rate are those with counts of 9 (50%), 12 (50%), 16 (43.8%), and 17 (40.63%), in that order. In addition, the following items have rather high favorable rates: 3 (34.3%), 5 (31.25%), and 6 (37.5%).

3.4. Some factors related to children with Autism Spectrum Disorder

Table 4. Relationship between factors related to the positive rate of children at risk of Autism Spectrum Disorder

Variables		M-CHAT-R		OR (CI 95%)	p value
		Positive n (%)	Negative n (%)		
Age	18-<24 months	7 (9.9)	64 (90.1)	2.240 (0.931-5.387)	0.084
	24-36 months	25 (4.7)	512 (95.3)		
Gender	Boys	24 (6.9)	326 (93.1)	2.301 (1.016-5.208)	**0.04**
	Girls	8 (3.1)	250 (96.9)		
Father's Age older or equal to 35 years old	Yes	12 (9.2)	119 (90.8)	2.304 (1.095-4.847)	**0.024**
	No	20 (4.2)	457 (95.8)		
Alcohol Consumption	Yes	6 (11.5%)	46 (88.5)	0,376 (0,147-0,96)	**0.047**
	No	26 (4.7%)	530 (95.3)		
Low birth weight (<2500g)	Yes	2 (6.5)	29 (93.5)	1.257 (0.286-5.520)	0.6
	No	30 (5.2)	547 (94.8)		
Birth Asphyxia	Yes	30 (13.7)	189 (86.3)	1.847 (1.033-3.303)	**0.036**
	No	22 (7.9)	256 (92.1)		
Seizures due to high fever/unknown cause	Yes	5 (55.6)	4 (44.4)	11.729 (3.044-45.186)	**0.035**
	No	47 (9.6)	441 (90.4)		

An association was observed between the risk of Autism Spectrum Disorder and gender (p=0.04), father's age (p=0.024), alcohol consumption (p=0.047), birth asphyxia (p=0.036) and seizures due to high fever/unknown cause (p=0.035). However, the research did not find a significant relationship between the risk of Autism Spectrum Disorder and age group factors (p=0.084) (Table 4).

IV. DISCUSSION

4.1. Characteristics of research subjects

Through our research, we recorded a total of 608 children, mostly in the 24–36 months group (88.3%), with boys accounting for 57.6% and girls for 42.4%. The first child accounts for the highest proportion with 48.5%. Research by Nguyen Minh Phuong (2023) also recorded that most research subjects were in the 24–36 months group (94.3%), the first child accounted for the highest proportion with 50.9% [8]. However, this study recorded a higher proportion of girls at 50.5%. In addition, research by Vo Van Thi (2023) recorded that the age of father and mother are younger than 35 years old, with rates of 77.44% and 84.47%, respectively [6]. This difference may be due to differences in research location, population density in the study area and living conditions.

4.2. Distribution of prevalence and risk levels of Autism Spectrum Disorder

The M-CHAT-R scale showed a positive rate of 5.3% in this study we conducted. The result is consistent with a number of domestic and international research. The positive rate for M-CHAT-R recorded in study of Vo Van Thi (2023) was 6.5% [6]. In addition, research by Nguyen Duc Tri is 6.63% (528 children) and Nguyen Minh Phuong (2021) is

6.9% (out of 1369 children) [5], [9]. Although our rate is lower than the mentioned studies, possibly due to the small sample size, positive results have increased significantly after several years. In international studies, we recorded higher positive rates such as Oner (2020) of 9.8% (out of 6712 children) [10]. To explain this risk rate, greater understanding of autism by the community, society as well as medical professionals is also considered the reason for the increase in the rate. Furthermore, we observe that international studies also have a high sensitivity in result of M-CHAT-R [11], [12].

The low-risk rate accounts for 94.7% (576/608 children), the moderate-risk rate accounts for 4.28% (26/608 children) and the high-risk rate accounts for 1.02% (6/608 children). This is similar to Nguyen Minh Phuong's (2023) study, which noted that the low-risk group (0-2 points) accounts for the highest rate at 93.5%, the high-risk group (8-20) accounts for only 1.4% [8]. The results are also similar to foreign studies such as Oner recorded in 6712 children, low risk rate accounted for 90.2%, average risk 8.7%, high risk 1.1% [10].

4.3. Frequency and positive rate of each item of M-CHAT-R scoring

Our research results on the positive rate of items show that these items with a high positive rate in children at risk are item 9 (50% of children show things to their parents), item 12 (50% of children get upset by everyday noises), item 16 (43.8% of children look around to see what you do), and item 17 (40.63% of children try to get parents to watch him or her). The least common symptom is item 4, when children like climbing on things, accounting for only 6.25%. Our findings align with those of Tran Thien Thang's research, which showed that item 9 (62.5%) and item 16 (50%) had particularly high positive rates, but he remarked that item 6 (Do the child use your index finger to ask for or help) had a negative rate of 100%, while our results have a high rate in item 6 (37.5%) [4]. Research by Vo Van Thi (2023) also shows that item 9 (52.7%), item 3 (46,3% of child play pretend or make-believe) has the highest rate, while the lowest positive rate is in item 11 (85.7%) and item 20 (91.6%) [6]. It is possible to explain the difference in the positive rate of the questionnaires depending largely on the subjective observation ability of the parents, as well as the environment in which the questionnaires were collected and the difference in sample size between our studies. (n = 497) with Tran Thien Thang's study (n=400) sampled at the clinic of Can Tho Children's Hospital and Vo Van Thi's study (n=3639) with large-scale sampling at preschools with young trees in Ca Mau province [4], [6]. The results of the synthesis of data from ten nations with the research conducted by author Stevanovic D. show some similarities with our research, we remark [13].

Combining our research and similar studies, we can see outstanding symptoms in children at risk of autism with high rates such as children don’t like to show things to their parents, children get upset by everyday noises, children don’t try to get parents to watch him or her, child don’t play pretend or make-believe. This clinical manifestation belongs to the group of limited social communication. Most children with Autism Spectrum Disorder show deficits in developing, maintaining and understanding relationships, so they have difficulty sharing, imaginative play and making friends. This sign is an important, reliable hint to identify a child with Autism Spectrum Disorder.

4.4. Factors related to the rate of Autism Spectrum Disorder

In addition to determining the overall rate of children with Autism Spectrum Disorder, it is extremely necessary to find risk factors as well as the rate of children with

disorder in these risk groups. Through research of 608 children, we have the following notes: Our research shows that children at risk of autism are mostly aged 24-36 months (88.3%). The results are similar to research by Nguyen Minh Phuong (2021) in Ca Mau with a rate of 65.71% (23/35 children) [9]. The boys have a statistically significant higher rate of Autism Spectrum Disorder than the girls (6.9% compared to 3.1%), this result is consistent with many domestic and foreign studies [4], [6], [10]. This is quite consistent with the general epidemiology of ASD where boys are usually taller than girls [4].

Our study noted a relationship between the risk of autism and the following factors: gender (p=0.04), father's age older or equal to 35 years (p=0.024), alcohol consumption (p=0.047), birth asphyxia (p=0.036) and seizures due to high fever/unknown cause (p=0.035) and no relationship between age group and risk of autism has been noted (p=0.084). This is quite reasonable as the factors mentioned are those that are believed to increase the rate of ASD. This result similar to research by Nguyen Minh Phuong (2023), which also noted that there is a relationship between the risk of autism and birth asphyxia (p<0,001) [8]. Low birth weight and premature birth are also recognized as factors related to increasing the rate of autism spectrum disorder, but because the sample in this study was limited, the difference could not be seen. But we also noted that there was no association between the risk of autism and age (p=0.115) [9].

V. CONCLUSION

In our study at Can Tho Children's Hospital, 32 of 608 children aged 18–36 months tested positive for M-CHAT-R, comprising 5.3% of the total. The majority of positive cases (94.7%) fell into the low-risk group, primarily in the 24–36 months (88.3%). Common symptoms indicating risk included children show things to their parents (50%), children get upset by everyday noises (50%), children look around to see what you do (43.8%), children try to get parents to watch him or her (40.63%). Factors significantly linked to autism spectrum disorder risk included gender, father's age older or equal to 35 years old, alcohol consumption, birth asphyxia and seizures triggered by high fever or unknown causes. No differences were found among age groups, but boys showed a higher risk compared to girls.

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