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EVALUATION OF THE EFFECTIVENESS OF A MULTIDISCIPLINARY INTERVENTION MODEL FOR CHILDREN WITH AUTISM SPECTRUM DISORDER AT DA NANG REHABILITATION HOSPITAL

Nguyen Van Dung[1*], Tran Danh Tien Thinh[1],
Cao Bich Thuy[2], Nguyen Tien Hung[1], Tran Van Ha[1], Vo Van Chien[1],
Phan Thi Tung Lam[1], Pham Thi Thuy Ngan[1], Le Thi My Tien[1], Cao Thi Thanh Thuong[1],
Tran Nguyen Thu Hang[1], Truong Van Trinh[3], Dinh Thi Minh Thuy[3], Nguyen Dac Quynh Anh[4]

[1]Da Nang City Rehabilitation Hospital - 79 Dinh Gia Trinh, Hoa Xuan, Da Nang City, Vietnam
[2]Da Nang University of Medical Technology and Pharmacy - 99 Hung Vuong, Hai Chau, Da Nang City, Vietnam
[3]Danang Department Of Information And Communications - 168 Nguyen Sinh Sac, Hoa Khanh, Da Nang City, Vietnam
[4]Duy Tan University School of Medicine and Pharmacy - 254 Nguyen Van Linh, Thanh Khe, Da Nang City, Vietnam

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ABSTRACT

Objective: To evaluate the effectiveness of a multidisciplinary intervention model in the treatment of children with autism spectrum disorder (ASD) at Da Nang City Rehabilitation Hospital.

Methods: This non-controlled clinical intervention study used a pre–post design in 79 children aged 16 months to 5 years diagnosed with ASD according to DSM-5 criteria. The interventions included speech therapy, occupational therapy, clinical psychology, physical therapy, special education, and family involvement, with a minimum of 20 hours per week for 6 months. Outcomes were assessed using the Childhood Autism Rating Scale (CARS) and the Autism Treatment Evaluation Checklist (ATEC) before and after intervention.

Results: After six months, 73.4% of participants achieved at least minimal clinical improvement. The proportion of children classified with severe ASD decreased from 22.8% to 3.8% ($p < 0.05$). The mean CARS score decreased from 33.9 ± 4.9 to 30.3 ± 3.0, and the mean ATEC score decreased from 84.2 to 60.0 ($p < 0.05$). All ATEC subscales improved, with the most significant changes in social functioning and language–communication.

Conclusion: The multidisciplinary intervention model produced significant improvements in behavior, language, and social functioning among children with ASD. This model represents a comprehensive, feasible, and context-appropriate approach for hospital-based rehabilitation.

Keywords: Autism Spectrum Disorder, CARS, ATEC, rehabilitation.

1. INTRODUCTION

Autism spectrum disorder (ASD) is a term used to describe a group of deficits in social communication and repetitive behaviors, severely restricted interests, and/or sensory behaviors that begin in early childhood. The global prevalence is below 1%, with higher reported rates in high-income countries [1]. The prevalence tends to increase, as in the United States, rising from 1.1% in 2008 to 2.3% in 2018. Currently, there is no specific biomarker for the diagnosis of PCOS [2]. In Vietnam, ASD has been recognized and given attention since the 1990s, along with the development of fields such as rehabilitation, clinical psychology, and special education. However, early diagnosis and intervention remain limited due to a shortage of specialized personnel and an unsynchronized infrastructure. On the other hand, international studies have shown that early, structured, multidisciplinary interventions significantly improve communication skills, social behavior, and adaptive abilities in children with ASD [3].

The multidisciplinary intervention model, which includes coordination among rehabilitation doctors, psychologists, occupational therapists, speech therapists, and special education professionals, is considered a comprehensive and practical approach for children with developmental coordination disorder

*Corresponding author
Email: drnguyenvandung72@gmail.com **Phone**: (+84) 905644388 **DOI:** 10.52163/yhc.v66i8.4066

[4]. Research conducted in India and Brazil shows that children participating in multidisciplinary programs have significant improvements in social interaction, communication, and motor skills compared to single-discipline approaches. In Vietnam, current intervention models are still primarily implemented separately by individual disciplines, mainly as separate therapy or speech therapy activities, and a unified multidisciplinary coordination system in public hospitals has not yet been established.

This study was conducted to evaluate the effectiveness of a multidisciplinary intervention model for treating children with ASD at Da Nang Rehabilitation Hospital, thereby providing scientific evidence to inform the development and expansion of suitable and effective intervention models in the Vietnamese context.

2. METHODS

2.1. Research design

The study was designed as a non-controlled clinical intervention with a pre-post comparison. All study participants were assessed before and 6 months after the intervention to determine changes in disorder severity, communication skills, social behavior, and adaptive abilities following participation in a multidisciplinary intervention model. The program was implemented through an interdisciplinary intervention model comprising the following areas: speech therapy, developing receptive and expressive language, and functional communication. Occupational therapy: improving fine motor skills, sensory regulation, and adaptive behavior. Clinical psychology: guiding parents, adjusting behavior, and enhancing social skills. Physical therapy: supporting posture, gross motor skills, and sensory orientation. Special education: organizing learning and play activities suitable for the child's abilities. Medical care: treating and intervening in co-morbid disorders. The minimum intervention duration as 20 hours per week, lasting for 6 months. Each child had an individualized intervention plan (IIP) developed by the specialist team and was assessed.

The intervention duration is a minimum of 20 hours per week, lasting 6 months. Each child has an individualized intervention plan (IIP) developed by a team of specialists, with progress assessed and adjusted monthly through multidisciplinary team meetings with the active participation of the child's parents.

2.2. Study period and setting

From 12/2024 to 8/2025 at Danang City Rehabilitation Hospital.

2.3. Research subjects

Children from 16 months to 5 years old, diagnosed with ASD according to DSM-5 criteria, who have the informed and voluntary consent of their parent or legal guardian after being clearly informed of the purpose of the intervention and potential adverse events, meeting the following criteria:

- Inclusion criteria for study participants: Children diagnosed with ASD according to DSM-5 criteria.

- Exclusion criteria: Children with one or more of the following conditions:

Severe neurological disease (severe cerebral palsy, uncontrolled epilepsy, traumatic brain injury, or specific genetic syndromes such as Rett or Fragile X);

+ Conditions requiring emergency care or surgical intervention;

+ Severe internal medical diseases affecting the ability to participate in training and daily activities, such as heart failure, chronic kidney disease stage IIIb or higher, or Child-Pugh C cirrhosis;

+ Non-adherence to intervention procedures;

+ Concurrent participation in intervention at another facility during the study period;

+ Severe sensory or motor disorders that prevented assessment or involvement in therapy;

+ Non-adherence or missing more than 20% of scheduled intervention sessions.

2.4. Sample size

This was an intervention study with pre–post comparison and no control group. In a survey by Hardan et al., the percentage change in speech ability in the intervention group was 41% [5]. We aimed to detect a higher percentage change using the following formula:

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

(p=0,65; α= 0,05, $Z^2_{1-\alpha/2}$=1,96; ε= 20%). In practice, 89 children were recruited; 10 were lost to follow-up, leaving 79 children who completed the study.

2.5. Variables and indicators

- Demographic characteristics of the study participants: age (in years), gender, height, and weight.

- CARS score: The CARS (Childhood Autism Rating Scale) assesses the severity of autism spectrum disorder in children. The scale consists of 15 items, with total scores ranging from 15 to 60. A score below 30 indicates no autism spectrum disorder; a score from 30 to 36.5 indicates mild to moderate severity, and a score of 37 or above shows severe severity.

- ATEC includes (1) Language/Speech/Communication, (2) Sociability, (3) Sensory/Cognitive Awareness, and (4) Health/Physical/Behavior. The first scale, Language /Speech/Communication, consists of 14 items with scores ranging from 0 to 28. The Sociability scale has 20 items with possible scores from 0 to 40. The third subscale, Sensory/Cognitive Awareness, includes 18 items with scores ranging from 0 to 36. Finally, Health/ Physical/Behavior consists of 25 items with scores ranging from 0 to 75. The total score ranges from 0 to 179. Lower scores indicate less severe ASD symptoms.

- Effectiveness criterion: Intervention effectiveness was defined as: a reduction in CARS score ≥ 4.5 points or a

reduction in CARS score below the threshold of 30 points [6].

2.6. Research process

Children who met the eligibility criteria were enrolled, baseline information was collected, and the multidisciplinary intervention was implemented through the following steps:

+ Baseline assessment: CARS and ATEC were administered to determine ASD severity, language, and behavior.

+ Development of individualized intervention plan: An IIP was established according to each child's priority goals.

+ Implementation of multidisciplinary intervention: A 6-month multidisciplinary program was delivered with close collaboration between therapists and parents.

+ Periodic monthly follow-up: Progression was monitored monthly.

+ Post-intervention assessment: The same tools were used after the intervention to compare effectiveness.

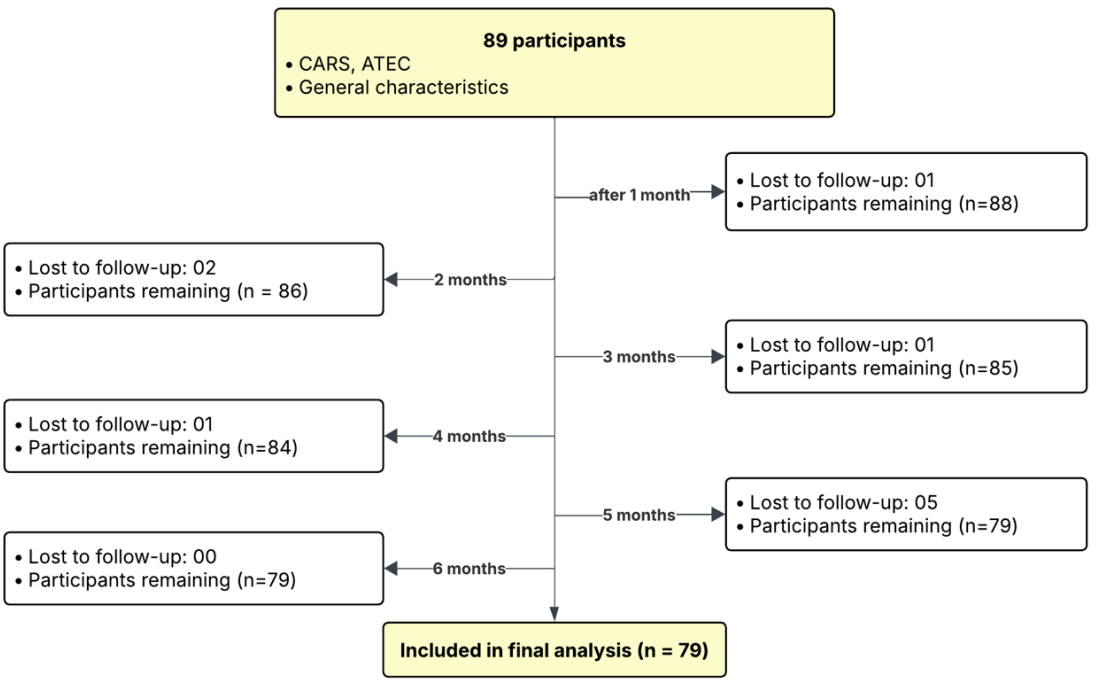

Figure 1. Study flowchart

2.7. Data analysis

Data were collected using a standardized research medical record form, entered and exported as Excel files, and processed using R-language version 4.3.0. Descriptive statistics for qualitative variables were presented as frequencies and percentages, while quantitative variables were described by mean (standard deviation). Treatment outcomes were evaluated by comparing pre- and post-treatment rates using the Chi-square test or Fisher's exact test, and changes in means were compared using paired comparisons.

2.8. Ethical

Children only participate in the study after obtaining consent from their parents or legal guardians. During the intervention, they are regularly monitored and evaluated. Children can stop participating in the study at any time. The Science and Technology Council of the Da Nang Department of Science and Technology has approved the project.

3. RESULTS

A total of 79 children completed the 6-month intervention. Most participants were male (65/79, 82.3%), with 14 females (17.7%). The mean age of the sample was 3.3 ± 1.2 years; it did not differ significantly between boys ($p > 0.05$).

Table 1. Demographic characteristics and clinical symptoms of the study participants

Characteristics	Overall (n = 79)	Male (n = 65)	Female (n = 14)	p-value[1]
Age (years)	3.3 (1.2)	3.4 (1.3)	3.2 (1.0)	0.64
CARS	33.9 (4.9)	33.9 (5.0)	33.9 (4.9)	0.85
ASD Level				
Mild and moderate	61 (77.2%)	50 (76.9%)	11 (78.6%)	>0.99
Serious	18 (22.8%)	15 (23.1%)	3 (21.4%)	
ATEC	84.2 (17.2)	83.7 (17.9)	86.2 (14.4)	0.71

1: n (%); 2: Wilcoxon rank sum test; Fisher's exact test

The research results showed that the majority of participants had mild to moderate levels of autism spectrum disorder (77.2%), with only 22.8% having

severe levels, with an average CARS score of 33.9 (4.9) points. The difference in severity levels between boys and girls was not statistically significant (p>0.05). The average ATEC score of the participants was 82.2 (17.2) points, with males scoring 83.7 (17.9) points and females 86.2 (14.4) points; the difference between the two genders was not statistically significant (p>0.05).

Results after 6 months of intervention showed that most children improved in their CARS scores. Specifically, the average CARS score before treatment was 33.9 (4.9) points, which decreased to 30.3 (3.0) points after the intervention. The average difference before and after was statistically significant with p<0.05 (Figure 2.A).

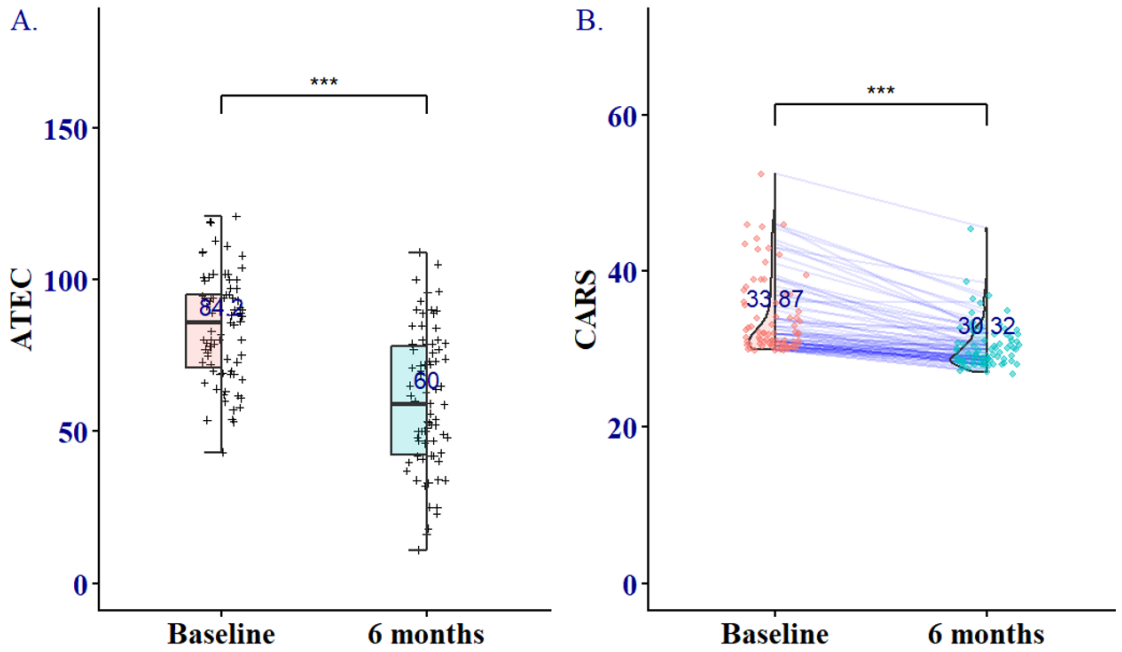

Figure 2. Changes in CARS and ATEC scores after 6 months of intervention

*(A. Change in CARS, B. Change in ATEC, *** : p<0,001)*

After 6 months of intervention, the ATEC score decreased from 84.2 to 60, with a statistically significant difference (p<0.05) (Figure 2.B).

Table 2. ATEC subscale scores after intervention

Criteria	Before the intervention (n = 79)	After 6 months (n = 79)	p-value[1]
Language/ communication	21,4 (4,2)	16,7 (6,0)	<0,001
Society	25,3 (8,0)	14,4 (7,7)	<0,001
Perception / Sensation	22,3 (6,9)	17,6 (7,8)	<0,001
Perception / Sensation	15,2 (6,6)	11,3 (8,3)	<0,001

1: Wilcoxon rank sum test

After 6 months of research, all component scores of the ATEC decreased, with the reductions being statistically significant at p<0.05. Among them, the social functioning and communication language groups showed the most improvement.

Table 3. Overall treatment results

Results	n = 79[1]
Effective	58 (73,4%)
Non-effective	21 (26,6%)

1: n (%)

After 6 months of intervention using the multidisciplinary model, 73.4% of children responded effectively.

4. DISCUSSION

After 6 months of intervention using a multidisciplinary model, the study recorded significant improvements in various developmental aspects of children with ASD. 73.4% of children achieved at least minimal intervention effectiveness, with 51.9% scoring below the 30-point threshold on the CARS. The proportion of children with severe levels decreased significantly from 22.8% to 3.8% (p < 0.05). The average CARS score decreased from 33.9 ± 4.9 to 30.3 ± 3.0; the ATEC score decreased from 84.2 to 60, with statistically significant differences (p < 0.05). All ATEC component scores decreased, particularly social function and language communication, which showed the most improvement.

The results of our study are similar to those of several other authors when implementing a multidisciplinary

intervention model, such as Boram Lee and colleagues (2023). The CARS score significantly improved from 34.6 ± 6.3 at baseline to 28.6 ± 6.1 after 6 months ($p < 0.0001$), which affirms the effectiveness of the coordination between speech therapy and occupational therapy [7]. The study's results align with many international and domestic works. Khawash et al. (2025) evaluated multidisciplinary interventions at a general hospital over six months. Statistical analysis of the data indicated that 19 children showed statistically significant improvements in the total CARS score after treatment [8]. In Vietnam, Nguyễn Đức Tấn and colleagues (2021) evaluated the effectiveness of interventions using the TEACH model. After 6 months, the mean CARS score in the control group decreased from 39.9 to 37.8, while in the intervention group it decreased from 41.1 to 33.7, with the difference being statistically significant at $p<0.05$. Furthermore, this study also indicated a correlation between adherence to the intervention regimen and its effectiveness [9]. Thien Thang Tran and colleagues (2024) evaluated the effectiveness of an intervention for children with ASD using a combined model of speech therapy, behavioral intervention, and parent guidance. After 6 months, 19.4% of the children improved from severe to mild-to-moderate disorder, with ATEC scores decreasing from 125.3 (16.4) to 77.1 (9.2) points, a statistically significant change ($p<0.05$) [10].

The above results demonstrate the stable effectiveness of the multidisciplinary intervention model, regardless of contextual differences (international or Vietnamese), thanks to the model's integrated multi-domain approach: simultaneously combining speech therapy, occupational therapy, psychology, and behavioral therapy, aiming to impact multiple developmental areas (language, sensory, social, and behavior) concurrently. Another reason for the similarity is the closely matched characteristics of the study subjects, mostly children with mild-to-moderate ASD (77.2%), with an average age of 3.3 years, which corresponds to the "golden period" for early intervention, when neuroplasticity and learning ability are still high. International studies also emphasize that early intervention before the age of 4 yields more significant improvements in language and social skills, which is consistent with these results. Although our study results align with both domestic and international findings, the reductions in CARS scores (3.6 points) and ATEC scores (24 points) are lower than in some other studies. This difference may be related to the shorter duration and intensity of the intervention (20 hours/week compared to 25–30 hours/week abroad) and to the fact that the professional team is not yet fully integrated, as in international models. In addition, parents in the study were only given home guidance and did not participate in formal training programs, whereas "Parent-Implemented" models have shown superior effectiveness. Furthermore, most children in the sample were in the mild-to-moderate group (77.2%), resulting in a milder average improvement than in the severe groups in other studies. Finally, the lack of coordinated support from family, school, and society also reduces the sustainability of intervention outcomes. Overall, this difference reflects the real conditions of the intervention system in Vietnam. Yet, the results still confirm the feasibility and practical effectiveness of the multidisciplinary model in rehabilitating children with ASD.

The first limitation of the study is that the intervention and follow-up periods lasted only 6 months, which does not reflect the long-term effectiveness of the multidisciplinary model. Second, the study did not include a control group for comparison, so any assertion of the relative efficacy of the methods is limited. Finally, the study did not assess changes in related biological markers, so the relationship between clinical improvement and underlying biological changes remains unclear. Future studies should extend the follow-up period, include a control group, and integrate biological markers to provide more comprehensive and robust scientific evidence.

5. CONCLUSION

After 6 months of multidisciplinary intervention, this study showed marked improvements in clinical and behavioral scales in children with ASD. The outcomes were comprehensive across multiple domains—behavior, communication, cognition, and social functioning—while ASD severity decreased and the potential for inclusion and participation increased.

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