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Factors Associated with Autism Spectrum Disorder at the Neurocognitive Unit in Congo

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Abstract

Introduction: ASD is a set of neurodevelopmental disorders affecting communication, interpersonal relationships, behaviors and activities of the child that are restricted and repetitive. The objective was to identify the factors associated with the evolution of ASD at the neurocognitive exploration unit of the Brazzaville University Hospital in Congo. **Methodology:** It was a prospective cohort study carried out at the neurocognitive exploration unit of the CHU-B over a period of 21 months. It concerned patients with ASD aged 3 to 16 years. Their diagnosis was made according to the criteria of the DSM-V. After an initial assessment, then the establishment of codified and adapted care, a final assessment of the degree of severity was carried out at 9 months using the CARS autism assessment scale. **Results:** The frequency of ASD was high (55.6%). These were dominated by childhood autism (84.9%). The average age of onset of signs was 16.1 ± 5.2 months, and that of diagnosis was 7.1 ± 2.9 years. The main treatment methods implemented were schooling in a special (50%) or ordinary school (40%), speech therapy (91.5%), developmental and behavioral therapies (50%), and psychotherapy (50%). The evolution at 9 months was marked by an improvement (10.9%) in the degree of severity of ASD, with associated factors such as young age at diagnosis, the absence of cognitive disorders and schooling in an ordinary school. **Conclusion:** The management of ASD in Brazzaville improves the degree of severity under certain conditions. Therefore, a parental awareness campaign and early screening of ASD in schools are needed to facilitate socio-relational integration.

Keywords

Autism Spectrum Disorders, Care, Neurocognitive Unit, Congo

1. Introduction

Autism spectrum disorders (ASD) are a group of neurodevelopmental disorders affecting a child's communication, interpersonal relationships, behaviors, and activities that are restricted and repetitive [1] [2].

ASDs are present from birth, but symptoms usually appear in early childhood [1] [3]. Although specific management can lead to notable improvements in performance, ASDs remain present throughout life [4] [5].

Worldwide, the most recent studies estimate that the prevalence of ASD varies between 90 and 120 individuals per 10,000 inhabitants, or approximately 1% of the general population, in children as in adults [6] [7]. Other more recent studies have reported an even higher prevalence of 157 to 260 per 10,000 inhabitants in the United Kingdom and South Korea [7] [8]. In the United States, in 2014, the prevalence of ASD was estimated at 168 per 10,000 children aged 8 years [9].

In Africa, a few studies have been conducted specifically on ASD. Their estimated hospital frequency is between 2.3% and 7.8% [10] [11].

ASDs have significant repercussions on the lives of children and their families [5]. They have a considerable impact on both learning and social integration [2].

The management of ASD is multidisciplinary. It is based on intensive behavioral and educational interventions [12]-[14]. It must be early in order to promote a better prognosis in terms of social integration and disability, thanks to cerebral neuroplasticity [5].

In Congo, little data exists on autism spectrum disorders and their associated factors. This raises the issue of ASD management in Congo. Hence, the objective of this study is to identify the factors associated with the development of ASD in the neurocognitive exploration unit of the Brazzaville University Hospital in Congo.

2. Patient and Methods

This was a prospective cohort study conducted from January 1, 2021, to September 30, 2022, a period of 21 months, carried out in the neurology department of the University Hospital Center of Brazzaville (CHU-B) specializing in the management of neurological conditions in children and adults in the department of Brazzaville.

This service includes four sub-units, namely:

- the neurocognitive exploration unit (the only unit in Congo): includes a consultation office and a room containing the equipment dedicated to carrying out assessment tests and support tools;
- the hospitalization unit;
- the neurovascular intensive care unit (NICU);
- the clinical neurophysiology unit.

Subject recruitment was carried out exhaustively over the entire study period.

The study included patients:

- aged 2 to 16 years;
- presenting an ASD confirmed by standardized diagnostic tests;

- whose parents and/or legal guardians had consented to participate in the study.

The following patients were not included in our study:

- ASD having benefited from initial support before our study;
- having a severe sensory or motor deficit, such as cerebral palsy (CP) or neuromuscular dystrophy.

The study variables were:

- Sociodemographic:
- gender: masculine or feminine;
- patient's age: in years.
- Neurocognitive assessment of ASD performed using diagnostic tools:
- DSM-5: The severity of the disorder is based on the extent of social communication deficits and restricted and repetitive behavioral patterns. It is coded into three levels: level 1 requiring assistance (mild form); level 2 requiring significant assistance (moderate form); level 3 requiring very significant assistance (severe form);
- Childhood Autism Rating Scale (CARS): This is a tool specifically designed to detect autism by discriminating from other behavioral disorders in children to account for only autistic traits, based on 15 behavioral items. It includes both an interview with the family and an observation of the child's behavior. It is applicable to all ages, including preschool.
- Therapeutics:
- schooling and type of schooling: yes or no;
- educational support by specialized educators: yes or no;
- interventions (TEACCH, Denver): yes or no;
- intervention (ABA): yes or no;
- speech therapy: yes or no;
- psychotherapeutic rehabilitation: yes or no;
- psychomotor rehabilitation: yes or no;
- specialized medical care: drug prescription, yes or no.
- Scalable: evolving severity modalities at 9 months (improvement, stationary).

The treatment protocol, codified and adapted based on ASD symptoms and associated comorbidities, involved several stakeholders, including a neurobehavioral therapist, a speech therapist, a psychologist, special educators, a psychomotor therapist, a neurologist, and a psychiatrist.

Depending on the severity of the ASD, an educational and pedagogical approach was provided by specialized educators in the special school for the severe form and in the mainstream school for the mild and moderate forms. Each patient received schooling for 9 months.

For verbal and nonverbal communication disorders, speech therapy was provided with 2 to 3 speech therapy sessions lasting 45 minutes or even 1 hour per week. It consisted of working on and/or strengthening communication prerequisites (through pointing, imitation, and the logical arrangement of objects and photos) and oral language (through sentence construction using pictures and picto-

grams, as well as naming and reading text). It also involved implementing alternative and augmentative communication using the Picture Communication Workbook (PECS).

For behavioral and social interaction disorders, neurobehavioral and developmental care was provided using behavioral and developmental approaches at a frequency of two sessions per week for a duration of 45 minutes to one hour, in the schools where each patient was located. This care was provided by psychologists, speech therapists, and special educators under the supervision of the neurobehavioral therapist. Behavioral approaches aimed to reduce the maladaptive behaviors of patients with ASD by integrating the learning of new behaviors to facilitate autonomy and social integration through play-based activities and time tracking. This time tracking was achieved using a visual schedule with pictograms moving throughout the day.

Developmental approaches are aimed at motivating patients with ASD to interact with those around them with the aim of developing social communication. They were based on play, activities focused on imitation, looking and paying attention to an object, touching and pointing at objects, and sensory integration. These approaches were continued at home by parents who played with the children.

For those with fine and gross motor disorders, psychomotor therapy was provided. This consisted of relaxation, laterality, self-image, and muscle strengthening exercises, with a frequency of 2 to 3 sessions per week. Speech therapy and neurobehavioral therapy were combined with other forms of care in cases of comorbidities.

Thus, for patients with learning disabilities and intellectual disabilities, psychological support was provided for 1 hour at a frequency of 2 to 3 sessions per week. This consisted of cognitive behavioral therapy (CBT) using cognitive exercises that positively modify the patient's negative beliefs and thoughts about themselves.

For those with sleep disorders, treatment was provided by a neurologist with the introduction of weight-based, low-dose melatonin, combined with appropriate sleep hygiene.

However, for patients with epilepsy, antiepileptics such as sodium valproate and valpromide were prescribed weight-based, low-dose medications for an initial period of 1 month, then renewed after a reassessment. Those with psychiatric disorders such as ADHD, depression, aggression and self-harm had appropriate psychiatric care: psychostimulants (methylphenidate) were prescribed for ADHD, antipsychotics (risperidone) for aggression and self-harm and antidepressants (fluoxetine) for depression.

Data were entered and processed using Excel software and statistical analysis using SPSS version 23.0 software. Quantitative variables were presented as mean and standard deviation and qualitative variables expressed as frequency. To identify factors associated with the evolution after 9 months of follow-up, a univariate analysis was performed; that is, the variable of interest (level of severity) was crossed

with the explanatory variables (sociodemographic, clinical and therapeutic). Pearson's chi-square test was used to compare the numbers. When the theoretical number was less than 5, the Fisher Exact test was used. The significance threshold was set at 5%.

3. Results

3.1. Hospital Frequency

The study population consisted of 250 patients with neurodevelopmental disorders, of whom 139 (55.6%) had a diagnosis of ASD, among whom 106 (76.3%) patients met our inclusion criteria.

The overall frequency of ASD in the neurocognitive exploration unit of CHU-B was therefore 55.6%. The frequency of the type of ASD: 90 (84.9%) patients had childhood autism and 16 (15.1%) had atypical autism.

The mean age of the patients was 7.1 ± 2.9 years, with the extremes aged 3 to 16. There were 86 (81.1%) boys and 20 (18.9%) girls, a sex ratio of 4.3.

Thirty-nine patients (36.8 %) were in the age group of [0 - 5] years, 56 (52.8%) patients of [6 - 10] years and 11 (10.4 %) patients of [11 - 16] years.

3.2. Therapeutic Modalities, Evolutionary and Associated Factors

The distribution of patients according to schooling is illustrated in Figure 1.

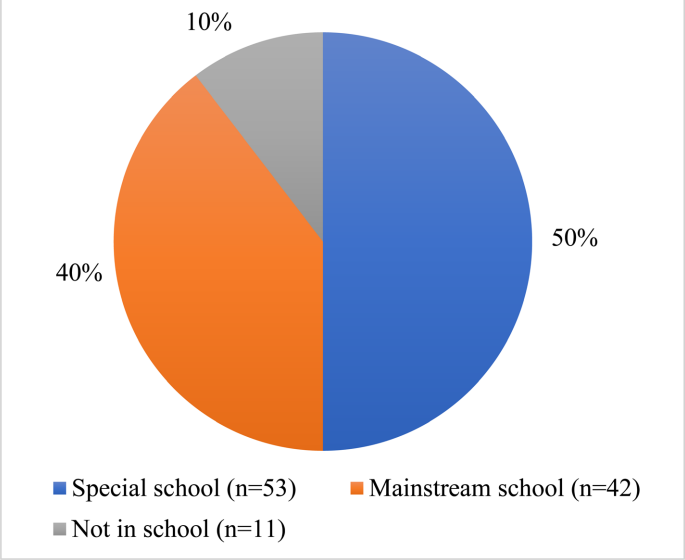

Figure 1. Distribution of patients according to education.

Among patients with ASD, 55 (51.9%) had used educational support and 51 (48.1%) had not.

The distribution of patients according to therapies and behavioral/developmental approaches is presented in Table 1.

Fifty (47.2%) patients had received psychiatric care, 34 (32.1%) neurological care and 30 (28.3%) pediatric care.

At the initial assessment, 106 patients with ASD were placed on a therapeutic protocol. The planned severity assessment at 9 months revealed a loss to follow-up of 60 (56.6%) patients, only 46 (43.4%) patients had returned to control.

The distribution of patients according to ASD severity at baseline and at 9 months of follow-up is summarized in Table 2.

Table 1. Distribution of patients according to behavioral/developmental therapies and approaches.

	Effective	Percentage
Speech therapy	97	91.5
Psychotherapy	53	50.0
ABA* Approach	53	50.0
Approaching Denver**	53	50.0
TEACCH*** Approach	22	20.8
Psychomotor skills	4	3.77
None	8	7.55

ABA*: Applied Behavior Analysis (behavioral approach); Denver**: Early Start Denver Model and TEACCH***: Treatment and Education of Autistic and Related Communication Disabled Children (developmental approach).

Table 2. Distribution of patients according to ASD severity at inclusion and at 9 months.

	Initial severity		Severity at 9 months		Improvement rate
	n	%	n	%	
Light	6	13.0	11	23.9	10.9
Moderate	34	74.0	31	67.4	6.6
Severe	6	13.0	4	8.7	4.3

Factors associated with ASD severity at 9 months of follow-up are presented in Tables 3-5.

Table 3. Comparison between sociodemographic characteristics and severity at 9 months.

	Severity at 9 months		*p*-value
	Severe/Moderate (n = 35) n (%)	Light (n = 11) n (%)	
Gender of patients			1000
Boy	29 (82.9)	9 (81.8)	
Girl	6 (17.1)	2 (18.2)	
Age group in years			0.017
[0 - 5]	4 (11.4)	5 (45.4)	

Continued

[6 - 10]	27 (77.2)	4 (36.4)	
[11 - 16]	4 (11.4)	2 (18.2)	
Father's education level			1000
Secondary	5 (14.3)	1 (9.1)	
Superior	30 (85.7)	10 (90.9)	
Mother's education level			0.092
Secondary	17 (48.6)	2 (18.2)	
Superior	18 (51.4)	9 (81.8)	
Socioeconomic level			0.130
Down	6 (17.1)	-	
Average	26 (74.3)	8 (72.7)	
Pupil	3 (8.6)	3 (27.3)	

Table 4. Comparison between clinical characteristics of ASD and severity at 9 months.

	Severity at 9 months		***p*-value**
	Severe/Moderate (n = 35) n (%)	**Light (n = 11) n (%)**	
Age of delay in months			1000
[0 - 6]	2 (5.7)	1 (9.1)	
[7 - 12]	17 (48.5)	5 (45.4)	
[13 - 18]	8 (22.9)	3 (27.3)	
[19 - 24]	8 (22.9)	2 (18.2)	
Type of ASD			0.053
Childhood autism	35 (100)	9 (81.8)	
Atypical autism	-	2 (18.2)	
Initial severity of ASD			<0.001
Light	-	6 (54.5)	
Moderate	29 (82.8)	5 (45.5)	
Severe	6 (17.2)	-	
Epilepsy			0.559
Yes	4 (11.4)	-	
Sleep disturbance			0.241
Yes	11 (31.4)	1 (9.1)	
Intellectual disability			0.009
Yes	34 (97.1)	7 (63.6)	

Continued

Learning Disability			0.009
Yes	34 (97.1)	7 (63.6)	
Eating disorder			0.229
Yes	15 (42.8)	7 (63.6)	
ADHD			1,000
Yes	15 (42.8)	4 (36.4)	

Table 5. Comparison between therapeutic modalities and severity at 9 months.

	Severity at 9 months		*p*-value
	Severe/Moderate (n = 35) n (%)	Light (n = 11) n (%)	
Schooling			0.031
Special school	27 (77.1)	5 (45.5)	
Regular school	7 (20.0)	6 (54.5)	
Not in school	1 (2.9)	-	
Educational support			0.494
Yes	21 (60.0)	5 (45.5)	
Speech therapy			0.358
Yes	31 (88.6)	11 (100.0)	
Psychotherapy			0.065
Yes	27 (77.1)	5 (45.5)	
Psychomotor skills			1000
Yes	1 (2.9)	-	
ABA approach			0.065
Yes	27 (77.1)	5 (45.5)	
Approaching Denver			0.065
Yes	27 (77.1)	5 (45.5)	
TEACCH Approach			0.501
Yes	14 (40.0)	3 (27.3)	
Neurologist			0.383
Yes	18 (51.4)	4 (36.4)	
Psychiatrist			1000
Yes	33 (94.3)	10 (90.9)	
Pediatrician			0.486
Yes	15 (42.9)	3 (27.3)	

4. Discussions

An improvement in the severity of ASD was noted in the present study with an improvement rate of 10.9% from the initial assessment to the final assessment carried out 9 months after treatment. There is increasing evidence that treatment of ASD is associated with an improvement in their severity [15]-[17]. This observation highlights the interest in creating centers dedicated specifically to the treatment of ASD.

This improvement is explained by the management of ASD in the present study, which was codified and adapted to the symptoms presented by the patients as well as to the associated comorbidities. This management was established on the basis of international recommendations [18]. In our study, the management consisted of educational support and integration into ordinary schools for mild and moderate forms and into special schools for severe forms. It also consisted, in the majority of cases, of speech therapy and psychotherapy. To a lesser extent, psychomotor rehabilitation was implemented. Developmental and behavioral therapies, more specific to ASD, were introduced in half of the cases. In some patients, specialized medical care was necessary.

The low control rate at 9 months could be explained by the lack of effective improvement in absent patients.

Several factors influenced this improvement. These were the age group of less than 6 to 10 years at the time of diagnosis, the absence of intellectual disability, learning disabilities and integration into a regular school.

Various studies regarding integration into mainstream schools show that even with a disability, similar progress can be observed both in mainstream schools and in specialised settings [19] [20]. Rose *et al.* [21] indicated that children with language disorders in mainstream schools engage more in collaborative play, have more positive social interactions and engage less in solitary play. Implementing national programs and creating specialized centers dedicated to the care of ASD will ensure better awareness and education of populations and facilitate the social reintegration of patients with ASD.

Besides school integration, factors involved in the improvement of ASD are early treatment, young age, and the absence of cognitive disorders. It is important to emphasize that the degree of severity of the majority of patients with ASD in the present study was moderate. Patients who presented severe forms had the lowest rate of improvement, *i.e.*, 4.3%. They were older, presented with cognitive disorders, and were enrolled in a special school. Western studies report that the intellectual disability associated with ASD is undoubtedly a factor in the aggravation of the intensity of the symptomatology, and the evolution is significantly better than in forms without intellectual disability [22] [23]. It is important to raise awareness among parents of children with ASD about the benefits of early care and regular monitoring in improving the quality of life of children with ASD in order to facilitate their socio-relational integration.

5. Conclusion

In Congo, ASD is frequently associated with intellectual disability, learning disabilities, and eating disorders. After codified and adapted care, a significant improvement in the severity of ASD is observed. Factors associated with this improvement are young age at diagnosis, the absence of cognitive disorders, and schooling in a regular school. The need for awareness campaigns is crucial for the early detection of behavioral and communication disorders. Additionally, implementing a neurocognitive assessment for students upon school admission, whether in regular or special education, is necessary.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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