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Children with neuro-developmental disorders at Center for Child and Adolescent Mental Health in Cambodia

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ABSTRACT

The Center for Child and Adolescent Mental Health (CCAMH) is one of the centers that have psychiatric specialists for children in Cambodia. This study aims to understand the characteristics of children with neuro-developmental disorders, especially autism spectrum disorder (ASD), at CCAMH. This study included 440 cases that were randomly chosen from 2,147 new patients at CCAMH in 2018–2019 and were aged 0–12 years. Socio-demographic factors, parent's information, obstetrical factors, and clinical data were collected from patients' records. A logistic regression analysis and Pearson's chi-square test were used to compare the characteristics between children who were finally diagnosed with ASD and the others (non-ASD). Of the 440 patients, most were male (75.2%), 0–4 years old (57.7%), and diagnosed with ASD (50.0%). Common symptoms were delay of speech, playing alone, and hyperactivity. ASD was significantly more prevalent in male patients compared to females and in the 0–4 years age group compared to the 5–12 years age group. Parents who lived in Phnom Penh and had high education were more likely to visit the CCAMH with their children who were diagnosed with ASD. Regarding treatment, approximately half of all 440 patients had family counselling and psychosocial education. ASD patients had more speech therapy, special education and structured teaching, and networking and coordination therapy compared to non-ASD patients. To provide education and therapy to children with ASD and their parents from the early stage, information about the center and ASD should be widely distributed to all parents in Cambodia.

Keywords: autism spectrum disorder, Cambodia, children, neuro-developmental disorder

Abbreviations:
ASD: autism spectrum disorder
CCAMH: Center for Child and Adolescent Mental Health
Q-CHAT: Quantitative Checklist for Autism in Toddlers

INTRODUCTION

Globally, of the nearly one billion people with disabilities, 200 million are facing living difficulties.[1] It is reported that 10–20% of children have mental health problems in low-middle income countries.[2] Cambodia is a lower middle-income country located in Southeast Asia and the total population in 2019 was approximately 15,288,000.[3] In Cambodia, nearly 301,000 people were living with disabilities, of which 10.6% were children aged 0–14 years.[1] The Cambodian government developed the National Disability Strategic Plan in 2014–2018 to reduce poverty among people with disabilities and provide healthcare services for their physical and mental rehabilitation.[1,4] One of the 10 objectives of the plan was to improve mental health services, treatment, and training for individuals with mental disabilities and their families.[1]

Cambodia suffered a civil war from 1967 to 1975, followed by the Khmer Rouge from 1975 to 1979.[4,5] Approximately, one of four people died during that period and 14.2–33.4% of the Khmer Rouge survivors were diagnosed with post-traumatic stress disorder.[2,4,5] During this period, all services, including mental health services, were destroyed.[6] In 2015, Cambodia had nine national hospitals, 25 provincial referral hospitals, 68 district referral hospitals, and 1,141 health centers.[4,7] Health facilities that provided services for mental health problems, such as drug abuse, increased from 67 facilities in 2010 to 450 facilities in 2019, including two national hospitals, 25 provincial referral hospitals, 72 district referral hospitals, and 351 health centers.[8] Basic and primary mental healthcare services are provided at 72% of referral hospitals and 18% of health centers.[9] There were approximately 60 psychiatrists in 2018, which meant one psychiatrist per 260,000 people.[4] The Ministry of Health is developing the national guidelines on the diagnosis and treatment of mental disorders in Cambodia, but it is not finalized yet.

The Center for Child and Adolescent Mental Health (CCAMH) in Chey Chumneas Referral Hospital in Kandal Province is supported by the non-governmental organization (NGO), Caritas Cambodia. Specialists on mental health of children and adolescents joined the Ministry of Health and established the center in 1991 to provide "one-stop-service" for children with mental disabilities.[2,4,10,11] In 2013, CCAMH had 5,227 patients and the major diagnosis was developmental disorders including autism spectrum disorder (ASD) (60%), followed by neuropsychiatric problems such as epilepsy (29%) and mental health problems (11%), which mainly encompassed psychosis.[2] The number of children who visited the center increased to 7,512 (5,250 boys and 2,262 girls) in 2019, which included 1,213 new patients and 6,299 patients for follow-up visits.[12] CCAMH have medical professionals to provide treatment for children with ASD, including one child psychiatrist, one psychiatric specialist, three medical doctors, two psychiatric nurses, two nurses, three psychologists, two social workers, one art therapist, one special educator, one speech therapist, one occupational therapist, one pharmacist, and nine administrative staff.

However, there have been no studies or any governmental reports that analyze clinical and epidemiological data of children with mental health problems and neuro-developmental disorders in Cambodia.[9] Therefore, this study aims to understand the characteristics of children with neuro-developmental disorders, especially ASD, who visited the CCAMH.

MATERIALS AND METHODS

Study design and participants

This study included 2,147 new patients who visited the CCAMH in Chey Chumneas Hospital, in Kandal Province, Cambodia, between January 2018 and December 2019. To understand the basic characteristics of new patients, data regarding sex, age, residential area, and the provisional

diagnosis of the 2,147 patients were collected from the registration book. The multidisciplinary team made the provisional diagnosis of new patients based on patient's chief complaints. The final diagnosis was provided by the multidisciplinary team after series of assessment and it was six to eight weeks after the registration.

Of the 2,147 patients, 1,927 patients were aged 0–12 years (children) and 220 were aged 13–18 years (adolescents). ASD is usually diagnosed when patients are in childhood, mostly around 2–3 years old. For an in-depth understanding of the characteristics of patients with neuro-developmental disorders including ASD, 500 child patients (0–12 years old) were randomly selected from the 1,927 children, by a random number method using the computer program, Random Number Generator (https://andrew.hedges.name/experiments/random/). A total of 60 patients were excluded because they and their medical records were transferred to other provinces for treatment. Finally, 440 patients were included in the analysis.

Data collection of children aged 0–12 years

The following data were collected from patients' records: (1) demographic information (sex, age, residence, current education, and living with family), (2) obstetrical information (birth weight, mode of delivery, place of delivery, crying at birth, multiple birth, mother's problem during pregnancy, and neonatal jaundice), (3) parent's information (age at birth, education, and job) and family history, and (4) clinical information (sign and symptom, final diagnosis, and treatment).

Residence was classified into Phnom Penh City and provinces based on where the children lived. The current education of the children was categorized into three groups (home, preschool, and primary school). In Cambodia, the age groups for preschool and primary school are 3–5 years and 6–12 years, respectively. Living with family meant living with a parent or grandparent. Parent's ages at birth were categorized into three groups (< 30 years, 30–39 years, and > 39 years). Parent's education was categorized into three groups (no education, up to high school, and university); their jobs were categorized into two groups (farmer/worker/small business owner and business/government staff/NGO).

Obstetrical factors of 440 patients were categorized as follows. Birth weight was categorized into two groups (< 2,500 g and ≥ 2,500 g). Mode of delivery was categorized into three groups (cesarean section, normal delivery, and instrumental delivery); instrumental delivery included forceps delivery and vacuum delivery. Place of delivery was categorized into two groups (health center/home and hospital/private clinic). Crying at birth was categorized into two groups (immediately and delay). Multiple birth was categorized into two groups (singleton and multiple). Problems during pregnancy referred to any complications that mothers experienced during pregnancy, such as fever, seizure, flu, and other maternal diseases.

The clinical diagnosis of ASD was made based on signs and symptoms and the Quantitative Checklist for Autism in Toddlers (Q-CHAT-10). The diagnostic criteria of ASD comprised three main aspects, including communication (speaking problems, eye contact, understand facial expression), social-emotional interaction (do not respond to their name, not follow other action), and unusual behaviors or interests (not interested in things, do the same activity, interested only in things that have the same movement).[13,14] The Q-CHAT-10 is a quantitative checklist to detect autism in toddlers, which was developed by the American Academy of Child and Adolescent Psychiatry; however, at the center, it was used as a screening tool for ASD. The Q-CHAT-10 has 10 questions and each question has 5 categories of answers (A, B, C, D, and E). One point was given when answers were C, D, or E, for questions 1–9, and when answers were A, B, or C for question 10. When the total points were more than three, the child was considered as having ASD, but the final diagnosis was made according to a multi-disciplinary assessment.[15]

Statistical analysis

SPSS version 27 (IBM SPSS Inc., New York, USA) was used to analyze the data. Descriptive analysis was used to summarize the data and represent percentages. A logistic regression analysis was conducted to determine the odds ratio (OR) and 95% confidence interval (CI). Pearson's chi-square test was performed using categorical data. A *P*-value less than 0.05 was considered significant.

Ethical considerations

This study was approved by the National Ethics Committee for Health Research of Cambodia on July 5, 2020. Written informed consent was waived due to a retrospective study.

RESULTS

Profile of all new patients of CCAMH in 2018–2019

Table 1 shows the characteristics of all 2,147 children who visited the Chey Chumneas Referral Hospital for the first time from January 2018 to December 2019. Of the 2,147 children, 1,511

Table 1 Characteristics of all new patients of the Centre for Child and Adolescent Mental Health in 2018–2019 (N=2,147)

Variable	Total	Male	Female
		Number (%)	Number (%)
Total	2,147	1,511 (70.4)	636 (29.6)
Age group (years)			
0–4	1,088	840 (77.2)	248 (22.8)
5–8	529	383 (72.4)	146 (27.6)
9–12	310	170 (54.8)	140 (45.2)
13–18	220	118 (53.6)	102 (46.4)
Provisional diagnosis			
Developmental language disorder	661	499 (75.5)	162 (24.5)
ASD	591	488 (82.6)	103 (17.4)
Mental retardation	474	298 (62.9)	176 (37.1)
Epilepsy	59	35 (59.3)	24 (40.7)
Cerebral palsy	56	30 (53.6)	26 (46.4)
Down syndrome	48	23 (47.9)	25 (52.1)
Anxiety disorder	39	12 (30.8)	27 (69.2)
Behavior problem	33	22 (66.7)	11 (33.3)
Other[a]	186	104 (55.9)	82 (44.1)

ASD: autism syndrome disorder

[a]Other includes development delay, conduct disorder, attention deficit hyperactivity disorder, post–traumatic stress disorder, acute psychosis, oppositional defiant disorder, obsessive compulsive disorder, Erb's palsy, tic disorder, selective mutism, migrant, sibling rivalry, and squint.

children (70.4%) were male and only 636 (29.6%) were female. All patients were aged below 18 years; the major age group was 0–4 years (n = 1,088, 50.7%). The major provisional diagnosis was developmental language disorder (n = 661, 30.8%), followed by ASD (n = 591, 27.5%). Half of the children resided in Phnom Penh (n = 1,116, 51.9%), and 350 children (16.3%) were from Kandal Province, where the hospital was located (Fig. 1).
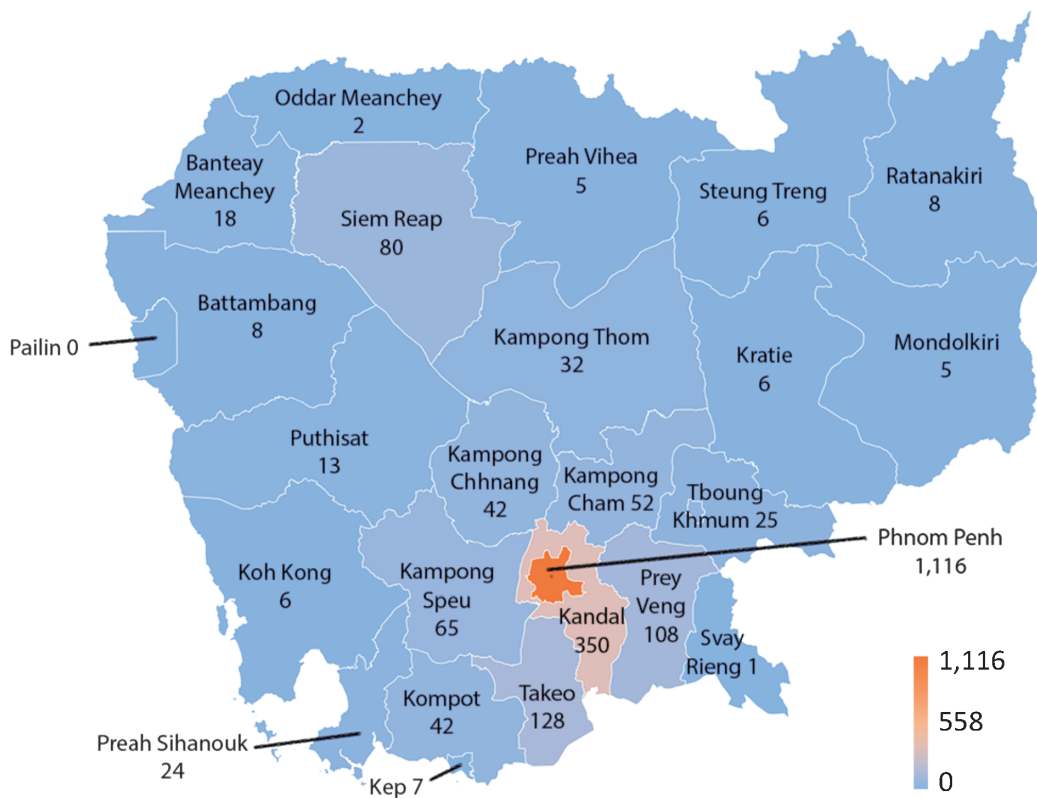

Fig. 1 The number of new patients who visited the Center for Child and Adolescent Mental Health from Phnom Penh and provinces (N = 2,147)

Blue and orange in the map represent provinces that had the lowest (n = 0) and highest (n = 1,116) number of new patients, respectively.

Socio-demographic factors of 440 children aged 0–12 years old

The data of 440 patients aged 0–12 years were analyzed. Male patients (n = 331, 75.2%) were more than female, and the major age group was 0–4 years (n = 254, 57.7%), as shown in Table 2. Slightly more than half of the patients resided in Phnom Penh (n = 245, 55.7%), whereas the rests were from other provinces. Only 35 and 59 children had education at preschool and primary school, respectively (Table 2), although 134 children were expected to go to primary school due to their age (6–12 years old).

Table 2 Characteristics of 440 patients

Variable		Number (%)
Sex	Male	331 (75.2)
	Female	109 (24.8)
Age (years old)	0–4	254 (57.7)
	5–12	186 (42.3)
Residence	Phnom Penh	245 (55.7)
	Province	195 (44.3)
Current education	Home	346 (78.6)
	Pre-school	35 (8.0)
	Primary school	59 (13.4)
Living with family	Yes	405 (92.0)
	No	35 (8.0)
Birth weight (g)	≥ 2,500	366 (83.2)
	< 2,500	46 (10.4)
	NA	28 (6.4)
Mode of delivery	Normal delivery	118 (26.8)
	Instrumental	24 (5.4)
	Cesarean section	281 (63.9)
	NA	17 (3.9)
Place of delivery	Health center/home	61 (13.9)
	Hospital/private clinic	379 (86.1)
Crying at birth	Immediately	384 (87.3)
	Delay	38 (8.6)
	NA	18 (4.1)
Multiple birth	Singleton	419 (95.2)
	Multiple	4 (0.9)
	NA	17 (3.9)
Problem during pregnancy	No	404 (91.8)
	Yes	17 (3.9)
	NA	19 (4.3)
Neonatal jaundice	No	408 (92.7)
	Yes	11 (2.5)
	NA	21 (4.8)
Family history of mental health	No	323 (73.4)
	Yes	98 (22.3)
	NA	19 (4.3)
Father's age at birth (years old)	< 30	74 (16.8)
	30–39	282 (64.1)
	> 39	61 (13.9)
	NA	23 (5.2)

Father's education	Up to high school	207 (47.1)
	University	210 (47.7)
	NA	23 (5.2)
Father's job	Farmer/worker/small business	218 (49.5)
	Business/government staff/NGO	199 (45.2)
	NA	23 (5.3)
Mother's age at birth (years old)	< 30	190 (43.2)
	30–39	210 (47.7)
	> 39	23 (5.2)
	NA	17 (3.9)
Mother's education	Up to high school	260 (59.1)
	University	163 (37.0)
	NA	17 (3.9)
Mother's job	Farmer/worker/small business	282 (64.1)
	Business/government staff/NGO	141 (32.0)
	NA	17 (3.9)

NA: not available data
NGO: non-government organization

Obstetrical and family factors of 440 children aged 0–12 years old

Most children had a birth weight of ≥ 2,500g (n = 366, 83.2%) and were born by cesarean section (n = 281, 63.9%) at hospitals or clinics (n = 379, 86.1%) (Table 2). Only 38 children did not cry immediately at birth, and four children were multiple-birth infants. Moreover, 17 children's mothers had experienced problems during pregnancy (3.9%), 11 children had neonatal jaundice (2.5%), and 98 children (22.3%) had a family history of mental health problems. Most children had fathers and mothers whose age at birth was 30–39 years (64.1% and 47.7%, respectively). There were 210 children (47.7%) whose fathers had university education and 199 children (45.2%) whose fathers had their businesses or worked for the government or NGOs. Most mothers had education up to high school (59.1%) and worked as farmers, workers, or small business owners (64.1%).

Symptoms and final diagnosis of 440 children aged 0–12 years old

The top four signs and symptoms were delayed speech (36.1%), playing alone (34.3%), hyper-activity (31.1%), and easily angered (26.1%) (Table 3). Other symptoms were aggressive, seizure, sleep, or appetite problem, non-stop talking, easily distracted, and others. Of the 198 children who were suspected to have ASD and examined by Q-CHAT-10, 169 children (38.4%) scored 4–10 points. The most common final diagnosis was ASD (50.0%), followed by developmental language disorder (16.0%), behavior problems (8.0%), and mental retardation (6.4%) (Table 3). In the provisional diagnosis of the 440 children, only 31.6% of the children were suspected of ASD.

Table 3 Symptoms and final diagnosis of 440 patients

Variable		Number (%)
Sign and symptom	Delay speech	159 (36.1)
	Play alone	151 (34.3)
	Hyperactivity	137 (31.1)
	Easy to be angry	115 (26.1)
	Play phone >1 hour per time	30 (6.8)
	Avoiding eyes contact	14 (3.2)
	Other[a]	224 (50.9)
Q-CHAT-10	1–3	29 (6.6)
	4–10	169 (38.4)
	NA	242 (55.0)
Final diagnosis	ASD	220 (50.0)
	Developmental language disorder	70 (16.0)
	Behavior problem	35 (8.0)
	Mental retardation	28 (6.4)
	Cerebral palsy	23 (5.2)
	Epilepsy	21 (4.8)
	Anxiety	6 (1.4)
	Down syndrome	5 (1.1)
	Attention deficit hyperactivity disorder	5 (1.1)
	Development delay	4 (0.9)
	Conduct disorder	3 (0.7)
	Tic disorder	3 (0.7)
	Selective mutism	3 (0.7)
	Migrant	3 (0.7)
	Acute psychosis	2 (0.4)
	Oppositional defiant disorder	2 (0.4)
	Obsessive compulsive disorder	2 (0.4)
	Sibling rivalry	2 (0.4)
	Post-traumatic stress disorder	1 (0.2)
	Erb's palsy	1 (0.2)
	Squint	1 (0.2)

NA: not available

Q-CHAT: Quantitative Checklist for Autism in Toddlers

ASD: autism syndrome disorder

[a]Other includes aggressive, seizure, sleep or appetite problem, non-stop taking, being easily distracted, and other.

Table 4 Comparison of characteristic between ASD and non-ASD patients

Variable	ASD n (%)	Non-ASD n (%)	Crude OR (95% CI)	Adjusted OR (95% CI)[a]	P-value
Sex					
Male	185 (55.9)	146 (44.1)	2.67 (1.69–4.23)***	1.95 (1.12–3.39)	0.017
Female	35 (32.1)	74 (67.9)	1 (Reference)	1 (Reference)	
Age group (years old)					
0–4	165 (65.0)	89 (35.0)	4.41 (2.93–6.63)***	2.98 (1.82–4.87)	<0.001
5–12	55 (29.6)	131 (70.4)	1 (Reference)	1 (Reference)	
Residence					
Phnom Penh	141 (57.6)	104 (42.4)	1 (Reference)	1 (Reference)	
Province	79 (40.5)	116 (59.5)	0.50 (0.34–0.73)***	0.89 (0.54–1.46)	0.657
Birth weight (n = 412)					
≥ 2,500g	193 (52.7)	173 (47.3)	1 (Reference)	1 (Reference)	
< 2,500g	20 (43.5)	26 (56.5)	0.69 (0.37–1.27)	0.74 (0.35–1.54)	0.430
Mode of delivery (n = 423)					
Normal delivery	78 (66.1)	40 (33.9)	1 (Reference)	1 (Reference)	
Instrumental	9 (37.5)	15 (62.5)	0.30 (0.12–0.76)*	0.41 (0.14–1.24)	0.118
Cesarean section	129 (45.9)	152 (54.1)	0.43 (0.27–0.68)***	0.72 (0.42–1.24)	0.242
Place of delivery (n = 440)					
Health center/home	15 (24.6)	46 (75.4)	1 (Reference)	1 (Reference)	
Hospital/private clinic	205 (54.1)	174 (45.9)	3.61 (1.95–6.69)***	1.52 (0.62–3.68)	0.352
Crying at birth (n = 422)					
Immediately	201 (52.3)	183 (47.7)	1 (Reference)	1 (Reference)	
Delay	14 (36.8)	24 (63.1)	0.53 (0.26–1.05)	0.62 (0.26–1.44)	0.266
Multiple birth (n = 423)					
Singleton	215 (51.3)	204 (48.7)	1 (Reference)	1 (Reference)	
Multiple	1 (25.0)	3 (75.0)	0.31 (0.03–3.06)	0.62 (0.03–11.74)	0.751
Family history of mental health (n = 421)					
No	162 (50.2)	161 (49.8)	1 (Reference)	1 (Reference)	
Yes	53 (54.1)	45 (45.9)	1.17 (0.74–1.84)	1.04 (0.61–1.78)	0.872
Problem during pregnancy					
No	209 (51.7)	195 (48.3)	1 (Reference)	1 (Reference)	
Yes	6 (35.3)	11 (64.7)	0.50 (0.18–1.40)	0.42 (0.12–1.39)	0.159
Neonatal jaundice (n = 419)					
No	207 (50.7)	201 (49.3)	1 (Reference)	1 (Reference)	
Yes	7 (63.6)	4 (36.4)	1.69 (0.49–5.89)	1.18 (0.31–4.50)	0.801

Father's age at birth (years old) (n = 417)					
< 30	37 (50.0)	37 (50.0)	1 (Reference)	1 (Reference)	
30–39	154 (54.6)	128 (45.4)	1.20 0.72–2.00)	1.17 (0.61–2.22)	0.622
> 39	23 (37.7)	38 (62.3)	0.60 (0.30–1.20)	0.67 (0.26–1.72)	0.405
Father's education (n = 417)					
Up to high school	75 (36.2)	132 (63.8)	1 (Reference)	1 (Reference)	
University	139 (66.2)	71 (33.8)	3.44 (2.30 − 5.15)***	1.73 (0.99–3.03)	0.054
Father's job (n = 417)					
Farmer/worker/ small business	92 (42.2)	126 (57.8)	1 (Reference)	1 (Reference)	
Business/government staff/NGO	122 (61.3)	77 (38.7)	2.17 (1.46–3.21)***	1.52 (0.90–2.54)	0.112
Mother's age at birth (years old) (n = 423)					
< 30	108 (56.8)	82 (43.2)	1 (Reference)	1 (Reference)	
30–39	100 (47.6)	110 (52.4)	0.69 (0.46–1.02)	1.16 (0.68–1.99)	0.575
> 39	7 (30.4)	16 (69.6)	0.33 (0.13–0.84)	2.19 (0.59–8.13)	0.238
Mother's education (n = 423)					
Up to high school	103 (39.6)	157 (60.4)	1 (Reference)	1 (Reference)	
University	112 (68.7)	51 (31.3)	3.34 (2.21–5.06)***	1.68 (0.96–2.93)	0.065
Mother's job (n = 423)					
Farmer/worker/small business	133 (47.2)	149 (52.8)	1 (Reference)	1 (Reference)	
Business/government staff/NGO	82 (58.2)	59 (41.8)	1.55 (1.03–2.34)*	0.86 (0.49–1.49)	0.596

ASD: autism syndrome disorder
n: number
OR: odds ratio
CI: confidence interval
NGO: non-government organization
[a]Adjusted for all variables.
*P <0.05, ***P<0.001.

Comparison of characteristics between ASD and non-ASD patients

The binary logistic regression analysis showed that male patients, aged 0–4 years, from Phnom Penh, and born at hospitals or clinics had more cases of ASD than female patients, those aged 5–12 years, and those born at health centers or at home (Table 4). Patients who were born by instrumental and cesarean section were significantly less likely to have ASD compared to normal delivery. In terms of parent's factors, education at university and working for their business, government, or NGO were associated with the diagnosis of ASD. In multivariate logistic regression analyses on ASD, male patients revealed more ASD cases than female patients (OR = 1.95, 95% CI = 1.12–3.39, P = 0.017), and the age group of 0–4 years had more ASD cases compared to the age group of 5–12 years (OR = 2.98, 95% CI = 1.82–4.87, P < 0.001) (Table 4). Regarding parent's factors, ASD patients were more likely to have fathers (OR = 1.73, 95% CI = 0.99–3.03, P = 0.054) and mothers (OR = 1.68, 95% CI = 0.96–2.93, P = 0.065) who had education at university than non-ASD patients.

Comparison of treatment between ASD and non-ASD patients

Treatments were also compared between the ASD and non-ASD groups (Table 5). Approximately a half of all 440 patients had individual family consulting (n = 227) and psychosocial education (n=218). Non-ASD patients received more drugs (65.7% vs 34.3%, *P* < 0.001) and physiotherapy (84.9% vs 15.1%, *P* < 0.001) than ASD patients. ASD patients underwent more speech therapy (57.7% vs 42.3%, *P* = 0.009), special education and structured teaching (69.4% vs 30.6%, *P* < 0.001), and networking and coordination therapy (65.6% vs 34.4%, *P* = 0.049), compared to non-ASD patients.

Table 5 Comparison of treatment between ASD and non-ASD patients

Treatment		Total	ASD	Non-ASD	*P*-value
			n (%)	n (%)	
Individual and family counseling	No	213	98 (46.0)	115 (54.0)	0.063
	Yes	227	122 (53.7)	105 (46.3)	
Psychosocial education	No	222	120 (54.1)	102 (45.9)	0.052
	Yes	218	100 (45.9)	118 (54.1)	
Drug	No	265	160 (60.4)	105 (39.6)	< 0.001
	Yes	175	60 (34.3)	115 (65.7)	
Speech therapy	No	279	127 (45.5)	152 (54.5)	0.009
	Yes	161	93 (57.7)	68 (42.3)	
Activity for daily living	No	362	180 (49.7)	182 (50.3)	0.450
	Yes	78	40 (51.3)	38 (48.7)	
Special education and structured teaching	No	365	168 (46.0)	197 (54.0)	< 0.001
	Yes	75	52 (69.4)	23 (30.6)	
Physiotherapy	No	387	212 (54.8)	175 (45.2)	< 0.001
	Yes	53	8 (15.1)	45 (84.9)	
Early stimulation	No	391	193 (49.4)	198 (50.6)	0.272
	Yes	49	27 (55.1)	22 (44.9)	
Networking and coordination	No	408	199 (48.8)	209 (51.2)	0.049
	Yes	32	21 (65.6)	11 (34.4)	
Art and drama therapy	No	413	204 (49.4)	209 (50.6)	0.214
	Yes	27	16 (59.3)	11 (40.7)	
Occupational therapy	No	423	213 (50.4)	210 (49.6)	0.311
	Yes	17	7 (41.2)	10 (58.8)	

ASD: autism syndrome disorder
n: number

DISCUSSION

In this study, 50% of the 440 new patients aged 0–12 years were diagnosed with ASD and ASD was the most common diagnosis at CCAMH. A previous study conducted at a children's

hospital in the United States reported that ASD accounted for 75.9% of 79 children enrolled in the day treatment neuropsychiatric special care program of the hospital in 2009.[16] The results of both studies suggest that ASD is the major diagnosis among children who visit hospitals specialized for child neuropsychiatric health services.

Second, male children and the age group of 0–4 years exhibited significantly more ASD symptoms than female children and the age group of 5–12 years. This result is consistent with those of previous studies. The study conducted at a children's hospital in the United States showed that male patients accounted for 78.0% of all ASD child patients.[16] A studies in Taiwan between 2004 and 2010 showed that males are six times more likely to have ASD than females.[17] It is suggested that the sex chromosome may contribute to the higher incidence of ASD in males; however, it is not confirmed yet.[18] In a previous clinical study in Southeast Asia, children aged 3–6 years were more frequently diagnosed with ASD compared to children who were older than 6 years.[19]

Among children who were finally diagnosed with ASD, the most lived in Phnom Penh, had parents who had university education, and were born at hospitals or private clinics. The CCAMH was located only 15 km away from the center of Phnom Penh City; therefore, patients in Phnom Penh easily visited this center. Regarding living in urban areas, it is suggested that exposure to air pollution during pregnancy and the neonatal period may be associated with ASD.[20,21] However, previous studies on ASD have also shown that parents of ASD patients have higher education, higher income, lived in urban rather than rural areas, and worked in the technology sector.[17-19,22-24] These results suggest that parents with higher education and financial status are more likely to access mental health services for their children. To provide education and therapy to children with ASD, as well as their parents, from an early stage, information of the center and ASD should be provided widely to all parents in Cambodia.

At CCAMH, most children with ASD had speech therapy, special education and structured teaching, networking and coordination therapy, and art and drama therapy. Previous studies reported intervention provided through educational practices, developmental therapies, and behavioral interventions, is effective to improve function in children with ASD.[25-27] Speech-language therapy is the most common intervention for ASD children.[28,29] This study showed that interventions were provided to children with ASD and their parents at CCAMH, because CCAMH is a special psychiatric center for ASD children and has some therapists. The art therapist, special educator, and speech therapist at CCAMH obtained their certificates in India or the United Kingdom in collaboration with the University of Health Science in Cambodia, as there are no such courses for these professionals in Cambodia.

There are some limitations to this study. This study was conducted only at CCAMH; therefore, the findings may not be representative of the whole country. However, diagnosis and treatment may not be provided appropriately for ASD patients at most hospitals in Cambodia therefore the results in this study can help clarify the situation of ASD patients in Cambodia. Second, recall bias could have occurred, as the obstetric factors were examined using self-reported data. Mothers might not have clearly recalled the problems during their pregnancy or childbirth and their baby's neonatal condition. Third, the final diagnoses might not be correct because of the limited medical equipment for diagnosis, such as computerized tomography, magnetic resonance imaging, or electroencephalography. Doctors were unable to use these examinations to confirm a diagnosis or make differential diagnoses at this center.

In conclusion, the major diagnosis in new patients aged 0–12 years was ASD at CCAMH in Cambodia. The final diagnosis of ASD was made significantly more in males and the age group of 0–4 years than in females and 5–12 years. Parents who lived in Phnom Penh and had high education were more likely to visit the CCAMH with their children who were diagnosed

with ASD. To provide education and therapy to ASD children and their parents from the early stage, information of the center and ASD should be provided widely to all parents in Cambodia.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest in this study.

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