Chula Med J Vol. 67 No. 3 July - September 2023;213-221 DOI : 10.14456/clmj.2023.27

Original article

The symptoms and management of children with attention-deficit/hyperactivity disorder during COVID-19 pandemic at the child and adolescent psychiatry clinic, King Chulalongkorn Memorial Hospital

Munchukorn Leelatanon[a], Jirada Prasartpornsirichoke[b], Nuttorn Pityaratstian[b,*]

[a]*Department of Psychiatry, King Chulalongkorn Memorial Hospital, Bangkok, Thailand*
[b]*Department of Psychiatry, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand*

Background: The coronavirus disease 2019 (COVID-19) pandemic has caused abrupt changes in almost everybody's life, particularly children. Children and adolescents with attention-deficit hyperactivity disorder (ADHD) have difficulties in many aspects in lives and may have worsening of the symptoms during the pandemic.
Objectives: This cross-sectional descriptive study aimed to investigate the changes of the ADHD symptoms and managements of children with ADHD during the first lockdown and after-lockdown period.
Methods: Parent-reported questionnaires i.e. the Swanson, Nolan, and Pelham Rating Scale-IV (SNAP-IV) and a demographic questionnaire, were applied to collect data from 109 children with ADHD aged between 4 -18 years during Thailand's post-lockdown period of October 2020 to January 2021. Descriptive statistics, paired *t* - test, Pearson's correlation and Pearson Chi's square were applied in this study.
Results: The ADHD symptoms of the sample were significantly more severe during the lockdown than the post-lockdown period. Drug compliance and psychosocial interventions were not significantly different between the two periods. Factors affecting ADHD symptoms were male gender, psychosocial interventions, and exercise. A factor affecting drug compliance was total family income. Factors affecting psychosocial interventions were ADHD symptoms.
Conclusions: The ADHD symptoms worsened during the lockdown compared to the post-lockdown period. The pharmacological and psychosocial management of children with ADHD were not significantly different. Recall bias was a potential limitation of this study.

Keywords: Adolescents, attention-deficit/hyperactivity disorder, ADHD, children, COVID-19 pandemic.

The coronavirus disease 2019 (COVID-19) pandemic has become a global health concern from 2020 onwards. Increasing numbers of infected patients and higher mortality rates have caused many countries to use various public measures to control the spread of COVID-19, including lockdown measures. In Thailand, the government had implemented lockdown measures several times from March 2020 to August 2021. The first lockdown period was from 26th March to 2nd May 2020. [1] At that time there were less than 100 new cases per day and a total of 3,000 patients all over the country. The government decided to impose the strict lockdown measures in Thailand, especially in the Bangkok Metropolitan region. These measures included closing schools and shopping malls, persuading private sectors to work from home, and curfews. The sudden lockdown order has caused abrupt changes in almost everybody's life, particularly children.

Over 100 countries have implemented nationwide school closures in response to the COVID-19 pandemic.[2] Most schools switched their curriculum to remote learning, although many students had difficulties participating in online classes.[3] In addition, COVID-19 also disrupted the relationship between children and their friends. This led to less physical activities, weight gain, less cardiopulmonary fitness[4],

*Correspondence to: Nuttorn Pityaratstian, Department of Psychiatry, King Chulalongkorn Memorial Hospital, Bangkok 10300, Thailand.
E-mail: drnuttorn@yahoo.com
Received: November 30, 2021
Revised: January 20, 2022
Accepted: April 4, 2022

increasing social media usage and mental health problems,[5, 6] all of these are issues of concern.[7] Previous studies have also noted that other mental health issues commonly occurring in the quarantine period, such as post-traumatic stress disorder (PTSD), stress, depression, anxiety, avoidance, and stigma; these can cause a long-lasting impact on a child's life.[8]

Attention-deficit hyperactivity disorder (ADHD) is one of the most prevalent neurodevelopmental disorders, found in 7.2% and 8.1% of children worldwide[9] and in Thailand[10] respectively. Children and adolescents with ADHD generally have difficulties in academic achievement and tend to have more emotional symptoms than children and adolescents without ADHD. Standard treatment of ADHD includes medication or/and psychosocial management.[11, 12] One out of four of ADHD children were reported to have poor adherence to the medication,[13] which leads to worsening of symptoms. A previous study found that the COVID-19 may worsen existing mental and neurodevelopmental problems.[14]

To date, few studies have explored the impact of COVID-19 on children with preexisting ADHD. The aim of this study was to assess the association of the first lockdown period on the severity of ADHD symptoms and psychosocial management among children and adolescents with ADHD by comparison between two periods: during and after the first lockdown.

Materials and methods

Subjects

We recruited 109 subjects aged under 18 years who were diagnosed with ADHD by child and adolescent psychiatrists and received treatment at the Child and Adolescent Psychiatric Unit, Department of Psychiatry, King Chulalongkorn Memorial Hospital. Caregivers who had been with the subjects throughout the lockdown and post lockdown period answered the questionnaires. Exclusion criteria were patients with psychotic symptoms, bipolar disorder, or depression; patients whose caregivers could not read or write Thai were also excluded. Subjects' caregivers provided informed consent.

Study procedures

We conducted this cross-sectional descriptive study from October 15, 2020 to January 14, 2021. The first lockdown in Thailand started during the summer holidays (from March 26, 2020 to May 2, 2020), therefore, most schools had been closed during the first lockdown. The first post-lockdown period coincided with the beginning of most school terms (from May 2, 2020 to the day the subjects answered the questionnaire), and most schools were using online learning. The data was collected at the Child and Adolescent Psychiatric Unit, Department of Psychiatry, King Chulalongkorn Memorial Hospital. This study has received the approval from the Institutional Review Board of the Faculty of Medicine, Chulalongkorn University, IRB no. 614/63.

Measurements

Children's characteristics

Data on gender, age, nationality, education, types of ADHD, comorbidities, and the types of medication were collected.

Parental characteristics

Data on gender, age, marital status, education, occupation, total family income, mental illness, parental characteristic during lockdown; working pattern, total family income, and time spent at home were collected.

Behavioral factors of children and adolescents

Behavioral factors (including screen time, sleep time, exercise, games, quality time, connection with friends face-to-face and via social media) during the lockdown and post-lockdown period were reported separately by the caregivers.

Swanson, Nolan, and Pelham Rating Scale-IV (SNAP-IV)

The SNAP-IV questionnaire was used to measure the severity of ADHD symptoms. Caregivers were asked to give two separate ratings for each period: lockdown and post-lockdown. There are three subscales: inattention symptoms, hyperactive/impulsive symptoms, and oppositional defiant symptoms. Each subscale score is summed up. Higher score indicates more severe symptoms. The SNAP-IV used in this study is a Thai version[15] which shows favorable reliability (Cronbach's alpha 0.93 - 0.96) and accuracy (AUC 0.71 - 0.81).

Drug compliance

The drug compliance was assessed in lockdown and post-lockdown period. To reduce the confounding

factors, we included only patients who were prescribed methylphenidate in this analysis. The compliance was divided in four-point Likert scale; 'regularly every day', 'regular during studying time', 'irregular symptomatic only', and 'no drugs at all'.

Psychosocial interventions

We assessed the psychosocial interventions by using a caregiver-administered questionnaire which is contained nine questions related to praising for the good behaviors, rewards for good behaviors, setting the rules, using time out, taking away the privileges for bad behaviors, setting up the good environment for studying, scheduling, doing the chores, and media control. It is a five-point Likert scale (1 = never and 5 = always). Caregivers were asked to identify the psychosocial interventions of ADHD children and adolescents during a first lockdown and after first lockdown. Between a first lockdown and after a first lockdown, the change in total scores of psychosocial interventions was categorized into three groups: worse if negative values, same if nondifference, and better if positive values.

Statistical analyses

Descriptive and inferential statistics were analyzed using SPSS Version 22.0. Descriptive statistics, including frequency, percentage, means and standard deviation (SD), were used to describe the baseline characteristics of subjects and their caregivers. Students paired *t* - test was employed to compare the severity of ADHD symptoms, psychosocial interventions and parent's duration at home between two periods of time. The Cohen's d was calculated to measure the effect size of the difference of ADHD symptoms.[16] Pearson's Chi-square was used to explore the drug compliance between lockdown and post-lockdown periods. The association between drug compliance and ADHD symptoms between two periods were analyzed using Chi-square test and Fisher's Exact test. Pearson's correlations were used to examine the association between the total score of psychosocial interventions and ADHD symptoms. Factors related to the primary outcomes, including ADHD symptoms, drug compliance, and psychosocial intervention was analyzed using independent *t* - test, Pearson's Chi-square, and Fisher's Exact test. Significance level was set at $P < 0.05$ and all tests were two-sided.

Results

Sample characteristics

A total of 109 subjects with ADHD were recruited in this study. Demographic characteristics of patients and their caregivers are presented in Table 1. Most of the ADHD children and adolescents were male. The mean age of children and adolescents with ADHD ranged from 4 to 18 years old was 11.5 ± 3.4 years. About half of the subjects (58.8%) are studying in primary school. Most subjects have ADHD with combined type (60.6%). Most of caregivers or parents who accompanied their children and adolescents with ADHD to the hospital were their mothers (80.7%). The parent's highest educational level was mostly in the Bachelor's degree level (60.6%). Most of them (74.3%) had a total family income of more than 30,000 Baht per month. Only five (4.6%) parents or caregivers had mental illness.

Table 1. Demographic characteristics of the sample (n = 109).

Characteristics	Total patients	
	N	Percentage
Children's characteristics		
Gender		
Male	88	80.7
Female	21	19.3
Age, mean ± SD) = 11.5 ± 3.4		
4 - 12 years	66	60.6
13 - 18 years	43	39.4
Types of ADHD		
Inattentive	20	18.3
Hyperactive-impulsive	23	21.1
Combined	66	60.6

Table 1. (Cont.) Demographic characteristics of the sample (n = 109).

Characteristics	Total patients	
	N	Percentage
Medication		
Yes	101	92.7
Methylphenidate	93	85.4
No	8	7.3
Comorbidities		
Yes	62	56.9
Autism spectrum disorder	18	16.5
Learning disorder	14	12.8
Intellectual disability	9	8.3
Oppositional defiant disorder	8	7.3
Tic disorder	5	4.6
Parental characteristics		
Relationship		
Mother	88	80.7
Marital status		
Married/couple	90	82.6
Single/separated/divorce/widowed	19	17.4
Highest educational level		
Lower than Bachelor's Degree	19	17.4
Bachelor's Degree	66	60.6
Higher or equal master degree	24	22.0
Monthly family income		
0 - 30,000 Baht	28	25.7
> 30,000 Baht	81	74.3
Parent mental illness		
Yes	5	4.6
Parental situations during lockdown		
Parent's working pattern		
Work outside as usual	33	30.3
Work at home as usual	3	35.8
Leave without pay	4	3.7
Quit, resigned	3	2.8
Work from home	23	21.1
Total family income during lockdown		
Same amount	68	62.4
Decreased	40	36.7
Increased	1	0.9

Parental situation during lockdown

Most of the parents (66.1%) had the same working style as before the lockdown, including both those who worked outside the home and worked at home. Most (63.4%) worked or stayed at home during the lockdown. Most of the parents (62.4%) had the same amount of total family income, and 36.7% had lower income compared to the period prior to the first lockdown.

ADHD symptoms

Table 2 presents mean differences and the effect sizes of lockdown on SNAP-IV scores as rated by parents or caregivers of ADHD children and adolescents between lockdown and post-lockdown periods. This result showed that the SNAP-IV scores and three SNAP-IV -subdomains' scores; inattention, hyperactive/impulsive, and oppositional, in the post-lockdown period were significantly lower than the lockdown period which implied improvement in

ADHD symptoms after lockdown period. (Mean = 2.1, SD = 4.4, 95 % CI = 1.23 - 2.90, $P < 0.001$). However, the Cohen's D is between 0.117 to 0.162 which implied a small effect size of the lockdown on the severity of ADHD symptoms

Drug compliance

93 ADHD children and adolescents were prescribed methylphenidate as mentioned in Table 1. Table 3 described the change in drug compliance during a first lockdown period and after first lockdown period. The results demonstrated that the majority of ADHD children and adolescents took medicine on a regular basis in both times, but that the frequency of regular drug compliance improved from 47.5% to 52.5% during the post-lockdown phase, albeit statistically insignificantly. In addition, 16 children and adolescents with ADHD stopped taking the medicine during the lockdown period.

Psychosocial intervention

There was an insignificant difference between psychosocial interventions used for ADHD children during the lockdown and post-lockdown periods ($P = 0.093$) as shown in Table 4. Table 5 describes the Pearson's correlation between the psychosocial intervention scores and SNAP-IV scores during lockdown and post-lockdown periods. There is no correlation between them during both lockdown and post-lockdown periods.

Factors associated with ADHD symptoms

Male children and adolescents were associated with the same or worse ADHD symptoms during lockdown (88.6% *vs*. 66.7%, $P = 0.02$). Less psychosocial interventions were associated with worse or the same ADHD symptoms (88.5% *vs.* 68.2%, $P = 0.042$). More than 30 minutes of exercise per day was associated with better ADHD symptoms. (22.6% *vs.* 6.4%, $P = 0.021$) (Table 6).

Factors associated with drug compliance

Gross monthly income was associated with drug compliance during the lockdown. Family income lower than 30,001 baht per month was significantly associated with better drug compliance. (17.4% *vs.* 1.4%, $P = 0.013$) (Table 6).

Factors associated with psychosocial intervention

Better SNAP-IV scores during the lockdown period were significantly associated with more psychosocial interventions (41.2% *vs*. 16.3%, $P = 0.042$) (Table 6).

Table 2. Comparison of ADHD symptoms (SNAP-IV) scores between lockdown and post-lockdown periods.

	Paired differences							
	SNAP-IV scores		Mean difference	SD	95% CI of the difference		Sig. (2-tailed)	Cohen's D*
	Lockdown	Post-lockdown			Lower	Upper		
Inattentive	12.41	11.80	0.62	2.14	0.21	1.02	0.003	0.12
Hyperactive/ Impulsive	10.22	9.55	0.67	2.27	0.24	1.10	0.003	0.12
Oppositional defiant	8.37	7.59	0.78	2.07	0.39	1.17	<0.001	0.15
Total scores	31.00	28.94	2.06	4.42	1.23	2.90	<0.001	0.16

Table 3. Comparison of drug compliance between lockdown and post-lockdown periods (n = 93).

Drug compliance	Lockdown n (%)	Post- lockdown n (%)	Total n (%)	*P* - value
Regular everyday	38 (47.5)	42 (52.5)	80 (100.0)	0.888
Regular during studying time	31 (51.7)	29 (48.3)	60 (100.0)	
Irregular only symptomatic	8 (47.1)	9 (52.9)	17 (100.0)	
No drugs at all	16 (55.2)	13 (44.8)	29 (100.0)	

Table 4. Comparing psychosocial intervention between lockdown and post-lockdown.

Lockdown – Post lockdown	Paired differences				Sig. (2-tailed)
	Mean difference	SD	95% confidence interval of the difference		
			Lower	Upper	
Psychosocial intervention:all domains (29.505 – 29.890)	-0.39	2.38	-0.84	0.07	0.093

Table 5. Pearson's correlation between psychosocial intervention and ADHD symptoms.

Lockdown – post lockdown		SNAP-IV Inattentive impulsive	SNAP-IV Hyperactive/	SNAP-IV Oppositional	SNAP-IV Total	Psychosocial intervention (Total score)
Psychosocial Intervention (Total score)	Pearson Correlation	-0.16	-0.19*	0.08	-0.14	1.00
	Sig. (2 - tailed)	0.11	0.05	0.41	0.16	

*Correlation is significant at the 0.05 level (2-tailed).

Table 6. Factors associated with ADHD symptoms, drug compliance, and psychosocial intervention.

	SNAP-IV total score (lockdown – post-lockdown)			
Factors associated with ADHD symptoms	**Worse or same (n = 92) (%)**	**Better (n = 17) (%)**	**Total (n = 109) (%)**	***P*-value**
Children's characteristics				
Gender				
Male	78 (88.6)	10 (11.4)	88 (100.0)	0.020
Female	14 (66.7)	7 (33.3)	21 (100.0)	
Psychosocial intervention				
Less during lockdown	77 (88.5)	10 (11.5)	87 (100.0)	0.042
More during lockdown	15 (68.2)	7 (31.8)	22 (100.0)	
Other factors				
Exercise per day				
None to < 30 minutes	44 (93.6)	3 (6.4)	47 (100.0)	0.021
More than 30 minutes	48 (77.4)	14 (22.6)	62 (100.0)	
	Drug compliance (Lockdown – post-lockdown)			
Factors associated with drug compliance	**Worse or same (n = 88) (%)**	**Better (n = 5) (%)**	**Total (n = 93) (%)**	***P*-value**
Parental characteristics				
Gross monthly income (Baht)				
0 - 30,000	19 (82.6)	4 (17.4)	23 (100.0)	0.013
> 30,000	69 (98.6)	1 (1.4)	70 (100.0)	
	Psychosocial intervention (Lockdown – post-lockdown)			
Factors associated with Psychosocial intervention	**Worse or same (n = 87) (%)**	**Better (n = 22) (%)**	**Total (n = 109) (%)**	***P*-value**
Difference of SNAP-IV between 2 periods				
Worsen or same	77 (83.7)	15 (16.3)	92 (100.0)	0.042
Better	10 (58.8)	7 (41.2)	17 (100.0)	

Discussion

This is the first study in Thailand to examine the impact of the COVID-19 pandemic on children with ADHD. The study found a significant difference of ADHD symptoms between the first lockdown and post-lockdown periods which was consistent with the results of a previous study in China that found significantly worsened the symptoms of ADHD during the outbreak.[17] They are also congruent with an online survey from France published in June 2020 which showed 34.7% of ADHD children and adolescents experienced worsening in well-being while 31.0% were doing better.[18] On the contrary, a previous study from Italy mentioned positive improvement of ADHD symptoms, especially restlessness, irritability and argumentativeness, among Italian children and adolescents during the lockdown period.[19] The opposing impacts of the lockdown measures on the severity of ADHD symptoms and well-being of children and adolescents in different countries were plausibly caused by different cultural attitudes and response to the pandemic in the East and West. Many Eastern countries had the experience of SARS, MERS, avian and swine flus so they responded more quickly to the new pandemic. In addition, Eastern people may have a higher level of compliance to social and physical restrictions, people of Western countries may be more concerned about liberty, human rights, privacy and freedom.[20] The cause of the improvement of ADHD symptoms in Italy could be the more freedom the children received during the first lockdown compared to the strictness in Thailand.

Factors associated with worsened ADHD symptoms during lockdown were male gender, less psychosocial interventions, and less exercise. Fewer routines were associated with greater remote learning difficulties in adolescents with ADHD.[21] A previous study in France found that parents who were unemployed and faced financial problems caused the higher severity of ADHD symptoms in children and adolescents.[22] It seems that the children of parents who have psychological difficulties or who experience socioeconomic difficulties should receive special attention from the psychiatrists. Psychiatrists should also be watchful of boys with ADHD and the children who had less exercise.

The children took the medicine less regularly, but the drug compliance was not significantly different between the two periods. One reason is because the first lockdown period was in the summer vacation in Thailand. Some families decided to have a drug holiday for summer vacation.

A previous study found that 25.0 – 70.0% of children had drug holidays during school holidays.[23] We found that parents gave less psychosocial interventions during the lockdown compared to the post-lockdown period. The reason might be because school closure during lockdown requires less discipline, so the parents did not enforce rules for daily routines. According to the results, the more parents gave psychosocial interventions to children during lockdown, the better were the hyperactive/impulsive symptoms of ADHD. According to the EAGG guideline, it is recommended that the improvement in parenting is one of the strategies that shows benefits in reducing oppositional defiant and disruptive behavior.[24]

This study found that interventions include adding routine activities, and exercising more than 30 minutes per day improved ADHD symptoms. The results are consistent with a meta-analysis showing that behavioral parent training is an effective intervention for children with ADHD.[25]

This study compared the symptoms and management of ADHD between the lockdown and post-lockdown periods, which is one of the strengths of this paper. Another strength is that we collected many factors that may influence ADHD symptoms, some of which may be further analyzed later.

There are several limitations to acknowledge, however. First, this is a cross-sectional study. We could not identify the causal relationship between factors. Second, we collected the data six to eight months after the first lockdown. Therefore, recall bias might influence the results. To reduce this limitation, we used the post-lockdown period as a comparison instead of the pre-covid-19 period. Third, there was no control group but only ADHD subjects. Fourth, there is information bias since ADHD symptoms were evaluated by the caregiver who might not be with the children all the time. We'd better asked the caregivers rather than the teachers because they came to the clinic with the patients and also studying online. Last but not least, the questionnaires were all only parent-reported and we did not have the children's perception of their symptoms.

Conclusion

This study is one of many studies that show that the Coronavirus-19 outbreak negatively affects the symptoms of children with ADHD, especially during

the lockdown. COVID-19 also brought a big change to the family, and parents may have less time to apply psychosocial interventions to their children. More exercise, particularly more than 30 minutes can reduce the children's ADHD symptoms. Drug compliances were not significantly impacted during lockdown. Children and adolescents with ADHD are vulnerable to changes. We have assessed the relevant factors, and with these results, we can help them reduce their difficulties through this hard time and live happily with their limitations.

Acknowledgements

We would like to thank 109 parents of the children who participated in this study.

Conflict of interest statement

The authors have each completed an ICMJE disclosure form. None of the authors declare any potential or actual relationship, activity, or interest related to the content of this article.

Data sharing statement

The present review is based on the reference cited. Further details, opinions, and interpretation are available from the corresponding authors on reasonable request.

References

1. Office of the Council of State. Emergency decree on public administration in emergency situations, B.E. 2548 (2005). Government Gazette Vol. 122, Part 58a, dated 16th July B.E. 2548 (2005).
2. UNESCO. COVID-19 educational disruption and response [Internet]. 2020 [cited 2022 Jan 10]. Available from: https://en.unesco.org/news/covid-19-educational-disruption-and-response.
3. Becker SP, Breaux R, Cusick CN, Dvorsky MR, Marsh NP, Sciberras E, et al. Remote learning during COVID-19: Examining school practices, service continuation, and difficulties for adolescents with and without attention-deficit/hyperactivity disorder. J Adolesc Health 2020;67:769-77.
4. Wang G, Zhang Y, Zhao J, Zhang J, Jiang F. Mitigate the effects of home confinement on children during the COVID-19 outbreak. Lancet 2020;395:945-7.
5. Adibelli D, Sümen A. The effect of the coronavirus (COVID-19) pandemic on health-related quality of life in children. Child Youth Serv Rev 2020;119:105595.
6. Gao J, Zheng P, Jia Y, Chen H, Mao Y, Chen S, et al. Mental health problems and social media exposure during COVID-19 outbreak. PLoS One 2020;15: e0231924.
7. Singh S, Roy D, Sinha K, Parveen S, Sharma G, Joshi G. Impact of COVID-19 and lockdown on mental health of children and adolescents: A narrative review with recommendations. Psychiatry Res 2020;293: 113429.
8. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. Lancet 2020;395:912-20.
9. Thomas R, Sanders S, Doust J, Beller E, Glasziou P. Prevalence of attention-deficit/hyperactivity disorder: a systematic review and meta-analysis. Pediatrics 2015;135:e994-1001.
10. Visanuyothin T, Pavasuthipaisit C, Wachiradilok P, Arunruang P, Buranasuksakul T. The prevalence of attention deficit/hyperactivity disorder in Thailand. J Ment Health Thai 2013;21:66-75.
11. Chan E, Fogler JM, Hammerness PG. Treatment of attention-deficit/hyperactivity disorder in adolescents: A systematic review. JAMA 2016;315:1997-2008.
12. Pornnoppadol C. Attention deficit hyperactivity disorder. 2nd ed. Bangkok: Siriraj Academic Affairs Offairs, Faculty of Medicine Siriraj Hospital, Mahidol University; 2019.
13. Gau SS, Shen HY, Chou MC, Tang CS, Chiu YN, Gau CS. Determinants of adherence to methylphenidate and the impact of poor adherence on maternal and family measures. J Child Adolesc Psychopharmacol 2006;16:286-97.
14. Breaux R, Dvorsky MR, Marsh NP, Green CD, Cash AR, Shroff DM, et al. Prospective impact of COVID-19 on mental health functioning in adolescents with and without ADHD: protective role of emotion regulation abilities. J Child Psychol Psychiatry 2021; 62:1132-9.
15. Pityaratstian N, Booranasuksakul T, Juengsiragulwit D, Benyakorn S. ADHD screening properties of the Thai version of swanson, nolan, and pelham iv scale (SNAP-IV) and strengths and difficulties questionnaire (SDQ). J Psychiatr Assoc Thailand 2014;59:97-110.
16. Becker LA. Effect size (ES) [Internet]. 2000 [cited 2021 Jun 15] Available from: http://web.uccs.edu/lbecker/Psy590/es.htm.
17. Zhang J, Shuai L, Yu H, Wang Z, Qiu M, Lu L, et al. Acute stress, behavioural symptoms and mood states among school-age children with attention-deficit/

hyperactive disorder during the COVID-19 outbreak. Asian J Psychiatr 2020;51:102077.

18. Bobo E, Lin L, Acquaviva E, Caci H, Franc N, Gamon L, et al. How do children and adolescents with attention deficit hyperactivity disorder (ADHD) experience lockdown during the COVID-19 outbreak?. Encephale 2020;46:S85-s92.
19. Melegari MG, Giallonardo M, Sacco R, Marcucci L, Orecchio S, Bruni O. Identifying the impact of the confinement of Covid-19 on emotional-mood and behavioural dimensions in children and adolescents with attention deficit hyperactivity disorder (ADHD). Psychiatry Res 2021;296:113692.
20. Jamison DT, Wu KB. The east-west divide in response to COVID-19. Engineering (Beijing) 2021;7:936-47.
21. Becker SP, Breaux R, Cusick CN, Dvorsky MR, Marsh NP, Sciberras E, et al. Remote learning during COVID-19: Examining school practices, service continuation, and difficulties for adolescents with and without attention-deficit/hyperactivity disorder. J Adolesc Health 2020;67:769-77.
22. Moulin F, El-Aarbaoui T, Bustamante JJH, Héron M, Mary-Krause M, Rouquette A, et al. Risk and protective factors related to children's symptoms of emotional difficulties and hyperactivity/inattention during the COVID-19-related lockdown in France: results from a community sample. Eur Child Adolesc Psychiatry 2021:1-12.
23. Ibrahim K, Donyai P. Drug holidays from ADHD medication: International experience over the past four decades. J Atten Disord 2015;19:551-68.
24. Cortese S, Asherson P, Sonuga-Barke E, Banaschewski T, Brandeis D, Buitelaar J, et al. ADHD management during the COVID-19 pandemic: guidance from the European ADHD guidelines group. Lancet Child Adoles Health 2020;4:412-4.
25. Fabiano GA, Schatz NK, Aloe AM, Chacko A, Chronis-Tuscano A. A systematic review of meta-analyses of psychosocial treatment for attention-deficit/hyperactivity disorder. Clin Child Fam Psychol Rev 2015;18:77-97.