



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Behavioral and Emotional Disorders in Children during the COVID-19 Epidemic

Wen Yan Jiao, MD¹, Lin Na Wang, MS², Juan Liu, MD³, Shuan Feng Fang, MD⁴, Fu Yong Jiao, MD⁵, Massimo Pettoello-Mantovani, MD, PhD^{6,7}, and Eli Somekh, MD^{7,8}

Since December 2019, health systems around the globe have struggled with an increasing number of cases of a viral respiratory syndrome that emerged in China. The cause is a new strain in the coronavirus family, provisionally named 2019 novel coronavirus (2019-nCoV)¹, SARS-CoV-2 or COVID-19.²

The European Paediatric Association–Union of National European Paediatric Societies and Associations (EPA-UNEPSA) has established a collaborative working group with key Chinese academic institutions and medical centers with the purpose of facilitating the reciprocal exchange of information and sharing scientific knowledge. The aim of this commentary by the China-EPA-UNEPSA working group is to raise awareness regarding children's psychological needs during epidemics and report early data collected in the COVID-19-affected areas in China during the current outbreak, emphasizing the role of families and caregivers in the timely recognition and management of negative emotions.

Epidemiology of COVID-19

The COVID-19 outbreak first erupted in the city of Wuhan in the Hubei Province of China, where several local health facilities reported clusters of patients with pneumonia of unknown cause; they were epidemiologically linked to a seafood and wet animal wholesale market.³ COVID-19 infection rapidly spread throughout China, involving the provinces of Chongqing, Hunan, Anhui, Henan, Jiangxi, and Shaanxi.⁴ Over the next 3 months, COVID-19 spread to other regions of the world, reaching >100 000 cases globally in the first week of March 2020, of which approximately 80% were reported in China, 6% in South Korea, 3% in Iran, and 0.2% in the US. In Europe, the first case of COVID-19 was registered in a patient hospitalized in Munich, Germany in early January 2020, following contact with a traveler from China.⁵ Later, several other cases were reported in variable numbers in Germany, Spain, Italy, France, and other European countries, together representing roughly 5% of the cases of COVID-19 recorded worldwide.⁴ Genetic studies on viral strains isolated from patients affected by Coronavirus infection throughout the world confirmed that they are all phylogenetically related to the original Chinese mutant strain.⁶

In contrast to seasonal influenza, COVID-19 seems to cause a milder clinical infection in children than in adults or older people. Early studies have suggested that children are just as likely as older age groups to become infected

with the coronavirus but are far less likely to develop severe symptoms.⁷ The risk of severe disease and death is highest for seniors and those with severe health conditions, such as heart disease, chronic lung disease, cancer, and diabetes.⁷

COVID-19 has been perceived worldwide as a major threat to health and a danger to the global economy, affecting people's lives by influencing their everyday behavior and causing feelings of panic anxiety, depression, and often triggering intense dread.

In China, COVID-19 has affected children aged 3 months to 17 years, most of whom had close contact with infected persons or were part of a family cluster of cases.⁸ No official data are available on the number of symptomatic and asymptomatic individuals positive for COVID-19 in the <18 age group. Infected children might appear asymptomatic⁹ or present with fever, dry cough, and fatigue, and few have upper respiratory symptoms including nasal congestion and running nose. Some patients present with gastrointestinal symptoms, including abdominal discomfort, nausea, vomiting, abdominal pain, and diarrhea. Most infected children have mild clinical manifestations without fever or symptoms of pneumonia, and the majority recover within 1–2 weeks after disease onset. Few progress to lower respiratory infections.

Although children seem to be less vulnerable than adults to COVID-19, initial reports from Chinese areas hit by the outbreak indicate that children and adolescents have been impacted psychologically, manifesting behavioral problems, as discussed below.¹⁰

Early Investigation of Chinese Children's Behavioral and Emotional Reactions to COVID-19

Children are not indifferent to the dramatic impact of the COVID-19 epidemic. They experience fears, uncertainties,

From the ¹Department of Psychology, Shaanxi Provincial People's Hospital of Xi'an, Jiatong University, Jiatong, China; ²Department of Clinical Medicine, Xi'an Medical University, Jiatong, China; ³Department of Child Health Care, Shennu City Hospital, Shennu City, China; ⁴Child Health Care Department, Zhengzhou University, Zhengzhou, Henan, China; ⁵Children's Hospital, Shaanxi Provincial People's Hospital of Xi'an, Jiatong University, Jiatong, China; ⁶Department of Pediatrics, Scientific Institute "Casa Sollievo della Sofferenza," University of Foggia, Foggia, Italy; ⁷European Paediatric Association–Union of National European Paediatric Societies and Associations, Berlin, Germany; and ⁸Department of Pediatrics, Mayanay Hayeshuah Medical Center, Bnei Brak and the Sackler School of Medicine, Tel Aviv University, Tel Aviv, Israel

The authors declare no conflicts of interest.

0022-3476/\$ - see front matter. © 2020 Elsevier Inc. All rights reserved.
<https://doi.org/10.1016/j.jpeds.2020.03.013>

and physical and social isolation and may miss school for a prolonged period. Understanding their reactions and emotions is essential to properly address their needs. A preliminary study conducted in Shaanxi Province during the second week of February 2020, which was authorized by the local authorities, showed that the most common psychological and behavioral problems among 320 children and adolescents (168 girls and 142 boys) aged 3-18 were clinginess, distraction, irritability, and fear of asking questions about the epidemic (unpublished data). Because of the Chinese government's mobility restrictions related to epidemics, as enforced by local and national authorities, the study was performed using an online questionnaire to investigate the children's behavioral and emotional responses to the current epidemics. Several children were confined at home under protective isolation because they resided in highly affected areas.

The questionnaire, which was completed by the parents, incorporated the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) criteria¹⁰ commonly used for a cross-cultural assessment of anxiety disorders, including depression.¹¹ Fear of asking about the epidemics and the health of relatives, poor sleep including nightmares, poor appetite, physical discomfort, agitation and inattention, clinginess, and separation problems were among the main psychological conditions investigated. An important factor ensuring the reliability of results collected by questionnaires investigating mental disorders in general and particularly during emergencies is the procedure for data collection and statistical analysis followed by specialized personnel responsible for data collection, registration, and statistical processing, as in this case. The use of standard statistical methods ensures the comparability of the results with other studies.^{12,13}

The purpose of the questionnaire used in the Chinese study was not to establish a final diagnosis of mental disorder and depression or to monitor depression severity, but rather to screen for behavioral and emotional disorders as a "first step" approach. Subjects who screened positive at preliminary investigation of their behavioral and emotional condition should be included in future programs to determine whether they meet criteria for a depressive disorder.

Psychological distress in Children Exposed to Adverse Events

Although the knowledge base regarding children's responses to trauma and adverse events in general has been expanding, descriptions of their responses during epidemics remain scarce.¹⁴ Yet their vulnerability makes this an important group to study. Several studies have documented the damaging effects of psychological stress due to negative events in children. Anxiety, depression, lethargy, impaired social interaction, and reduced appetite are commonly reported manifestations. Physiological effects include a weak-

ened or compromised immune system.¹⁵⁻¹⁹ In the course of adverse events, children are often forced to stay home for long periods due to enforced isolation and school closure, resulting in limited connection with classmates and reduced physical activity.

A preliminary study conducted in the Shaanxi province during the COVID-19 epidemic by the China-EPA-UNEPESA collaborative working group showed that children in the younger age group (3-6 years) were more likely than older children to manifest symptoms, such as clinginess and fear that family members could contract the infection ($P = .002$). Children aged 6 to 18 years were more likely to show inattention ($P = .049$) and persistent inquiry ($P = .003$). Clinging, inattention, and irritability were the most severe psychological conditions demonstrated by the children in all age groups (Figure; available at www.jpeds.com). The rates of fear, anxiety, and other emotions were higher in children residing in highly epidemic areas; however, the differences between areas identified by different levels of epidemic risk were not statistically significant. Media entertainment was largely successfully used by families over reading and physical exercise as a means to relieve their children's distress and address their concerns regarding the negative condition they were experiencing (Table; available at www.jpeds.com).

The Importance of Nurturing Resilience in Children Exposed to Epidemics

Children facing unexpected and unknown events typically exhibit various stress reactions, as confirmed in the study performed in China during the COVID-19 epidemic. Resilience, the personal attributes that help children manage everything from little disappointments to big life traumas, should be nurtured and implemented by public health programs in children and teens living in areas hit by calamities such as epidemics. If properly supported by healthcare professionals, families, and other social connections, including school environment, children and adolescents can appropriately overcome a condition of distress and prospectively stabilize emotionally and physiologically.²⁰

Conclusions

Pediatricians working in Shaanxi Province, China have pursued the strategy of nurturing resilience in children and adolescents hit by the psychological consequences of the COVID-19 epidemic. The measures suggested by Chinese pediatricians to parents and family members, included increasing communication with children to address their fears and concerns, playing collaborative games to alleviate loneliness, encouraging activities that promote physical activity, and using music therapy in the form of singing to reduce the worry, fear, and stress that the child may feel. All these measures are focused on supporting the child to

get through this difficult time. Furthermore, parents should pay attention to sleep difficulties and nightmares, prevent increased daytime sleep and suggest sleep hygiene and relaxation methods, model a positive psychological attitude to reduce stress, and divert attention to more productive and positive directions.

The effect of this outbreak is unclear at present, as the situation is rapidly evolving.²¹ The China-EPA-UNEPSA working group believes that the preliminary report from the Chinese province of Shaanxi includes useful information for professionals involved in the care of children hit by the current and possible future epidemics.²² ■

Reprint requests: Eli Somekh, MD, Mayanei Hayeshuah Medical Center, 17 Povarski St 17, Bnei Brak, Israel. E-mail: esomekh@gmail.com

References

- Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, et al. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet* 2020;395:565-74.
- Fauci AS, Lane HC, Redfield RR. Covid-19—Navigating the uncharted. *N Engl J Med* 2020. <https://www.nejm.org/doi/full/10.1056/NEJMe2002387>. Accessed March 6, 2020.
- Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020;382:727-33.
- World Health Organization. COVID-19 situation. <https://experience.arcgis.com/experience/685d0ace521648f8a5beeeeb1b9125cd>. Accessed March 6, 2020.
- Rothe C, Schunk M, Sothmann P, Bretzel G, Froeschl G, Wallrauch C, et al. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. *N Engl J Med* 2020;382:970-1.
- Nextstrain. Genomic epidemiology of novel coronavirus (HCoV-19). <https://nextstrain.org/ncov>. Accessed March 6, 2020.
- Nature. Coronavirus latest: China study suggests children are as likely to be infected as adults. <https://www.nature.com/articles/d41586-020-00154-w>. Accessed March 7, 2020.
- Shen K, Yang Y, Wang T, Zhao D, Jiang Y, Jin R, et al. Diagnosis, treatment, and prevention of 2019 novel coronavirus infection in children: experts' consensus statement. *World J Pediatr* 2020. <https://doi.org/10.1007/s12519-020-00343-7> [Epub ahead of print].
- Cai J, Xu J, Lin D, Yang Z, Xu L, Qu Z, et al. A Case Series of children with 2019 novel coronavirus infection: clinical and epidemiological features. *Clin Infect Dis* 2020. <https://doi.org/10.1093/cid/ciaa198> [Epub ahead of print].
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 5th ed. Arlington (VA): American Psychiatric Publishing; 2013.
- Petito A, Pop TL, Namazova-Baranova L, Mestrovic J, Nigri L, Vural M, et al. The burden of depression in adolescents and the importance of early recognition. *J Pediatr* 2020;218:265-7.e1.
- Campanozzi A, Russo M, Catucci A, Rutigliano I, Canestrino G, Giardino I, et al. Hospital-acquired malnutrition in children with mild clinical conditions. *Nutrition* 2009;25:540-7.
- Albenzio M, Campanozzi A, D'Apolito M, Santillo A, Pettoello Mantovani M, Sevi A. Differences in protein fraction from goat and cow milk and their role on cytokine production in children with cow's milk protein allergy. *Small Rumin Res* 2012;105:202-5.
- Klein TP, Devoe ER, Miranda-Julian C, Linas K. Young children's responses to September 11th: the New York City experience. *Infant Ment Health J* 2009;30:1-22.
- Hoven CW, Duarte CS, Lucas CP, Wu P, Mandell DJ, Goodwin RD, et al. Psychopathology among New York City public school children 6 months after September 11. *Arch Gen Psychiatry* 2005;62:545-52.
- Laor N, Wolmer L, Mayes LC, Gershon A, Weizman R, Cohen DJ. Israeli preschool children under Scuds: a 30-month follow-up. *J Am Acad Child Adolesc Psychiatry* 1997;36:349-56.
- Plourde A, Lavoie KL, Raddatz C, Bacon SL. Effects of acute psychological stress induced in laboratory on physiological responses in asthma populations: a systematic review. *Respir Med* 2017;127:21-32.
- Park I, Oh SM, Lee KH, Kim S, Jeon JE, Lee HY, et al. The moderating effect of sleep disturbance on the association of stress with impulsivity and depressed mood. *Psychiatry Investig* 2020 <https://doi.org/10.30773/pi.2019.0181> [Epub ahead of print].
- Han JW, Lee H. Effects of parenting stress and controlling parenting attitudes on problem behaviors of preschool children: latent growth model analysis. *J Korean Acad Nurs* 2018;48:109-21.
- Pettoello-Mantovani M, Pop TL, Mestrovic J, Ferrara P, Giardino I, Carrasco-Sanz A, et al. Fostering resilience in children: the essential role of healthcare professionals and families. *J Pediatr* 2019;205:298-9.e1.
- Paules CI, Marston HD, Fauci AS. Coronavirus infections—more than just the common cold. *JAMA* 2020;323:707-8.
- Ehrich J, Namazova-Baranova L, Pettoello-Mantovani M. Introduction to "Diversity of Child Health Care in Europe: A Study of the European Paediatric Association/Union of National European Paediatric Societies and Associations". *J Pediatr* 2016;177S:S1-10.

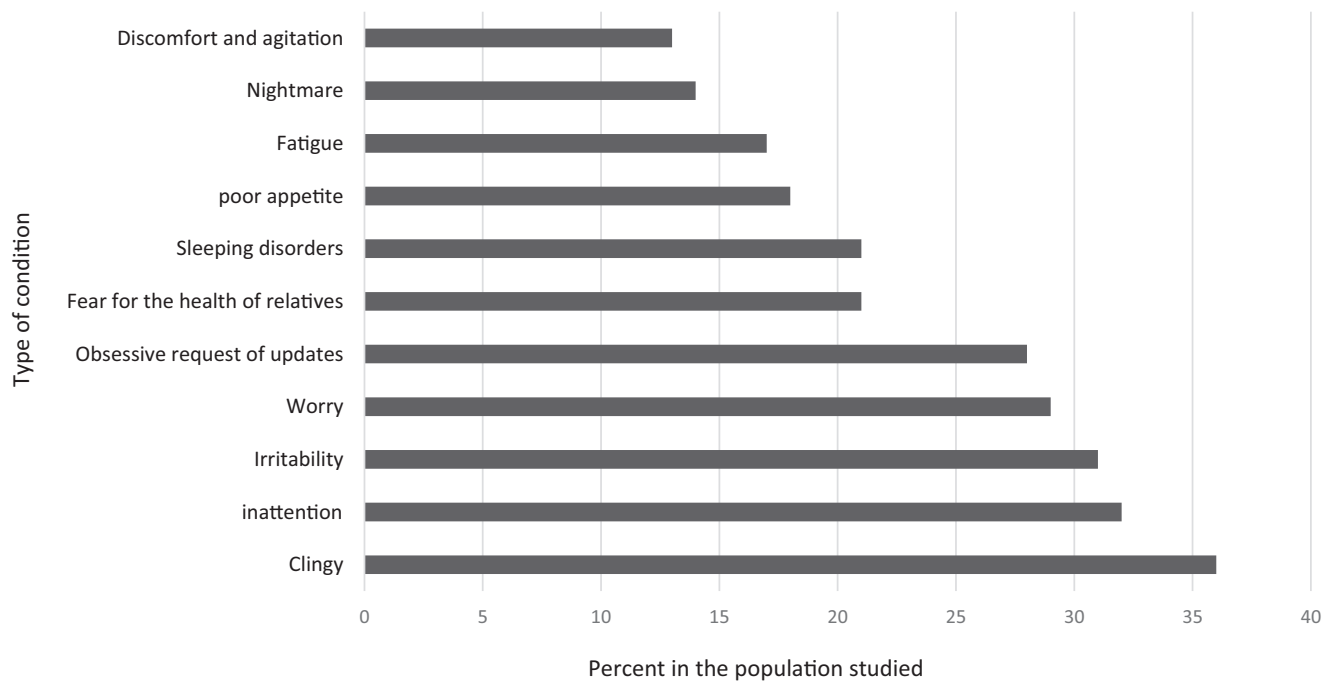


Figure. Psychological conditions studied in a population aged 3-18 during COVID-19 epidemic in the Shaanxi province, China. (January 25-February 8, 2020).

Table. Means used by families to address children's psychological problems and to mitigate their effects during COVID-19, evaluated on a 5-point rating scale

Option	Not used	Ineffective 1	2	3	4	Very effective 5
Media entertainment, %	18.77	0.97	5.83	11	37.86	25.57
Reading entertainment, %	19.09	3.56	12.3	17.48	28.8	18.77
Physical exercise, %	22.65	1.29	8.09	16.18	31.72	20.06

(Rating scale from HR-Survey, LLC for educational purposes: <https://hr-survey.com/PfRatingScales.htm>).