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## Editorial

# COVID-19 virus and children: What do we know?



With a mortality rate of 2–3% and a transmissibility rate ( $R_0$ ) of 2–3, the COVID-19 virus outbreak is spreading rapidly worldwide and is the new foe.

The first cases in Wuhan, China, did not involve children, which suggested that the disease was not symptomatic in children [1]. Now that the outbreak is global with more than 90,870 confirmed cases and 3112 deaths (as of March 3, 2020) [2], we can evaluate more accurately the epidemiology of this disease. There are more than 900 confirmed pediatric cases, but currently no child under 10 years of age has died; only one individual between 10 and 19 years of age died [3–6] and only one child under 1 year old was reported to have a severe form of the disease [7]. Most of the children were infected after exposure to an adult from the household [4]. These data suggest that children seem to have been spared the major impact of COVID-19 virus.

By comparison with adults, the number of confirmed pediatric cases is very low, and the severity and mortality rates are even lower [5–8]. In China, the journal *Zhonghua Liu Xing Bing Xue Za Zhi* described the age distribution of 44,672 symptomatic confirmed cases: among 43,707 patients older than 20 years, there were 1022 deaths (2.3%), whereas among 416 patients aged 0–9 years there was no case of death (0%), and among 549 patients aged 10–19 years there was one death (0.2%) [5].

The proportion of asymptomatic patients described worldwide is very small (889 confirmed asymptomatic cases/45,561 confirmed cases in China; 2.0% [5]), but this could be underestimated because of the diagnostic methods that involved exclusively RNA detection by RT-PCR of secretions (nasopharyngeal and throat swabs and in stool samples [4,9]). RNA in nasopharyngeal and throat swab samples has been shown to become undetectable within 6–22 days (mean: 12 days) of illness onset in children [4]. The excretion of the virus could be shorter in asymptomatic patients and there is no systematic sampling series in asymptomatic persons. The age distribution of asymptomatic patients is not detailed in the literature. Do children represent less severe cases, are they less infected, or are they being underdiagnosed as less symptomatic [10]?

Symptoms in children include flu-like syndrome, fluctuating fever, pneumonia, and upper respiratory signs (cough, sore throat, stuffy nose, sneezing, and rhinorrhea) [3,4,8]. Symptomatic care is sufficient in the majority of cases but sometimes antibiotic treatment of bacterial superinfection may be necessary. There

have been reports about etiological treatment with the antiviral activity of chloroquine (a well-known antimalarial treatment) [11] and remdesivir (which had been tried against the Ebola virus) [12].

Similarly, no severe or lethal case linked to coronavirus infection has been reported to date among pregnant women [13–15]. However, a higher risk of preterm birth is reported (five preterm neonates at 30–33 gestational weeks, seven at around 34–36 gestational weeks, and 12 at full term/24 neonates), and maternal infection could be involved in neonatal distress; one neonate died but his samples were negatives for COVID-19 virus [13–16]. The vertical transmission before and during delivery is unknown. Some data suggest that no viral RNA is found in amniotic fluid, cord blood, or breastmilk [13], but neonatal infected cases have been reported and they evolved favorably [17–21]. In cases of confirmed or suspected infection in pregnant women, it is necessary to maintain a high level of surveillance during the 14–21 days following birth. Breastfeeding should be encouraged as it is the best source of nutrition and also provides antibodies; the spread of the virus in milk is not well known. Infected mothers should wash their hands often with soap and water or hydro-alcoholic solutions and, if possible, wear a face mask. If a mother is too tired to breastfeed, it can be suggested to express the milk with manual or electric pumps so that a healthy member of the family or a caregiver may give the expressed milk to the infant. Hygiene is required when handling the pump and bottles in order to prevent transmission of viruses or bacteria [21].

No data are available in the literature concerning the severity of the infection in immunocompromised pediatric patients. And although caution should be taken in this population, the lack of data suggests that an increased risk of severe infection has not been demonstrated in these patients [22].

In conclusion, the COVID-19 virus seems to cause benign infections in children. The reasons for this tolerance are unknown. Currently, it is not clear whether specific pediatric populations (children with chronic disease or immunosuppressive treatment) will also have such a favorable outcome. Moreover, children as asymptomatic or mildly symptomatic carriers of the virus may transmit the virus to other groups (elderly relatives, caregivers, etc.) even if no transmission of the COVID-19 virus from children to adults has been described to date. Children and their relatives should act to prevent the spread of respiratory infections (covering coughs, cleaning hands often with soap and water or hydro-

alcoholic solutions), and in the event of suspected or confirmed cases they should wear a mask. Furthermore, orofecal transmission is suspected as COVID-19 virus DNA has been detected in stool samples.

This article was written early march. Since new data have been published, allowing a better view of pediatric population without changing the sense of this article, however you can refer to Dong Y. et al in pediatrics<sup>1</sup> and Lu. X et al in NEJM<sup>2</sup>.

#### Disclosure of interest

The authors declare that they have no competing interest.

#### References

- [1] Li Q, Guan X, Wu P, Wang X, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus-infected pneumonia. *N Engl J Med* 2020. <http://dx.doi.org/10.1056/NEJMoa2001316> [Epub ahead of print].
- [2] WHO. Coronavirus disease 2019 (COVID-19) Situation Report–43; 2020. [https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200303-sitrep-43-covid-19.pdf?sfvrsn=d03e7a3a\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200303-sitrep-43-covid-19.pdf?sfvrsn=d03e7a3a_2).
- [3] Wei M, Yuan J, Liu Y, et al. Novel coronavirus infection in hospitalized infants under 1 year of age in China. *JAMA*. doi: 10.1001/jama.2020.2131. [Epub ahead of print].
- [4] Cai J, Xu J, Lin D, et al. A CASE SERIES OF CHILDREN WITH 2019 NOVEL CORONAVIRUS INFECTION: CLINICAL AND EPIDEMIOLOGICAL FEATURES. *Clin Infect Dis* 2020. <http://dx.doi.org/10.1093/cid/ciaa198> [pii: ciaa198], [Epub ahead of print].
- [5] Liu Z, Bing X, Zhi XZ. [The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China]. *Zhonghua Liu Xing Bing Xue Za Zhi* 2020;41:145–51.
- [6] National Institute of infectious diseases. Field Briefing: Diamond Princess COVID-19 Cases, 20 Feb Update. Published: 21 February 2020. <https://www.niid.go.jp/niid/en/2019-ncov-e/9417-covid-dp-fe-02.html>.
- [7] Tian S, Hu N, Lou J, et al. Characteristics of COVID-19 infection in Beijing. *J Infect* 2020. <http://dx.doi.org/10.1016/j.jinf.2020.02.018> [pii: S0163-4453(20)30101-8], [Epub ahead of print].
- [8] Wang D, Ju XL, Xie F, et al. [Clinical analysis of 31 cases of 2019 novel coronavirus infection in children from six provinces (autonomous region) of northern China]. *Zhonghua Er Ke Za Zhi* 2020;58(4):E011. <http://dx.doi.org/10.3760/cma.j.cn112140-20200225-00138> [Epub ahead of print].
- [9] Corman VM, Landt O, Kaiser M, et al. Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR. *Euro Surveill* 2020;25:2000045.
- [10] Kam KQ, Yung CF, Cui L, et al. A well infant with coronavirus disease 2019 (COVID-19) with high viral load. *Clin Infect Dis* 2020. <http://dx.doi.org/10.1093/cid/ciaa201> [pii: ciaa201], [Epub ahead of print].
- [11] Gao J, Tian Z, Yang X. Breakthrough: Chloroquine phosphate has shown apparent efficacy in treatment of COVID-19 associated pneumonia in clinical studies. *Biosci Trends* 2020. <http://dx.doi.org/10.5582/bst.2020.01047> [Epub ahead of print].
- [12] Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): the epidemic and the challenges. *Int J Antimicrob Agents* 2020;105924. <http://dx.doi.org/10.1016/j.ijantimicag.2020.105924> [Epub ahead of print].
- [13] Chen H, Guo J, Wang C, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. *Lancet* 2020. [http://dx.doi.org/10.1016/S0140-6736\(20\)30360-3](http://dx.doi.org/10.1016/S0140-6736(20)30360-3) [In Press].
- [14] Wang X, Zhou Z, Zhang J, et al. A case of 2019 Novel Coronavirus in a pregnant woman with preterm delivery. *Clin Infect Dis* 2020. <http://dx.doi.org/10.1093/cid/ciaa200> [pii: ciaa200], [Epub ahead of print].
- [15] Liu W, Wang Q, Zhang Q, et al. Coronavirus disease 2019 (COVID-19) during pregnancy: a case series. Preprints 2020, 2020020373.
- [16] Zhu H, Wang L, Fang C, et al. Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia. *Transl Pediatr* 2020;9:51–60.
- [17] Lu Q, Shi Y. Coronavirus disease (COVID-19) and neonate: what neonatologist need to know. *J Med Virol* 2020. <http://dx.doi.org/10.1002/jmv.25740> [Epub ahead of print].
- [18] Niu Y, Yue H. Wuhan Tongji Hospital diagnoses first case of neonatal infection with new coronavirus; 2020. <http://society.people.com.cn/n1/2020/0205/c1008-31572959.html>. Date accessed: February 7, 2020 (in Chinese).
- [19] Zeng LK, Tao XW, Yuan WH, et al. [First case of neonate infected with novel coronavirus pneumonia in China]. *Zhonghua Er Ke Za Zhi* 2020;58:E009. <http://dx.doi.org/10.3760/cma.j.issn.0578-1310.2020.0009> [Epub ahead of print].
- [20] Zhang Z, Wang C, Gao CC. Neonatal coronavirus expert confirmed at 30 hours of birth: vertical transmission from mother to infant; [http://www.cnr.cn/hubei/yuanchuang/20200205/t20200205\\_524961963.shtml](http://www.cnr.cn/hubei/yuanchuang/20200205/t20200205_524961963.shtml) 2020, Date accessed: February 10, 2020 (in Chinese).
- [21] Centers for Disease Control and Prevention, National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases. Coronavirus Disease 2019 (COVID-19); 2020. <https://www.cdc.gov/coronavirus/2019-ncov/specific-groups/pregnancy-guidance-breastfeeding.html>.
- [22] INFOVAC-France. Bulletin supplémentaire mars 2020 – Mise au point sur le COVID-19 en pédiatrie; 2020. [https://www.infovac.fr/actualites/bulletin-supplementaire-mars-2020-mise-au-point-sur-le-covid-19-en-pediatrie?utm\\_source=Facebook&utm\\_medium=email&utm\\_campaign=Bulletin%20Infovac%20sp%C3%A9cial%20Coronavirus%202020%20-%20Mars](https://www.infovac.fr/actualites/bulletin-supplementaire-mars-2020-mise-au-point-sur-le-covid-19-en-pediatrie?utm_source=Facebook&utm_medium=email&utm_campaign=Bulletin%20Infovac%20sp%C3%A9cial%20Coronavirus%202020%20-%20Mars).

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<sup>1</sup> Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, et al. Epidemiological Characteristics of 2143 Pediatric Patients With 2019 Coronavirus Disease in China. *Pediatrics*. 2020 Mar 16. pii: e20200702.

<sup>2</sup> Lu X, Zhang L, Du H, Zhang J, Li YY, Qu J, et al. SARS-CoV-2 Infection in Children. *N Engl J Med*. 2020 Mar 18.