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## Changes in pathogen distribution in the blood culture of neonates before and after the COVID-19 pandemic, Henan, China

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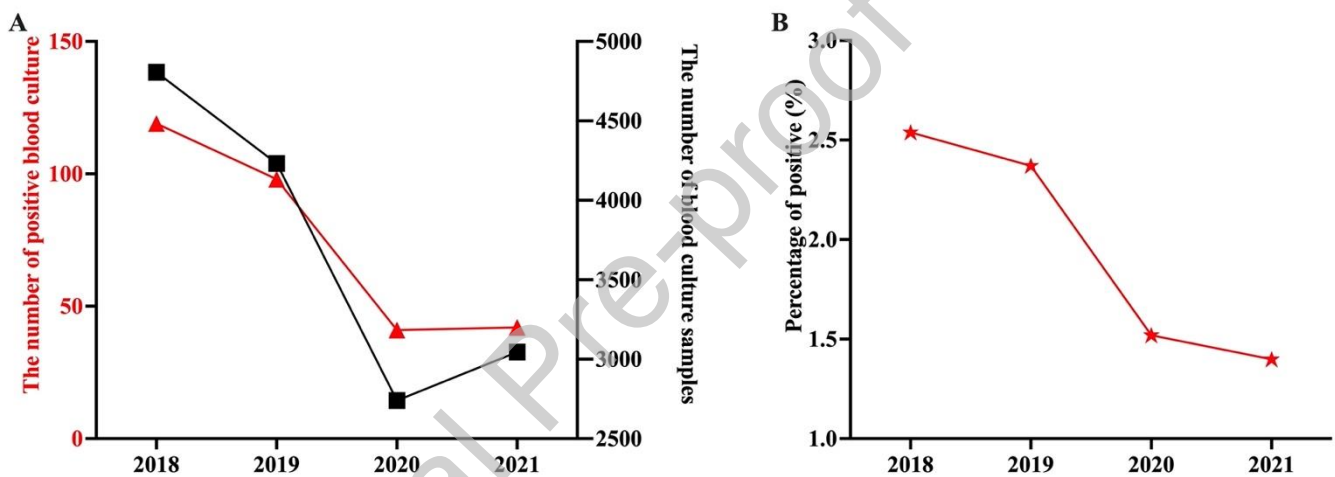
Dear Editor,

The reports of Li et al.<sup>1</sup> and Zhou et al.<sup>2</sup> in this journal, which demonstrated the changes in *Streptococcus pneumoniae* and *Haemophilus influenzae* infection in children before and after the Coronavirus disease 2019 (COVID-19) pandemic in Henan, China, recently caught our interest. However, no data were available on the changes in pathogen distribution in the blood culture of neonates before and after the COVID-19 pandemic.

Bloodstream infection is a serious infectious disease. Owing to the weak immune system that newborns have, neonates are more prone to infection by pathogens, which leads to bloodstream infection<sup>3</sup>. Neonatal bloodstream infection is a major disease that seriously threatens the life of newborns. The incidence rate of neonatal bloodstream infection is 4.5-9.7/1000<sup>4</sup>. Bloodstream infection is primarily caused by bacteria, fungi, and viruses. The distribution of bloodstream infection pathogen may vary in different regions. In addition, in response to COVID-19, many countries have implemented strict interventions, such as social distancing, wearing masks, limiting crowd gatherings, and restricting outdoor activities<sup>5</sup>. Coronavirus disease 2019 (COVID-19), as well as its prevention and control measures, have severely affected people's lifestyles and may also affect the epidemiology of pathogens<sup>6</sup>. Analyzing pathogen distribution in

bloodstream infections in neonates before and after the COVID-19 pandemic is helpful to provide a basis for hospital infection prevention and clinical management strategies.

In this study, we compared the number of positive blood cultures, the positive blood culture rate, and the constituent ratio of pathogens to explore the impact of the COVID-19 pandemic on the pathogen distribution in bloodstream infection in neonates. As shown in Fig 1, we analyzed the number of blood culture samples sent, the number of positive blood cultures, and the positive infection rate before and after the COVID-19 pandemic. The results showed that both the number of blood culture samples and the number of positive blood cultures decreased in 2020, and then increased slightly in 2021 (after the COVID-19 pandemic) compared to that in 2018 and 2019 (before the COVID-19 pandemic). The positive rate in blood culture gradually decreased from 2018 to 2021.



Further, we analyzed the pathogen distribution in the blood cultures of neonates before and after the COVID-19 pandemic (Table 1). Our data showed that the pathogenic microorganisms present in newborn blood cultures were primarily *Klebsiella pneumoniae*, *Escherichia coli*, and coagulase-negative staphylococci before and after the COVID-19 pandemic, which account for more than 60% of pathogenic microorganisms. Among the pathogens, the abundance of *Klebsiella pneumoniae*, *Escherichia coli*, and coagulase-negative staphylococci gradually decreased from 2018 to 2021, whereas the percentage of *Klebsiella pneumoniae* gradually decreased from 2018 to 2020 and increased in 2021. The percentage of *Escherichia coli* gradually increased from 2018 to 2020 and decreased in 2021. The percentage of coagulase-negative staphylococci gradually increased from 2018 to 2021. In addition, *Saccharomycetes* and *Ochrobactrum anthropi* were not detected in 2020 and 2021 (after the COVID-19 pandemic), whereas *Pseudomonas aeruginosa* was detected in both 2020 and 2021 but not in 2018 and 2019.

Our data showed that the COVID-19 pandemic decreased the pathogen detection rate and changed the pathogen distribution in the blood culture of neonates. With the gradual control of the COVID-19 pandemic,

people's lives will return to normal, and the pathogen distribution of blood culture in neonates will also change. For example, the proportion of *Klebsiella pneumoniae* decreased during the period of strict control of COVID-19 (2020), whereas the proportion increased during the recovery period of the pandemic (2021). The changes in pathogen distribution in neonatal blood cultures before and after the COVID-19 pandemic require attention.

In conclusion, we found that the number and positive rate of pathogens in the blood of neonates decreased during COVID-19, and the distribution of pathogens also changed. Continuous monitoring of the changes in pathogen distribution in the blood cultures in neonates can be helpful for preventing neonatal infection by pathogens.

### Declaration of competing interest

None.

### Acknowledgments

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**Fig 1.** The number of blood culture samples, positive blood cultures and positive blood culture rate from 2018 to 2021

**Table 1.** The pathogen distribution of blood culture in neonates.

Pathogens	2018 (n = 120)	2019 (n = 98)	2020 (n = 41)	2021 (n = 43)
<i>Klebsiella pneumoniae</i>	29 (24.2%)	21 (21.4%)	8 (19.5%)	14 (32.6%)
<i>Escherichia coli</i>	16 (13.3%)	15 (15.3%)	9 (22.0%)	4 (9.3%)
Coagulase negative staphylococci	46 (38.3%)	33 (33.7%)	12 (29.3%)	10 (23.3%)
<i>Staphylococcus aureus</i>	2 (1.7%)	6 (6.2%)	2 (4.9%)	0 (0)
<i>Enterococcus faecium</i>	4 (3.3%)	3 (3.1%)	1 (2.4%)	4 (9.3%)
<i>Enterococcus faecalis</i>	0 (0)	2 (2.0%)	1 (2.4%)	1 (2.3%)
Saccharomycetes	10 (8.3%)	3 (3.1%)	0 (0)	0 (0)
<i>Ochrobactrum anthropi</i>	2 (1.7%)	2 (2.0%)	0 (0%)	0 (0)
<i>Listeria monocytogenes</i>	1 (0.8%)	1 (1.0%)	2 (4.9%)	0 (0)
<i>Pseudomonas aeruginosa</i>	0	0	1 (2.4%)	1 (2.3%)
Other pathogens	8 (6.7%)	12 (12.2%)	5 (12.2%)	9 (20.1)

Abbreviations: COVID-19, coronavirus disease 2019.