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6. Coronavirus COVID-19 global cases by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). Available at: <https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>. Accessed April 30, 2020.
7. Italian Ministry of Health-COVID-19 pandemic update. Available at: http://www.salute.gov.it/imgs/C_17_notizie_4632_0_file.pdf. Accessed April 30, 2020.

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Reply



To the Editor:

The article by Marco et al¹ titled “Asthmatic patients in COVID-19 outbreak: few cases despite many cases” discusses the prevalence of asthma in patients with coronavirus disease 2019 (COVID-19) in the Northeast of Italy. The low prevalence of asthma in patients with COVID-19 in Italy¹ was consistent with what we observed in our study,² but was much lower than those from the United States³ and Dublin.⁴ The reasons behind the regional difference in the prevalence of asthma with COVID-19 are worth discussion.

We searched PubMed and Medline database for articles published up to May 20, 2020, using the keywords “SARS-COV-2,” “COVID-19,” and “asthma.” As shown in Table I,¹⁻⁷ the prevalence of asthma with COVID-19 in each country was listed as well as the prevalence of asthma in the general population of the corresponding region.

The studies from China, Italy, and Mexico confirmed the lower rates of asthma patients with COVID-19 when compared with the prevalence of asthma in the corresponding general population (0.9%, 1.92%, and 3.6%, compared with 6.4%, 6.1%, and 5.0%, respectively).^{1,2,5} However, recent data released from New York and Dublin indicated the high rates of asthma in COVID-19, which were similar or a little higher than the prevalence of asthma in the general population (9.0% and 8.8%, compared with 10.1% and 7%, respectively).^{3,4} The other 2 small cohorts from France and Australia also manifested the high rates of comorbidity of asthma in pediatric patients with COVID-19.^{6,7}

The reasons for the regional differences may partially be attributed to the variety in the strictness of prevention and control measures, the public awareness of self-protection, and the detection strategy of SARS-COV-2. However, we also notice that the risk of patients with asthma to COVID-19 in the regions with a low prevalence of asthma seems lower than that in regions with a high prevalence of asthma. The recent study suggested that T_H2 cytokine may decrease the expression of angiotensin-converting enzyme 2 (ACE2) in epithelial cells, but increase another SARS-COV-2 entry protein transmembrane protease serine 2 (TMPRSS2) gene expression. The regulation on the expressions of ACE2 and TMPRSS2 in T_H2-high patients with asthma differed from that in T_H2-low patients with asthma. Therefore, we may speculate that the difference in phenotype and genotype of asthma may contribute to the differential regulation of ACE2 and TMPRSS2 and be partially responsible for the variety in susceptibility of patients with asthma to COVID-19 among different regions.

The other concern is the various clinical characteristics of patients with asthma in the different regions; for example, high body mass index in patients with asthma is more common in the United States than in China and Italy. Obesity is related to an increased risk of COVID-19. Obese patients are also prone to have hypertension, which is a predisposing factor for COVID-19.

TABLE I. Regional differences in the prevalence of asthma in patients with COVID-19

Country	Percentage of asthma with COVID-19 (n/n)	Prevalence of asthma in the general population	References
China	0.9% (5/548)	6.4%	Li et al ²
Italy	1.92% (20/1043)	6.1%	Caminati et al ¹
Mexico	3.6% (270/7497)	5.0%	Solís et al ⁵
USA	9.0% (479/5700)	10.1%	Richardson et al ³
Ireland	8.8% (17/193)	7.0%	Butler et al ⁴
France	8.5% (3/35)	11%	Belhadjer et al ⁶
Australia	25% (1/4)	13.9%	Ibrahim et al ⁷

The different comorbidities with patients with asthma may also be one of the reasons for the regional differences in the prevalence of asthma in COVID-19.

Asthma is a disease with marked heterogeneity. It would be intriguing to investigate and understand how the heterogeneity of asthma is attributable to the variability in susceptibility and clinical course of asthma with COVID-19.

Junqing Yue, MD^{a,b}
Lu Qin, PhD^{a,b}
Cong Zhang, MD^{a,b}
Min Xie, MD^{a,b}

From ^athe Department of Respiratory and Critical Care Medicine, Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology, and ^bthe Key Laboratory of Respiratory Diseases, National Ministry of Health of the People's Republic of China and National Clinical Research Center for Respiratory Disease, Wuhan, China. E-mail: xie_m@126.com.

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REFERENCES

- Caminati M, Lombardi C, Micheletto C, Roca E, Bigni B, Furci F, et al. Asthmatic patients in COVID-19 outbreak: few cases despite many cases. *J Allergy Clin Immunol* 2020;146:541-2.
- Li X, Xu S, Yu M, Wang K, Tao Y, Zhou Y, et al. Risk factors for severity and mortality in adult COVID-19 inpatients in Wuhan [published online ahead of print April 12, 2020]. *J Allergy Clin Immunol* <https://doi.org/10.1016/j.jaci.2020.04.006>.
- Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, et al. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. *JAMA* 2020;323:2052-9.
- Butler MW, O'Reilly A, Dunican EM, Mallon P, Feeney ER, Keane MP, et al. Prevalence of comorbid asthma in COVID-19 patients [published online ahead of print June 10, 2020]. *J Allergy Clin Immunol* <https://doi.org/10.1016/j.jaci.2020.04.061>.
- Solís P, Carreño H. COVID-19 fatality and comorbidity risk factors among confirmed patients in Mexico [published online ahead of print April 25, 2020]. *medRxiv* <https://doi.org/10.1101/2020.04.21.20074591>.
- Belhadjer Z, Méot M, Bajolle F, Khraiche D, Legendre A, Abakka S, et al. Acute heart failure in multisystem inflammatory syndrome in children (MIS-C) in the context of global SARS-CoV-2 pandemic [published online ahead of print May 17, 2020]. *Circulation* <https://doi.org/10.1161/CIRCULATIONAHA.120.048360>.
- Ibrahim LF, Tosif S, McNab S, Hall S, Lee HJ, Lewena S, et al. SARS-CoV-2 testing and outcomes in the first 30 days after the first case of COVID-19 at an Australian children's hospital [published online ahead of print May 10, 2020]. *Emerg Med Australas* <https://doi.org/10.1111/1742-6723.13550>.

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Global lockdown, pollution, and respiratory allergic diseases: Are we in or are we out?



To the Editor:

We have read with great interest the work by Navel et al¹ about the impact of the current coronavirus disease 2019