



not be necessary in all women. There is no clear benefit of delivery via cesarean in women with COVID-19.

The limitations of our study include a small sample size of 16 pregnant women from a single obstetric unit and a retrospective design; however, our results suggest that COVID-19 is not an indication for pregnancy termination, and decisions regarding delivery timing must be individualized. Most women with COVID-19 delivered at or beyond the late preterm period, and most who delivered prematurely had other medical indications for preterm birth other than COVID-19. Therefore, choice of delivery method should be based on the usual obstetric indications.

AUTHOR CONTRIBUTIONS

YZ drafted the manuscript. LL, QY, and BXY designed the study. WW, RH, and FH collected the data and conducted data analysis. DC made essential revisions.

ACKNOWLEDGMENTS

This study was funded by the National Key R&D Program of China (2016YFC1000400 & 2016YFC1000405); Major Project of the "Thirteenth Five-Year Plan" of the China Ministry of Science and

Technology (2017YFC1001402); National Natural Science Foundation of China (81830045).

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

REFERENCES

1. Kourtis AP, Read JS, Jamieson DJ. Pregnancy and infection. *N Engl J Med*. 2014;370:2211–2218.
2. Chen YH, Keller J, Wang IT, et al. Pneumonia and pregnancy outcomes: a nationwide population-based study. *Am J Obstet Gynecol*. 2012;207:288.e1–288.e7.
3. Wong SF, Chow KM, de Swiet M. Severe acute respiratory syndrome and pregnancy. *BJOG*. 2003;110:641–642.
4. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan. *JAMA*. 2020;323:1061–1069.
5. Wei M, Yuan J, Liu Y, et al. Novel coronavirus infection in hospitalized infants under 1 year of age in China. *JAMA*. 2020;323:1313–1314.
6. 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;395:809–815.

Received: 20 May 2020 | Accepted: 27 May 2020 | First published online: 16 Jun 2020

DOI: 10.1002/ijgo.13250

Obstetrics

Maternal mortality from COVID-19 in Mexico

Mario Isaac Lumbreras-Marquez^{1,2} | Melissa Campos-Zamora³ |
Heriberto Lizaola-Diaz de Leon⁴ | Michaela Kristina Farber²

¹Department of Obstetrics and Gynecology, Brigham & Women's Hospital, Harvard Medical School, Boston, MA, USA

²Department of Anesthesiology, Perioperative and Pain Medicine, Brigham & Women's Hospital, Harvard Medical School, Boston, MA, USA

³Harvard Medical School, Boston, MA, USA

⁴Hospital Angeles, San Luis Potosi, San Luis Potosi, Mexico

Correspondence

Michaela K. Farber, Brigham & Women's Hospital, Department of Anesthesiology, Perioperative and Pain Medicine, Harvard Medical School, Boston, MA, USA.
Email: mfarber@bwh.harvard.edu

KEYWORDS: COVID-19; Maternal mortality

COVID-19, the illness caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is the deadliest pandemic to occur in this century. Common symptoms of COVID-19 include cough, myalgia, fever, chest pain, and headache. However, its clinical presentation

ranges from completely asymptomatic to acute respiratory distress syndrome.¹ Pregnant women are susceptible to community spread of COVID-19 because they cannot postpone interactions with healthcare professionals and other women receiving obstetric care.¹

TABLE 1 Demographic and clinical characteristics of pregnant women with COVID-19, according to maternal survival.^a

Characteristic	Maternal survival	Maternal death
	(N = 301)	(N = 7)
General characteristics		
Median age in years (IQR)	30 (26, 33)	37 (26, 39)
Indigenous peoples	4 (1.3)	0 (0.0)
Comorbidities		
Diabetes	11 (3.7)	4 (57.1)
Obesity ^b	45 (15.0)	2 (28.6)
Asthma	8 (2.7)	0 (0.0)
Hypertension	14 (4.7)	0 (0.0)
Tobacco exposure	10 (3.3)	0 (0.0)
COPD	2 (0.7)	0 (0.0)
CKD	2 (0.7)	0 (0.0)
Other comorbidities	15 (5.0)	1 (14.3)
COVID-19-associated characteristics		
Hospital admission	87 (28.9)	7 (100.0)
Mechanical ventilation	3 (1.0)	1 (14.3)
Pneumonia diagnosis	32 (10.6)	6 (85.7)
ICU admission	8 (2.7)	2 (28.6)
Known exposure to COVID-19	70 (23.3)	1 (14.3)

Abbreviations: CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; COVID-19, Coronavirus disease; ICU, intensive care unit; IQR, interquartile range.

^aValues are given as number (percentage) unless otherwise stated.

^bDefined as body mass index >30 kg/m².

Moreover, the physiological changes of pregnancy may impart added risk to patients with COVID-19. Unfortunately, several associated maternal deaths have been reported to date.^{2,3} Furthermore, reports from under-resourced locations are lacking, and whether reduced access to maternal care may impact maternal mortality is unknown. Understanding maternal mortality related to COVID-19 is critical for future prevention of morbidity and mortality during this outbreak and anticipated future surges of the disease, particularly in low- to middle-income countries. The present study reports characteristics of COVID-19-related maternal mortality cases in Mexico.

A total of 45 219 cases of COVID-19 in Mexico have been confirmed as of May 17, 2020. Using open data from the Mexican Ministry of Health to conduct a search for COVID-19-positive cases among pregnant women, 308 cases were identified including seven maternal deaths.⁴ Table 1 shows demographic and clinical characteristics of pregnant women with COVID-19 in Mexico, grouped by

survival. Compared to obstetric COVID-19 patients who survived, women who suffered maternal mortality were older and had higher prevalence of diabetes, obesity, and other comorbidities. Of the seven maternal death cases, only two received intensive care and only one received mechanical ventilation. Known exposure to COVID-19 was low in both groups, suggesting lower overall COVID-19 testing and tracing capacity in the population.

High quality maternity care should be guaranteed to all women. However, gaps still remain and are often underscored in the setting of a widespread, global pandemic. In contrast with previous findings,⁵ the present study reports a 2.3% case fatality rate among parturients with COVID-19, which is an alarming statistic. Unfortunately, the data included in this open source are limited; variables related to pregnancy, neonatal outcomes, or symptoms of COVID-19 are not available. Whether mortality was driven by direct or indirect causes is unclear. Further scrutiny of maternal outcomes and management in under-resourced countries is warranted during and beyond the COVID-19 pandemic.

AUTHOR CONTRIBUTIONS

All authors helped with the conception of the work, data collection, analysis and interpretation, helped to draft the work and revise it critically, and approved the final version of the manuscript.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

REFERENCES

- Breslin N, Baptiste C, Gyamfi-Bannerman C, et al. COVID-19 infection among asymptomatic and symptomatic pregnant women: Two weeks of confirmed presentations to an affiliated pair of New York City hospitals. *Am J Obstet Gynecol MFM*. 2020;100118 [Published online ahead of print, 2020 Apr 9]. <https://doi.org/10.1016/j.ajogmf.2020.100118>.
- Hantoushadeh S, Shamshirsaz AA, Aleyasin A, et al. Maternal death due to COVID-19. *Am J Obstet Gynecol*. 2020; [Published online ahead of print, 2020 Apr 28]. <https://doi.org/10.1016/j.ajog.2020.04.030>.
- Amorim MMR, Soligo Takemoto ML, Fonseca EBD. Maternal deaths with coronavirus disease 2019: A different outcome from low- to middle-resource countries? *Am J Obstet Gynecol*. 2020; [Published online ahead of print, 2020 Apr 26] S0002-9378(20)30471-3. <https://doi.org/10.1016/j.ajog.2020.04.023>.
- Información referente a casos COVID-19 en México - datos.gob.mx/busca. <https://datos.gob.mx/busca/dataset/informacion-referente-a-casos-COVID-19-en-mexico>. Accessed May 17, 2020.
- Zaigham M, Andersson O. Maternal and perinatal outcomes with COVID-19: A systematic review of 108 pregnancies. *Acta Obstet Gynecol Scand*. 2020; <https://doi.org/10.1111/aogs.13867>.