

guidelines for management have been developed. Laparoscopy has not been widely used due to the risk of hemorrhage caused by trophoblasts invading the retroperitoneal vascular structure. Surgery should be performed by a doctor with rich clinical experience and who is familiar with the retroperitoneal anatomy. Meanwhile, preparations should be made for blood transfusion and multidisciplinary teams—including clinicians working in blood transfusion, vascular surgery, vascular interventional surgery, anesthesiology, and B-ultrasound—should cooperate closely.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.

AUTHOR CONTRIBUTIONS

WXi was responsible for the conception of the study and guidance for communications. SQ and WXu collected the data and wrote the first draft of the manuscript. All authors revised and approved the final version of the manuscript.

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Obstetrics

The impact of the COVID-19 pandemic on maternal mortality in Brazil: 523 maternal deaths by acute respiratory distress syndrome potentially associated with SARS-CoV-2

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KEYWORDS

COVID-19, maternal death, maternal mortality

The present study is based on publicly available data obtained from the Brazilian Official Acute Respiratory Syndrome Surveillance System (ARDS-SS). We extracted data up to November 23, 2020 and selected pregnant and postpartum women with acute respiratory distress syndrome (ARDS) and a recorded outcome (death or recovery). Cases with a confirmed COVID-19 diagnosis or closed as “undetermined etiology” were deemed eligible. A detailed description of the methods is described elsewhere.¹

We identified 9563 eligible cases, of which 523 (5.4%) died either with a confirmed diagnosis of COVID-19 ($n = 363$) or undetermined

etiology ($n = 160$) (Table 1). The peak of COVID-19 ARDS cases and deaths occurred between epidemiological weeks 17 and 30, while undetermined cases peaked from weeks 11 to 34 (Figure 1). The case fatality rate for COVID-19 was 7.6%, while for undetermined etiology it was 3.3%. Postpartum deaths accounted for 41.6% (151/363) and 47.5% (76/160) of confirmed COVID-19 and undetermined etiology deaths, respectively. Postpartum lethality was over twice the rate of pregnancy lethality regardless of etiology (9.9% vs. 4.1%) (Table 1).

In 2018, the Brazilian Ministry of Health officially reported 1658 maternal deaths and preliminary data for 2019 indicate 1547 maternal

TABLE 1 ARDS cases among obstetric patients in Brazil by etiology and outcome

	Cured		Died		Total
	n	%	n	%	
Postpartum	2059	90.1	227	9.9	2286
Undetermined etiology	1207	94.1	76	5.9	1283
COVID-19	852	84.9	151	15.1	1003
Pregnancy	6981	95.9	296	4.1	7277
Undetermined etiology	3427	97.6	84	2.4	3511
COVID-19	3554	94.4	212	5.6	3766
All obstetric cases	9040	94.5	523	5.5	9563
Undetermined etiology	4634	96.7	160	3.3	4794
COVID-19	4406	92.4	363	7.6	4769

Abbreviation: ARDS, acute respiratory distress syndrome.

deaths.² This means that COVID-19-related maternal deaths so far represent approximately 20% of all maternal deaths relative to mortality statistics from 2018 and 2019. COVID-19 maternal deaths up to November 2020 already surpass maternal deaths due to hypertension in 2018 and are six times higher than all influenza-related maternal deaths in 2009.²

In recent years, 2016 presented the largest maternal mortality ratio (MMR) due to respiratory causes (105 events, 3.6/100 000 live

births). Live birth statistics for 2020 are not available so far; however, by extrapolating 1998–2018 data,³ we project a COVID-19 MMR of 17.5/100 000, five times higher than all respiratory causes of death in 2016. This figure may be even higher, as a further 160 undetermined etiology ARDS-related deaths occurred in the same period, many of which could potentially be attributed to COVID-19. Undetermined etiology ARDS maternal deaths represent 44% of COVID-19 fatal cases in 2020 and are 1.5 times higher than maternal deaths due to all respiratory causes combined in 2016, raising concerns about underdiagnosis in this population. By now, the “second wave” is well documented in other countries and we are seeing evidence of the same phenomenon in Brazil. The effects on maternal outcomes remain to be understood.

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CONFLICTS OF INTEREST

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AUTHOR CONTRIBUTIONS

MNP and MLST equally contributed to study conception and design, data collection, analysis, and interpretation. MNP wrote the first draft of the paper and incorporated substantial contributions

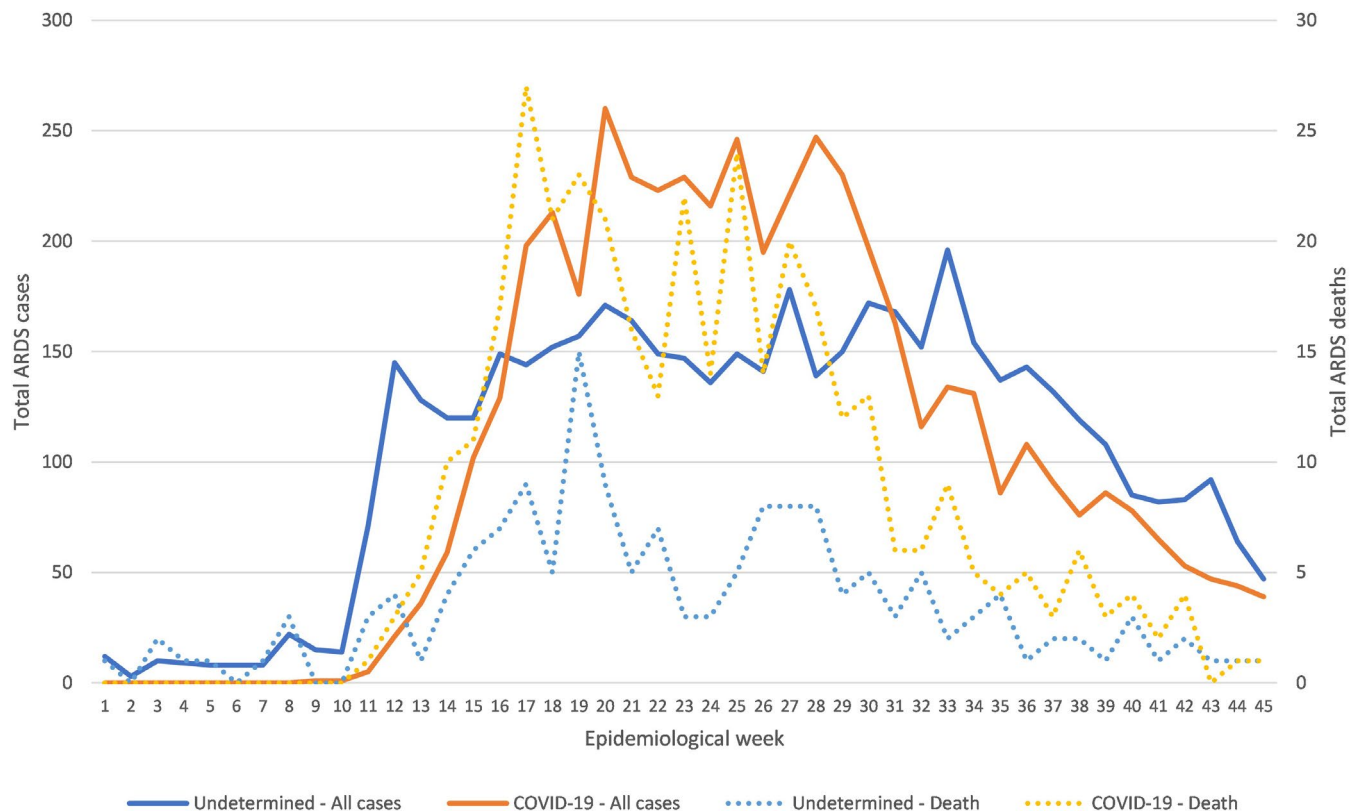


FIGURE 1 Acute respiratory distress syndrome (ARDS) cases and deaths among pregnant and postpartum women in Brazil by etiology and epidemiological week

from RK, MOM, CAB and MLST after critical revision. All authors reviewed and approved the final manuscript.

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