

Maternal mortality and COVID-19

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ABSTRACT

Objective: The aim of this study was to collect and analyze data from different sources to have a general overview of COVID-19-related maternal deaths in Brazil, as well as to compare data with worldwide reports.

Study design: We systematically searched data about COVID-19 maternal deaths from the Brazilian Ministry of Health surveillance system, State Departments of Health epidemiological reports, and media coverage. Data about timing of symptom onset and death (pregnancy or postpartum), gestational age, mode of birth, maternal age, comorbidities and/or risk factors, date of death, and place of death were retrieved when available.

Results: We identified 20 COVID-19-related maternal deaths, age range 20–43 years. Symptoms onset was reported as on pregnancy for 12 cases, postpartum for 3 cases, and during the cesarean section for 1 case (missing data for 4). In 16 cases, death occurred in the postpartum period. At least one comorbidity or risk factor was present in 11 cases (missing data for 4). Asthma was the most common risk factor (5/11). Ten cases occurred in the Northeast region, and nine cases occurred in the Southeast region (5 of them in São Paulo, the first epicenter of COVID-19 in the country).

Conclusions: To the best of our knowledge, this is the largest available series of maternal deaths due to COVID-19. Barriers to access healthcare, differences in pandemic containment measures in the country and high prevalence of concomitant risk factors for COVID-19 severe disease may play a role in the observed disparity compared to worldwide reports on maternal outcomes.

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Introduction

From December 2019, the world has faced a global crisis after the discovery of a novel coronavirus, SARS-CoV-2, that causes COVID-19, a disease with predominantly respiratory manifestations. Since then, the number of cases series data have increased rapidly, with confirmed cases affecting all population groups, regardless of age or gender worldwide [1–8]. Following the World Health Organization (WHO) pandemic decree, expert recommendations [9–11] and medical society guidelines [12–14] were released

addressing management in pregnant and postpartum women.

Although, physiological adaptations in normal pregnancy increased the susceptibility of mothers to microorganisms (bacteria and viruses) and their products [15], and such adaptation has been invoked to explain the increased fatality rate of pregnant women affected by severe acute respiratory syndrome (SARS), Middle East Respiratory Syndrome (MERS), Ebola, Influenza, and H1N [16]. However, in the case of COVID-19 and on the basis of a few case series from China, Europe and the USA [1–8], it is thought that pregnant women

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may not be more likely than the general population to develop severe symptoms from this disease and there were no reported maternal deaths [6–8].

From 147 COVID-19 positive pregnant, 8% had severe illness and 1% were in critical condition [17]. Similar results were also seen in more recent series [5–8], with no maternal deaths, and having just two near miss cases reported in the US study [5]. Additionally, pregnant and postpartum women with SARS-CoV-2 infection might be at higher risk of being admitted to intensive care unit compared to non-pregnant women in Sweden [18].

Nevertheless, a new picture may now be emerging from low to middle resource countries, raising the possibility of increased risk of maternal death from COVID-19 [19–23]; in Iran there is evidence of 2 maternal deaths out of 9 pregnant women tested positive for SARS-CoV-2 [19]. It is therefore possible that in developing as opposed to developed countries high birthrates and limited resources for healthcare provision will uncover the increased risk for maternal death due to COVID-19 and emphasize the need for the appropriate measures to be taken for adequate prenatal and postnatal care of these women. Such reports might alter the initial concept that pregnant women with COVID-19 were not expected to have increased risk of unfavorable outcomes. Thus, the aim of this study was to collect and analyze data from different sources to have a general overview of COVID-19-related maternal deaths in Brazil, as well as to compare data with worldwide reports.

Materials and methods

Data on COVID-19-related maternal deaths were collected using three data sources: i) epidemiological reports from Brazilian States Departments of Health; ii) media coverage of COVID-19 maternal death cases (news articles in local newspapers and other online media sources); and iii) Brazilian Ministry of Health Surveillance System reports. Two authors (MSLT and MOM) independently and systematically searched media items using Google® and a combination of keywords in Brazilian Portuguese (COVID-19, COVID, coronavirus, pregnancy, postpartum, childbirth, pregnant, maternal, death, dead) from February 26, 2020 (date of the first COVID-19 case in Brazil) until May 7, 2020. The same authors hand searched the epidemiological reports of Departments of Health from all Brazilian States, specifically looking for maternal deaths in the same period. Another author (ASOM) screened data on severe adult respiratory syndrome cases provided

by the Brazilian Ministry of Health, searching for maternal deaths with COVID-19 positive test at the official surveillance system.

Duplicates were removed by two authors (MSLT and MOM) based on a combination of the following criteria: date of death, moment of death (pregnancy or postpartum), city or State where death occurred, maternal age, gestational age, and presence of comorbidities or risk factors. In case of disagreement between the two reviewers during the duplicates removal, a third reviewer (ASOM) was consulted. The same variables were abstracted and analyzed. If more than one source was available for the same case, information was collected from all of them to reduce missing data.

Results

Twenty COVID-19 related maternal deaths has been reported by local media, Brazilian Ministry of Health Surveillance System, and epidemiological reports from States Departments of Health. The mean maternal age was 31, 5 (range 20–43) years. Onset of symptoms was reported on pregnancy for 12 cases (60.0%), on postpartum for 3 cases (15.0%), during the cesarean section for 1 case (5.0%), and there we 4 missing data (20.0%). In most cases, death occurred in the postpartum period (16/20 – 80.0%). In three cases, the death occurred at the first half of pregnancy at 13 (2/20 – 10.0%) and 22 (1/20 – 5.0%) weeks, respectively. There was a *postmortem* cesarean section at 30 weeks due to cardiac arrest in obese pregnant women with pyelonephritis. There were 9 pregnant women (45.0%) with no risk factor or not reported comorbidity, 9 had at least one comorbidity or risk factor, and 2 had 2 comorbidities or risk factors. Asthma was found in 5 out of 11 cases (45.5%). Ten cases occurred in the Northeast region, and nine cases occurred in the Southeast region (5 of them in São Paulo, the first COVID-19 epicenter in Brazil).

Discussion

Principal findings

Our findings show that so far there have been more maternal deaths due to COVID-19 in Brazil than anywhere else, according to available international reports. To our best knowledge, regarding worldwide maternal deaths due to COVID-19, there have been only seven events in Iran [19], and two maternal deaths confirmed by the Ministry of Health from Mexico, as disclosed by local media coverage in April

9, 2020 [24]. Hence the mortality rate might be quite high, considering the total number of COVID-19 cases and deaths in the country. Twenty maternal deaths out of 125,218 overall cases and 8,536 deaths (as of May 7, 2020) would be up to now the largest publicly available figure. Namely, in the same period, Mexico had 2 maternal deaths out of 2,704 total deaths and Iran reported 7 deaths out of 6,486 deaths [19,24].

Although different testing and notification strategies were adopted in each country, it is possible to predict that Brazil may have a higher incidence of adverse maternal outcomes during COVID-19 pandemic compared to available current data from other countries [25]. To put this in context, in 2009, during the H1N1 influenza pandemics, Brazilian Ministry of Health officially reported 49 H1N1-related maternal deaths in a 12-months period [26]. The data presented on COVID-19-related maternal deaths show 20 maternal deaths in a 45-days period.

Results

It is reasonable to anticipate that the situation in Brazil may probably contribute significantly to a better understanding of COVID-19 effects on pregnancy, childbirth and postpartum for several reasons. Firstly, Brazilian birth rates are higher than China's, South Korea's, Japan's, Italy's, Spain's and several further European countries firstly hit by COVID-19, while lower than Iran's (that has a smaller population and also firstly hit by COVID-19 pandemics) and Mexico [27]. Secondly, antenatal care in Brazil faces chronic and complex difficulties [28,29] that may directly influence maternal and perinatal outcomes. It is possible that the pandemic context and the prioritization of COVID-19 on resource allocation within the healthcare system may also impair antenatal quality of care in the country, by creating barriers to access routine antenatal appointments and laboratory tests. Thirdly, cesarean section rate in Brazil is much higher than most of the before mentioned countries. At least one previously published article rises awareness to an increased risk of morbidity and mortality for patients undergoing surgeries (not specifically cesarean sections) even while at COVID-19 incubation period [30]. Fourthly, pandemics containment measures adopted in Brazil seem consistently diverse from those implemented in China, where so far most of the case series about COVID-19 and pregnancy published were conducted [31]. Recently, The Lancet published an editorial featuring the lack of Brazilian federal public actions to combat COVID-19 pandemics, despite the rise on

number of deaths [32]. Fifth, Brazil still has a high maternal death ratio of 60 per 100,000 live births [33], being hypertension the main cause of maternal death, and an important risk factor for complications due to COVID-19 as well [26]. In addition, there is an important percentage of obese pregnant women with metabolic syndrome, also risk factors for complications due to COVID-19 [34]. Considering that inflammatory states are etiological hypotheses for the development of both preeclampsia and arterial hypertension [35,36], both risk factors may be associated with a worse prognosis of pregnant women with COVID-19 in Brazil.

It is likely that the United States of America will also face similar challenges, once the country has similar birth rates within larger population than Brazil. Additionally, in the US there are marked barriers to access health care, as well as worse maternal health indicator when compared to countries in the same income range [37], regardless of COVID-19. As previously mentioned, maternal deaths have not been reported in the US so far, but there were maternal near miss cases documented [8].

Clinical implications

COVID-19 pandemic is now an urgent public health matter in Brazil, given that some states are already facing uncontrolled transmission epidemiologic phase [38]. The first local COVID-19 confirmed case was diagnosed less than three months ago, and the country is now at the beginning of the pandemic escalation. It seems that we already have a higher number of maternal deaths than previously reported by China, South Korea, Iran, Italy, Spain, United Kingdom and the USA all together, even though Brazil has just reached the pandemic maximum acceleration, and currently has a lower number of total cases and deaths than some of them (namely the United Kingdom and USA) [19].

It is not possible time to rule out that there has been underreported cases of maternal deaths or delays in their investigation, particularly in countries that already deal with health system collapse. However, as maternal deaths are considered sentinel events worldwide, it is reasonable to believe that such events would have been reported by the countries' health authorities.

Research implications

The potential disparity should draw our attention to the urgent need of containment measures focused on

Table 1. COVID-19-related maternal deaths in Brazil until April 10, 2020.

State	Data of death	Age	Symptoms onset	Moment of death	Comorbidities	Source
Minas Gerais	Not reported (admitted to hospital in March 21)	33	Pregnancy (GA not reported, spontaneous miscarriage)	Pregnancy	Obesity	Brazilian Ministry of Health
São Paulo	March 22	43	Pregnancy (13 weeks, spontaneous miscarriage)	Pregnancy	Asthma	Brazilian Ministry of Health/ Local media*
São Paulo	March 23	36	Pregnancy (third trimester)	Postpartum	Absent	Brazilian Ministry of Health
Rio de Janeiro	April 04	29	Pregnancy (admitted with 32 weeks, delivery 2 days latter) ⁺⁺	Postpartum (10 days)	Absent	Brazilian Ministry of Health/ Local media**
Bahia	April 1	28	Postpartum ⁺ (6 days)	Postpartum (7 days)	Asthma	Brazilian Ministry of Health/ Local media***
Rio de Janeiro	Not reported (admitted to hospital in March 31)	39	Not reported	Postpartum	Not reported	Brazilian Ministry of Health
Pernambuco	April 5	33	Pregnancy (admitted with 32 weeks, delivery 2 days later) ⁺⁺	Postpartum (2 days)	Absent	Brazilian Ministry of Health/ Local media****
Minas Gerais	April 10	22	Not reported	Postpartum	Absent	Brazilian Ministry of Health
Pará	March 30	23	Pregnancy (34 weeks) ⁺⁺	Postpartum (12 days)	Mitral stenosis	Local media*****
São Paulo	April 11	35	Postpartum (4 days) ⁺⁺	Postpartum (4 days)	Pre-eclampsia	Local media*****
São Paulo	April 21	36	During CS ⁺ (twins)	Postpartum (6 days)	Absent	Local media
Maranhão	Not reported (death informed on April 22)	31	Pregnancy (GA not reported, stillbirth)	Postpartum	Not reported	Maranhão State Health Department
Ceará	April 24	31	Pregnancy (29 weeks, spontaneous preterm labor emergency CS) ⁺⁺	Postpartum (1 day)	Asthma	Ceará State Health Department
São Paulo	April 28	38	Pregnancy (term, GA not reported, stillbirth)	Postpartum (4 days)	Not reported	Local media*****
Paraíba	April 28	20	Pregnancy (22 weeks, spontaneous miscarriage)	Pregnancy	Asthma	Local media*****
Ceará	April 29	27	Pregnancy (29 weeks) ⁺⁺	Postpartum (12 days)	Kidney disease, gestational hypertension	Ceará State Health Department
Ceará	May 2	28	Pregnancy (29 weeks)	Pregnancy (cardiac arrest, <i>postmortem</i> CS)	Obesity, pyelonephritis	Ceará State Health Department
Paraíba	May 4	38	Pregnancy (34 ⁺² weeks) ⁺⁺	Postpartum (4 days)	Cardiovascular disease	Paraíba Sate Health Department
Ceará	May 4	36	Postpartum ⁺	Postpartum (9 days)	Not reported	Ceará State Health Department
Alagoas	Not reported (death informed on May 5)	25	Not reported	Postpartum	Asthma	Alagoas State Health Department

Mode of delivery: ⁺ elective cesarean section; ⁺⁺ emergency cesarean section.

*<https://g1.globo.com/sp/santos-regiao/noticia/2020/03/23/gravida-com-suspeita-de-coronavirus-morre-no-litoral-de-sp-e-filha-pede-respostas.ghtml>.

<https://www.agazeta.com.br/brasil/no-rio-mulher-morre-de-covid-19-dez-dias-apos-dar-a-luz-prematuramente-0420>. *<https://www.folhadelondrina.com.br/geral/mulher-de-28-anos-morre-por-covid-19-sete-dias-apos-parto-na-bahia-2985448e.html>. ****<https://epoca.globo.com/brasil/gravida-morre-de-covid-19-em-recife-bebe-sobrevive-24353787>. *****<https://g1.globo.com/pa/para/noticia/2019/12/19/negligencia-medica-causa-morte-de-gravida-logo-apos-o-parto-em-oeiras-do-para-dizem-familiares.ghtml>; <https://g1.globo.com/pa/para/noticia/2020/04/22/apos-23-dias-de-internacao-bebe-de-mae-que-morreu-vitima-de-covid-19-recebe-alta-em-belem.ghtml>. *****<https://g1.globo.com/sp/sao-paulo/noticia/2020/05/11/45-gestantes-foram-internadas-com-covid-19-no-hospital-das-clinicas-de-sp-em-abril.ghtml>. *****<https://tribunadejundiai.com.br/saude/coronavirus/enfermeira-gravida-de-38-anos-e-bebe-morem-apos-contraiem-covid-19-em-franco-da-rocha/>; <https://cidadereporter.com/moradora-de-francisco-morato-gravida-com-covid-19-morre-e-perde-o-bebe/>. *****<https://www.portalt5.com.br/noticias/paraiba/2020/4/323743-gestante-de-20-anos-morre-vitima-da-covid-19-em-joao-pessoa>; <https://www.maispb.com.br/461350/gravida-morre-por-covid-19-em-jp-paraiba-tem-mais-de-800-casos.html>.

maternal health, which will require accurate and detailed analysis of all cases to support clinical decisions within the health care system in a daily basis. Thus, it is essential that the Ministry of Health discloses data transparently on both maternal death and near miss cases in a timely manner, detailing

symptoms, demographic variables, gestational age or pregnancy-puerperal cycle phase, laboratory and image tests, gestational risk factors or comorbidities, as well as clinical evolution. It is also important to involve municipal, regional and state maternal and child mortality review committees, as well as

institutional ones, so that they can be prepared for rapid identification and communication of events that may be associated with COVID-19. The committees provide essential information to subsidy and evaluate public policies concerning maternity care [39].

Likewise, financial support for scientific research that systematically describes such findings should be prioritized, as building networks of researchers to collect, analyze and comprehend the data should be encouraged. The information may be essential to support all levels government action plans, institutional protocols, and development of guidelines by societies of specialists. In this sense, we suggest that may be urgent that professional associations involved in maternity care implementation measures accelerate data availability. As a result, we could be better prepared to offer better quality care for women and babies in the near future.

Strength and limitations

This is a descriptive analysis based on secondary data compiled through media articles and epidemiological/surveillance reports. Due to sources nature, it was not possible to retrieve data on all relevant variables, such as risk factors, comorbidities and clinical evolution. Nationwide population-based studies or official reports from the Ministry of Health could provide more comprehensive data, and potentially disclose further cases. More accurate analyses could also provide information on the prevalence of COVID-19 in the Brazilian obstetric population, thus allowing to estimate the actual maternal mortality rates.

Unfortunately, such data are still lacking in the country. Official reports on maternal deaths in Brazil are usually not available before two years after the events, a timeline that does not respond to the urgent needs of a pandemic. The lack of transparent and timely data may be partially attributed to the pandemic per se and the resulting health system collapse, aggravated by the unfavorable political environment [32]. It is worth mentioning that only severe and critically ill patients have been tested for COVID-19 in the country, so the number of infected people (including pregnant and postpartum women) may probably be underestimated [40].

Nonetheless, our data may contribute to address the knowledge gaps regarding the effects of COVID-19 during pregnancy and the postpartum period, as well as to highlight the need to specifically examine the impact of social risk factors.

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