

# Maternal death due to COVID-19: a scoping review\*

Morte materna em decorrência da COVID-19: revisão de escopo

Muerte materna por COVID-19: revisión de alcance

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## RESUMEN

**Objetivo:** mapear las muertes maternas por infección por el virus SARS-CoV-2 en gestantes y púérperas. **Método:** revisión de alcance según el *Instituto Joanna Briggs* realizada mediante una búsqueda en la literatura disponible en las bases de datos SciELO, LILACS, PubMed, CINAHL, *Web of Science* y PUBCOVD19. El análisis del material identificado fue realizado por dos revisores independientes. Los datos fueron extraídos utilizando un instrumento elaborado por los autores, analizados, resumidos y clasificados en categorías conceptuales. **Resultados:** de los 231 estudios encontrados, 66 fueron elegibles y los resultados se resumieron en cuatro categorías conceptuales: Desenlace muerte materna por COVID-19; Desenlace muerte materna en pandemias de coronavirus; Muerte materna por grupo obstétrico; Infección por SARS-CoV-2, muerte materna, recursos sanitarios y determinantes sociales. **Conclusión:** la atención de calidad, el diagnóstico precoz y el acceso oportuno fueron eventos necesarios para prevenir la muerte materna en 2020. **Descriptores:** Mujeres Embarazadas; Infecciones por Coronavirus; Muerte Materna.

## RESUMO

**Objetivo:** mapear o cenário da morte materna em decorrência da infecção pelo vírus SARS-CoV-2 em gestantes e púérperas. **Método:** revisão de escopo conforme o Instituto Joanna Briggs realizada por meio de uma estratégia de pesquisa na literatura disponível nos bancos de dados SciELO, LILACS, PubMed, CINAHL, *Web of Science* e PUBCOVD19. A análise do material identificado deu-se por dois revisores independentes. Os dados foram extraídos por meio de um instrumento construído pelos autores, analisados, sumarizados e classificados como categorias conceituais. **Resultados:** dos 231 estudos encontrados, 66 foram elegíveis e tiveram os resultados sumarizados em quatro categorias conceituais: Desfecho morte materna em decorrência da COVID-19; Desfecho morte materna nas pandemias por Coronavírus; Morte materna por grupo obstétrico; Infecção por SARS-CoV-2, morte materna, recursos de saúde e determinantes sociais. **Conclusão:** a atenção vigilante, o diagnóstico precoce e o acesso em tempo oportuno foram eventos necessários para evitar a morte materna em 2020. **Descriptores:** Gestantes; Infecções por Coronavírus; Morte Materna.

## ABSTRACT

**Objective:** to map the scenario of maternal death due to infection by the SARS-CoV-2 virus in pregnant and puerperal women. **Method:** A scoping review according to the Joanna Briggs Institute and conducted by means of a research strategy in the literature available in the SciELO, LILACS, PubMed, CINAHL, *Web of Science* and PUBCOVD19 databases. The analysis of the material identified was carried out by two independent reviewers. The data were extracted using an instrument prepared by the authors, analyzed, summarized and classified as conceptual categories. **Results:** of the 231 studies found, 66 were eligible and had their results summarized in four conceptual categories: Outcome of maternal death due to COVID-19; Outcome of maternal death in the coronavirus pandemics; Maternal death by obstetric group; SARS-CoV-2 infection, maternal death, health resources and social determinants. **Conclusion:** vigilant care, early diagnosis and timely access were necessary events to prevent maternal death in 2020. **Descriptors:** Pregnant Women; Infections by Coronavirus; Maternal Death.

## INTRODUCTION

Contexts of health and humanitarian crises such as pandemics, endemics and epidemics exert a major impact on the population's health; however, there are also repercussions on maternal and child health, as seen in the epidemics of Spanish flu, Influenza A, H1N1 virus infection, Zika virus and, currently, as reflected in the COVID-19 pandemic<sup>(1-3)</sup>. Maternal death is among the most feared outcomes and, in the H1N1 pandemic, 10% of the total deaths were in pregnant women<sup>(3)</sup>, as also seen in infections by the SARS-CoV and MERS-CoV viruses<sup>(4)</sup>.

In 2019, spread of the SARS-Cov-2 virus made the World Health Organization (WHO) declare it a public health emergency<sup>(1,5-8)</sup>. Initially, both the WHO and the Ministry of Health (*Ministério da Saúde*, MS) reported situations of worsening of the disease and death in people aged 60 years old and over. However, as the pandemic progressed, new groups began to show vulnerabilities, including pregnant and puerperal women. Given the context, the MS recognized that both pregnant women and those with up to 20 days postpartum or post-abortion tend to be more vulnerable to SARS-CoV-2<sup>(1,5-10)</sup>.

Maternal death due to COVID-19 becomes evident for pregnant and puerperal women from the moment the consequences for the fetus and transplacental transmission are studied<sup>(1,4,9,11)</sup>, a fact that had not been identified in the first international studies with a small group of pregnant and puerperal women<sup>(12-14)</sup>.

The understanding that maternal death is an event that causes from family disruption to social impacts, such as depriving the child of maternal contact, as well as breastfeeding interruption<sup>(15)</sup>, makes it urgent and necessary to explore the magnitude of the repercussions that these deaths can cause also at this pandemic moment. Until June 2020, a study carried out by Brazilian researchers identified 124 maternal deaths due to COVID-19 in Brazil, when compared to 36 maternal deaths in other countries of the world, a fact that turned Brazil into one of the record holders in maternal deaths due SARS-CoV-2<sup>(16-17)</sup>. Given the relevance and originality in exploring the panorama and the context in which maternal death due to COVID-19 gains repercussion, both in Brazil and in the world, this study has the following objective: to map the scenario of maternal death due to infection by the SARS-CoV-2 virus in pregnant and puerperal women. In order to achieve the desired objective, it was decided to

carry out a scoping review, as this review method allows exploring the available scientific literature in a broad and systematic way and achieving the research scope and applicability, in particular, of emerging themes<sup>(18)</sup>.

## METHOD

In this study it was decided to use the Joanna Briggs Institute (JBI) approach for scoping reviews. Consequently, this review was structured by means of the following stages: (1) definition of the research question; (2) identification of relevant studies; (3) selection and inclusion of studies; (4) data organization; and (5) collection, reporting and synthesis of the results<sup>(18)</sup>. The study protocol is registered in the Open Science Framework (OSF), at the following link: <https://osf.io/ca39j><sup>(19)</sup>.

The PCC mnemonic was used to define the guiding question of this study. In this review, the Population (P) was defined as pregnant women and the postpartum period in order to include, in the research, women who are in the puerperal period, as described in the Descriptors in Health Sciences (*Descritores em Ciências da Saúde*, DeCS); the Concept (C) chosen was maternal death, defined from the Medical Subject Headings (MeSH) descriptor and characterized by "The death of the female parent"; and the Context (C) refers to the infection by Coronavirus in the COVID-19 pandemic. Consequently, the following guiding question was defined for this review: "Which is the knowledge production available in the scientific literature on maternal death as a result of the SARS-CoV-2 virus infection in pregnant and puerperal women?"

An initial search was carried out at the end of November 2020, based on the "maternal death" and "maternal mortality" descriptors, on the PUBCOVID19 platform, which indexes articles published on the EMBASE and National Library of Medicine (PubMed) platforms, and with the "COVID-19", "maternal death" and "maternal mortality" keywords in the Virtual Health Library (*Biblioteca Virtual da Saúde*, BVS) in order to know what it returned about the researched literature. In this sense, after the initial search, the descriptors according to DeCS and MeSH and the keywords defined to comprise the search strategies were combined using the AND and OR Boolean operators, such as: *período pós-parto*/postpartum period; *gestantes*/pregnant women; *morte materna*/maternal death; *mortalidade materna*/maternal mortality; *infecções por co-*

ronavírus/coronavirus infections; COVID-19 and severe acute respiratory syndrome coronavirus 2. It is noted that, for the search in the other databases, the descriptors and keywords were combined according to the specificities of each search location.

The process of searching the available literature was carried out from December 7<sup>th</sup> to December 12<sup>th</sup>, 2020, in the following databases, libraries and platforms: PUBCOV19; Web of Science (WoS); Cochrane Library; MEDLINE (accessed via PubMed); The Cumulative Index to Nursing and Allied Health Literature (CINAHL); *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS) and Scientific Electronic Library Online (SciELO) accessed by the Virtual Health Library (BVS).

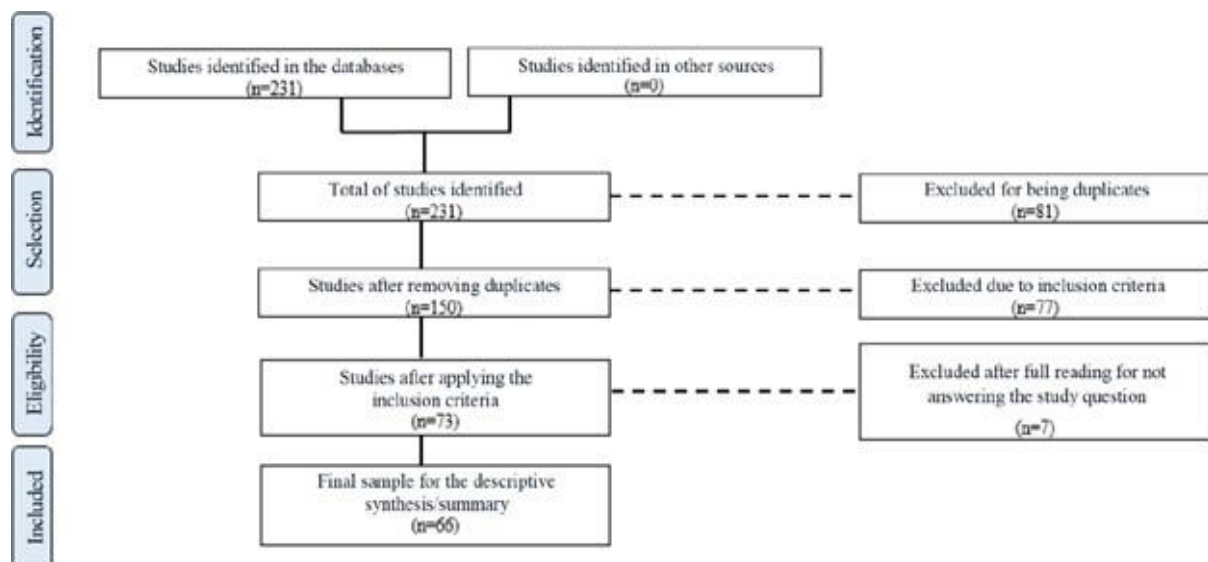
The inclusion criteria established were that the studies should be primary, secondary or guidelines, with different methodological approaches, in English, Spanish and Portuguese, without limitation regarding year of publication, as recommended by the JBI<sup>(18)</sup>, and made available until December 2020. Books, summaries of events, articles not available in full and those that did not answer the review question were excluded. The studies resulting from the searches were exported to the Rayyan bibliographic platform in order to reach the stages of data selection, inclusion, extraction and organization. On this platform, it was possible to identify duplicate studies and their selection and inclusion were carried out independently by two reviewers, based on

access to the same search results. Doubtful cases were solved through the evaluation by a third independent reviewer<sup>(18)</sup>. In general, the process to search and select the studies is represented in Figure 1 according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses - Extension for Scoping Reviews (PRISMA-ScR) tool<sup>(20)</sup>.

A total of 231 studies were identified in the search. Of these, 81 were repeated and were not counted. After reading the titles and abstracts of the remaining 150 studies, a total of 77 were selected for full reading, according to the JBI criteria. After selection and full reading of these studies, seven were excluded for not answering the review question. The final sample totaled 66 studies analyzed and included in this review. Data extraction was performed using an instrument prepared by the authors, according to the JBI guidelines, which included the following: study title; month and year of publication; country of origin; language; database; methodological design; type of publication; and results/reflections on maternal death. In order to better visualize the main results and reflections on maternal death in the context of the SARS-CoV-2 infection, it was decided to group them into conceptual categories, which were arranged in the format of a conceptual chart.

## RESULTS

Of the 66 studies included, there was predominance of the English language (62; 93.9%), with



**Figure 1** - Flowchart corresponding to the search and selection of articles, adapted from PRISMA-ScR. São Paulo, SP, Brazil, 2021.

Source: Prepared by the authors, 2021.

most of them (17; 25.8%) having the United States of America as country of origin, followed by Brazil (9; 13.6%). There were also studies from more than 15 nations, with predominance of countries located in the American continent (29; 43.9%) followed by those in Europe (18; 27.4%), Asia (15; 22.7%), Africa (2.3%) and Oceania (2.3%).

Most of the studies were concentrated in the second half of 2020 (53; 80.3%) and 29 (43.9%) corresponded to quantitative primary studies, 24 (36.4%) to literature reviews, 12 (18.2%) were correlated with opinion and reflection articles, brief communications and editorials and one (1.5%) with the guideline.

Only 17 (25.7%) studies had the topic of maternal death as their main objective. The others included the theme of maternal death as a result of the maternal outcomes. In relation to the main results and reflections, it was chosen to present them from conceptual categories in the format of a synthesis chart, as shown in Figure 2. These categories worked to summarize the main results and reflections on maternal death in pregnant and puerperal women due to the SARS-CoV-2 infection.

## DISCUSSION

The studies selected in this scoping review made it possible to map maternal death due to COVID-19 in the global context, also in the first year since the pandemic was decreed. When identifying maternal death as an outcome of the COVID-19 pandemic, in the available scientific literature it was observed that, even at the beginning of the pandemic, it was less visualized. However, from the moment that both Brazil and other countries of the world<sup>(29,31,43,56-57,61,69,70)</sup>, mostly emerging or low-income countries, began to issue warnings about deterioration of the maternal health status of pregnant and puerperal women victims of the SARS-CoV-2 virus, a new look was given to the subject matter and protocols started to highlight vulnerability and classify pregnant and puerperal women as a risk group<sup>(1,5,10-11)</sup>.

There is a special emphasis on the fact that an increase in the occurrence of maternal death was observed in women who were admitted to ICUs<sup>(9,12,16-17,22-24,25-29,33-35,38-40,42,45,50-51,53,58-60,62,65-68,71,73,75,77,79,81,82)</sup> who required invasive mechanical ventilation<sup>(17,22-23,25,27,32-33,35-36,38-39,42-45,50-52,60,65-67,71,73,75,77,82)</sup>, ECMO use<sup>(9,22,24,42,51,67)</sup>, peritoneal dialysis<sup>(23,60)</sup> and hemodialysis<sup>(45)</sup>.

In this sense, even with a conceptual category

that represents lack of consensus on whether SARS-CoV-2 generates more maternal deaths than other pandemics caused by other SARS-CoV and MERS-CoV Coronaviruses<sup>(72)</sup>, the relevance of a careful analysis at the population that witnesses the pregnancy-puerperal cycle in endemics/pandemics with respiratory viruses is noted, with a view to negative outcomes for maternal and perinatal health, as also witnessed in the Influenza A and H1N1 virus pandemics<sup>(1-3)</sup>. Although most of the studies have investigated pregnant women, as provided in the central category on COVID-19 and the obstetric group, it is noted that the worst outcomes, such as need for ICU admission and invasive mechanical ventilation, occurred after resolution of the pregnancy<sup>(17,37,51,55,62,77)</sup>, as well as almost 80% of the total deaths due to COVID-19 were in puerperal women<sup>(37,51)</sup>.

Finally, when grouping the conceptual categories that worked on maternal death as a COVID-19 outcome together with the theme of health resources and social determinants, addressed in another category, it can be verified that maternal deaths were related and intensified when associated with factors such as racial disparities<sup>(17,31,57,61,69,77-78,80)</sup>; risk factors<sup>(17)</sup>; difficulty accessing health services with ICU and ventilatory support<sup>(16,63)</sup>; and lack of health policies that include pregnant and puerperal women as a risk group<sup>(78)</sup>.

Also in this aspect, in Brazil, the absence of a universal policy for testing pregnant and puerperal women may have generated underreporting and, consequently, erasure of gender when compared to the social inequalities witnessed in this territory<sup>(9,80)</sup>. So much so that black-skinned women living in Brazil and undergoing the pregnancy-puerperal cycle were twice as likely to die as a result of the SARS-CoV-2 infection than white-skinned women<sup>(78)</sup>. One of the explanations for this fact is the absence of timely ICU admission and availability of ventilatory support<sup>(16)</sup>. Similar dilemmas were seen in the United States of America<sup>(10)</sup> and the United Kingdom<sup>(9)</sup>, which had reduced numbers of maternal deaths in white-skinned women. However, black-skinned and ethnic minority women living in these countries were disproportionately more affected by severe COVID-19 complications during pregnancy<sup>(61)</sup>.

Therefore, for the practice, there is an implied need for an alert in which, in addition to recognizing pregnant and puerperal women as a risk group, the importance of understanding that the

Conceptual categories	Studies
<b>Outcome of maternal death due to COVID-19</b>	
No maternal death.	12,21-22,24,30,33-34,40,42,47-48,50,52-53,58-59,62,65,74,76
At least one maternal death.	9,16,17,23,25-28,32,35-39,41,44-46,49,51,54,55,60,63,64,66-68,71-73,75,77-82
Reflections that evidence/cite maternal deaths.	29,31,43,56-57,61,69,70
Evidence between maternal death and comorbidities. They show a relationship with cardiovascular diseases, Diabetes Mellitus, obesity, asthma and hypothyroidism.	16-17,23,35,37,44-45,51,63,67,77,82
Cardiopulmonary arrest, multiple organ failure, renal failure, respiratory failure, brain death, septic shock, and Severe Acute Respiratory Syndrome were causes of death due to the SARS-CoV-2 infection in this population.	25,36-37,39,44,45,67,75,82
<b>Outcome of maternal death in the Coronavirus pandemics</b>	
The SARS-CoV and MERS-CoV pandemics were more lethal for pregnant women when compared to the available data from the current SARS-CoV-2 virus pandemic.	21-22,24,26,28,36,41,49,54,73
<b>Maternal death by obstetric group</b>	
Studies conducted only with pregnant women.	9,12,21,23-24,29,30,32-36,40,42-47,49-50,52,58-60,62,64,66-68,70-74,76-77,81
Studies conducted with pregnant and puerperal women.	16-17,48,51,53,56,69,75,80
Studies conducted only with puerperal women.	79
<b>Infection by SARS-CoV-2, maternal death, health resources and social determinants</b>	
An increase in the number of maternal deaths is observed among pregnant and puerperal women who need to be hospitalized in ICUs.	9,12,16-17,22-24,29,33-35,38-40,42,45,50-51,53,58-60,62,65-68,71,73,75,77,79,81-82
An increase is evidenced in the need for intubation and mechanical ventilation in pregnant and puerperal women.	17,22-23,25,27,32-33,35-36,38-39,42-45,50-52,60,65-67,71,73,75,77,82
Need and use of an extracorporeal membrane were evidenced in international studies.	9,22,24,42,51,67
Need for peritoneal dialysis.	23,60
Need for hemodialysis.	45
The race and skin color social determinants are related to the intensification of maternal death due to COVID-19.	17,31,57,61,69,77-78,80
There was an increase in maternal deaths related to the lack of early diagnosis of the SARS-CoV-2 infection and to low accessibility to health resources such as ICU beds and ventilatory support.	16-17,63,80

\*ICUs - Intensive Care Units

**Figure 2** - Conceptual categories about the event of maternal death due to COVID-19 in pregnant and puerperal women. São Paulo, SP, Brazil, 2021.

Source: Prepared by the authors, 2021.

risk for deterioration due to COVID-19 and the outcome of maternal death increase depending on the “race” social determinant and on accessibility to specialized services and care becomes evident. It is also considered that the limitations of this study are linked to the limited number of primary studies, with reduced samples, which prioritized pregnant over puerperal women and which did not directly investigate maternal death, although not directly interfering with the quality and relevance of the paper.

## CONCLUSION

Based on the mapping of maternal deaths due to the SARS-CoV-2 infection in the obstetric population, with special emphasis on Brazil, the need for early diagnosis and vigilant attention to this group of women is highlighted, with special attention to women in situations of social vulnerability and ethnic-racial inequalities, as lack of timely access intensifies the chances of dying. Therefore, the need for equitable and timely access to health services is reiterated in order to try and mitigate the chances of deterioration caused by SARS-CoV-2.

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Finally, based on the studies selected, there is an urgent need for studies on the theme of maternal death, seeking to reduce the consequences of the pandemic in the face of gender erasure, which occurs when data and numbers of cases remain underreported or when there is lack of research.

\*Paper extracted from the Conclusion Paper of the Residency Program “Maternal death due to COVID-19: a scoping review”, presented to the University of São Paulo, São Paulo, SP, Brazil.

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## CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

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