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Abstract

Objective: To elucidate the role of advanced maternal age (AMA) in determining the outcome of pregnancies complicated by SARS-CoV-2 infection.

Methods: Multinational cohort study included women with laboratory-confirmed SARS-CoV-2 infection from 76 centers in 27 different countries in Europe, United States, South America, Asia and Australia from 04 April 2020 till 28 October 2020. The primary outcome was a composite measure of maternal mortality and morbidity including admission to intensive care unit (ICU), use of mechanical ventilation (defined as intubation, need for continuous positive airway pressure, extra-corporal membrane oxygenation), severe respiratory symptoms (including dyspnea and shortness of breath) or death.

Results: Eight hundred and eighty seven pregnant women were included in the study who were positive SARS-CoV-2 results by RT-PCR (reverse transcriptase-polymerase chain reaction) on their nasal and pharyngeal swab specimens (235 with and 652 with no AMA). The risk of composite adverse maternal outcome was higher in AMA group compared to that of under 35 years of age group, with an OR of 1.99 (95% CI 1.4–2.9; p=0.002). Likewise, women >35 years were also at higher risk of hospital admission (OR: 1.88, 95% CI 1.4–2.5; p=0.001), presence of severe respiratory symptoms (OR: 1.53, 95% CI 1.0–2.3; p=0.04) and/or admission to ICU (OR: 2.00, 95% CI 1.1–3.7; p=0.003); however, no difference was observed in terms of perinatal outcome risk.

Conclusion: Advanced maternal age is an independent risk factor for adverse maternal outcome in pregnancies complicated by SARS-CoV-2 infection. Accurate risk stratification of women presenting with suspected SARS-CoV-2 infection in pregnancy is warranted in order to identify a subset of women who may benefit from a personalized management, including elective hospitalization and/or prolonged surveillance in order to improve maternal outcome.

Keywords: SARS-CoV-2, COVID-19, Coronavirus, infection, pregnancy.

Özet: SARS-CoV-2 enfeksiyonundan etkilenmiş ileri anne yaşına sahip kadınlarında maternal ve perinatal sonuçlar (Faz 2): WAPM (Dünya Perinatal Tıp Birliği) COVID-19 Çalışma Grubu

Amaç: SARS-CoV-2 enfeksiyonu ile komplike gebeliklerin sonucunu belirlemek için ileri anne yaşına sahip (IAY) anne yaşına sahip (IAY) olan ileri anne yaşına sahip (IAY) olanların riskini belirlemek amaçlanır.缮


Bulgular: Çalışmanın, nazar ve fardingelir sürünüt olan örneklerinde RT-PCR (transkriptaz-polimeraz zincir reaksiyonu) ile pozitif SARS-CoV-2 sonuçlarına sahip SARS-CoV-2 enflasyonlu kadınların (ile-ri anne yaşına sahip olan 235 olgu ile ileri anne yaşına sahip olmayan 652 olgu). Bileşik advers maternal sonuç riski, 35 yaş altındaki grupa kıyasla 1.99 OR (olasılık oranı) ile (%95 IC 1.4–2.9; p=0.002) iay grubunda daha yüksekti. Benzer şekilde 35 yaşından büyük kadınlarda da hastaneye yatır (OR: 1.88, %95 GA 1.4–2.5; p=0.001), şiddetli respiratuar sempptom varlığı (OR: 1.53, %95 GA 1.0–2.3; p=0.04) ve veya YBU’yu yatır (OR: 2.00, %95 GA 1.1–3.7; p=0.003) riski daha yüksek idi, ancak perinatal sonuç riski bakımından hiçbir fark bulunmadı.

Sonuç: İleri anne yaşına, SARS-CoV-2 enfeksiyonuyla komplike gebeliklerde advers maternal sonuç için bazı bir risk faktörüdür. Maternal sonuç iyileştirilebilen için, elektif hospitalizasyon ve veya uzun süreli takıl dahil kişisel verili trätmintin bir yönetimden faydalanabileceği kabul edilenin sızıntısı SARS-CoV-2 enfeksiyonu olduğundan düşülenen kadınlarda doğru risk sınıflandırması gereklidir.

**Introduction**

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection spread towards the end of 2019 and is still a major public health problem. New cases of infection, hospitalization, admission to Intensive Care Unit (ICU) and death toll are increasing on a daily basis worldwide. From the beginning of pandemic, pregnancy has been claimed to be potentially be associated with a higher burden of maternal mortality and morbidity compared to the general population, due to the peculiar cardiovascular and respiratory maternal adaptations occurring during pregnancy.

Several cohort studies and systematic reviews evaluating the course of SARS-CoV-2 in pregnancy for maternal and perinatal outcomes have been published so far. Despite the reassuring low rates of maternal-perinatal mortality and vertical transmission, in pregnancy, the risk of maternal admission to ICU appears to be higher, than that of age-matched non-pregnant women.

The severity of SARS-CoV-2 infection in pregnancy has been reported to be associated with several risk factors. Among these, maternal age has been found to be an independent additional risk for adverse maternal outcome. Still, the data for the relation between maternal age and outcome of pregnancies complicated by this infection is inconsistent. The aim of this study was to report the outcome of SARS-CoV-2 infection in pregnancies with AMA in a multinational cohort of pregnant women who were tested positive for SARS-CoV-2 infection.

**Methods**

This was a multinational, prospective cohort study involving pregnant women with a laboratory-confirmed SARS-CoV-2 infection, diagnosed from April the 4th, 2020 till October 28th, 2020. This study was designed as an open and web-based database study in 76 centers from 27 different countries (Argentina, Australia, Belgium, Brazil, Bulgaria, Colombia, Czech Republic, Chile, Finland, Germany, Greece, Equatorial Guinea, India, Israel, Italy, Mexico, North Macedonia, Peru, Portugal, Republic of Kosovo, Romania, Russia, Serbia, Slovenia, Spain, Turkey, and The United States) by the World Association of Perinatal Medicine (WAPM). Ethical approval for the study was obtained from the Ethical Committee of Federico II University of Naples (nr.145/2020). The first phase of the study has already been published and comprised the data from April 4th, 2020 till June 1st, 2020. Then, additional data (more details for fetal and neonatal outcome) was added and reevaluated by contributors for WAPM COVID-19 Study Phase-2 new database. Only confirmed cases with PCR were included in the evaluation. The cases with clinical diagnosis without positive PCR test were excluded.

SARS-CoV-2 was diagnosed on the basis of The World Health Organization (WHO) interim guidance. A confirmed case of SARS-CoV-2 was defined as a positive result on real-time reverse-transcriptase-polymerase-chain-reaction (RT-PCR) assay of nasal and pharyngeal swab specimens.

In the included centers, women were tested with RT-PCR of nasal and pharyngeal swab mostly because of having symptoms or history of exposure. Neonates of mothers with positive SARS-CoV-2 results were usually tested within 24 hours after delivery by oro-nasopharyngeal swab RT-PCR. Data on recent exposure history, clinical symptoms or signs, laboratory findings, maternal and perinatal outcomes were collected. All medical records were anonymized and sent to the coordinator center at University of Naples Federico II (Naples, Italy) through the WAPM data platform. Data were entered into a computerized database and cross-checked. In case of missing data, requests for clarification were sent to the coordinator of each participating center.

The primary outcome was to compare the rates of maternal mortality and morbidity (admission to intensive care unit [ICU], use of mechanical ventilation [defined as intubation, need for continuous positive airway pressure, extra-corporeal membrane oxygenation], severe respiratory symptoms [including dyspnea and shortness of breath]). Secondary outcomes were a composite score of adverse perinatal outcome, including miscarriage, intrauterine death (IUD), neonatal death (NND), perinatal death (PND), admission to neonatal intensive care unit. Miscarriage was defined as pregnancy loss before 22 weeks of gestation, IUD as fetal loss at or after 22 weeks of gestation, while NND as death of a live-born infant within the first 28 days of life. PND was defined as IUD or NND.
Further details on criteria for maternal admission to ICU and neonatal admission to NICU are more extensively described elsewhere.\(^4\)

All outcomes of AMA group were compared to that of non-AMA group. For the purpose of the analysis, AMA was defined as age >35 years. Subgroup analysis considering women >40 years was also performed.

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) v. 19.0 (IBM Inc., Armonk, NY, USA) and using Stata, version 13.1 (Stata Corp., College Station, TX, USA, 2014). Continuous variables were reported as means ± standard deviation (SD), while categorical variables as percentage. Univariate comparisons of dichotomous data were performed with the use of the Fisher’s exact test with continuity correction. Comparisons between groups were performed with the use of the Student’s t-test to analyze by assuming equal within-group variances for parametric data, and with the use of Mann-Whitney U tests for nonparametric data. Multivariate analysis was performed to evaluate potential predictors of the primary outcome. Logistic regression was reported as odds ratio (OR) and adjusted OR (aOR) with 95% confidence interval (CI). A p-value <0.05 was considered statistically significant.

**Results**

During the study period, 887 singleton viable pregnancies from 76 centers in 27 different countries, who were tested positive for SARS-CoV-2 by nasopharyngeal swab RT-PCR were included. Among these, 652 were <35 years old of age, 235>35 and 67>40 years. General characteristic of the study population is reported in Table 1.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>&lt;35 years (n=652)</th>
<th>≥35 years (n=235)</th>
<th>p-value</th>
<th>≥40 years (n=67)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maternal and pregnancy characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Gestational age at diagnosis of infection (weeks)</td>
<td>25.4±8.1</td>
<td>26.3±8.9</td>
<td>0.134</td>
<td>30.8±8.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nulliparity</td>
<td>30.5 (199)</td>
<td>44.7 (105)</td>
<td>0.001</td>
<td>43.3 (29)</td>
<td>0.039</td>
</tr>
<tr>
<td>Smoking before or during pregnancy</td>
<td>4.6 (30)</td>
<td>0.9 (2)</td>
<td>0.007</td>
<td>1.5 (1)</td>
<td>0.349</td>
</tr>
<tr>
<td>High-risk pregnancies</td>
<td>17.3 (113)</td>
<td>(95)</td>
<td>&lt;0.001</td>
<td>67.1 (45)</td>
<td>&lt;0.001</td>
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<tr>
<td><strong>Clinical, radiological and laboratory findings</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Symptomatic infection</td>
<td>56.1 (366)</td>
<td>64.3 (151)</td>
<td>0.039</td>
<td>58.2 (39)</td>
<td>0.797</td>
</tr>
<tr>
<td>Respiratory symptoms</td>
<td>32.7 (213)</td>
<td>44.7 (105)</td>
<td>0.719</td>
<td>40.3 (27)</td>
<td>0.701</td>
</tr>
<tr>
<td>Non-respiratory symptoms</td>
<td>30.7 (200)</td>
<td>34.0 (80)</td>
<td>0.368</td>
<td>31.3 (21)</td>
<td>0.601</td>
</tr>
<tr>
<td>Only non-respiratory symptoms</td>
<td>22.5 (147)</td>
<td>19.6 (46)</td>
<td>0.358</td>
<td>17.9 (12)</td>
<td>0.442</td>
</tr>
<tr>
<td>Fever</td>
<td>28.1 (183)</td>
<td>31.1 (73)</td>
<td>0.402</td>
<td>23.9 (16)</td>
<td>0.567</td>
</tr>
<tr>
<td>Cough</td>
<td>23.5 (153)</td>
<td>35.7 (84)</td>
<td>0.001</td>
<td>44.8 (30)</td>
<td>0.001</td>
</tr>
<tr>
<td>Myalgia</td>
<td>16.0 (104)</td>
<td>22.6 (53)</td>
<td>0.028</td>
<td>47.8 (32)</td>
<td>0.001</td>
</tr>
<tr>
<td>Anosmia</td>
<td>5.4 (35)</td>
<td>9.8 (23)</td>
<td>0.030</td>
<td>7.5 (5)</td>
<td>0.409</td>
</tr>
<tr>
<td>Gastrointestinal symptoms</td>
<td>3.5 (23)</td>
<td>1.7 (4)</td>
<td>0.190</td>
<td>1.5 (1)</td>
<td>0.717</td>
</tr>
<tr>
<td>Lymphopenia</td>
<td>48.6 (317)</td>
<td>43.8 (103)</td>
<td>0.223</td>
<td>55.2 (37)</td>
<td>0.308</td>
</tr>
<tr>
<td>Thrombocytopenia</td>
<td>6.0 (39)</td>
<td>8.1 (19)</td>
<td>0.282</td>
<td>9.0 (6)</td>
<td>0.297</td>
</tr>
<tr>
<td>Increased LDH levels</td>
<td>5.7 (37)</td>
<td>6.8 (16)</td>
<td>0.523</td>
<td>11.9 (8)</td>
<td>0.059</td>
</tr>
<tr>
<td><strong>Pharmacologic treatments</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>LMWH</td>
<td>17.5 (114)</td>
<td>29.4 (69)</td>
<td>&lt;0.001</td>
<td>50.7 (34)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>27.5 (179)</td>
<td>38.7 (91)</td>
<td>0.002</td>
<td>67.2 (45)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Any antiviral drug</td>
<td>20.6 (134)</td>
<td>31.9 (75)</td>
<td>0.001</td>
<td>58.2 (39)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hydroxychloroquine</td>
<td>15.5 (99)</td>
<td>29.4 (69)</td>
<td>&lt;0.001</td>
<td>53.7 (36)</td>
<td>1.00</td>
</tr>
</tbody>
</table>

LDH: lactate dehydrogenase; LMWH: low molecular weight heparin.
There was no difference in mean gestational age at the diagnosis of the infection between AMA group and non-AMA group (25.4±8.1 vs 26.4±8.9, respectively; p=0.134). The incidence of nulliparity (44.7% vs 30.5%, p=0.001) and high-risk pregnancies (i.e. pre-existing or gestational medical complications complicating the pregnancy) (40.4% vs 17.3%, p<0.0001) was higher in AMA group when compared to no-AMA group. When exploring the different clinical, radiologic and laboratory findings, women in AMA group were more likely to present with a symptomatic infection (64.3% vs 56.1%, p=0.039), while there was no difference in the occurrence of respiratory or non-respiratory symptoms, fever, lymphopenia, thrombocytopenia or increased serum LDH levels between the two study groups (Table 1).

The risk of composite adverse maternal outcome was higher in women with AMA compared to those <35 years (OR: 1.99, 95% CI 1.4–2.9; p<0.001) (Table 2). Likewise, women were also at higher risk of hospital admission (OR: 1.88, 95% CI 1.4–2.5; p<0.001), presence of severe respiratory symptoms (OR: 1.53, 95% CI 1.0–2.3; p=0.045), and admission to ICU (OR: 2.00, 95% CI 1.1–3.7; p=0.001) while there was no difference in the risk of adverse perinatal outcome between the two groups.

When restricting the analysis to women over 40 years of age, the risk of composite adverse maternal outcome was higher in women >40 compared to those <40 years of age (OR: 2.53, 95% CI 1.4–4.5; p=0.006). Likewise, women >40 had also a higher risk of in hospital admission (OR: 1.89, 95% CI 1.1–3.1; p=0.016), development of severe respiratory symptoms (OR: 2.28, 95% CI 1.2–4.2; p=0.012), admission to ICU (OR: 3.26, 95% CI 1.4–7.5; p=0.010) and/or need for invasive ventilation (OR: 4.18, 95% CI 1.6–11.2; p=0.009). At logistic regression analysis, AMA >35 (OR: 3.12, 95% CI 2.2–5.7; p<0.001), presence of a high-risk pregnancies (OR: 4.12, 95% CI 3.1–6.311; p=0.001) and nulliparity (OR: 3.11, 95% CI 2.9–6.2; p=0.001) were independently associated with adverse maternal outcome.

**Discussion**

This secondary analysis of the WAPM’s multinational cohort study on pregnant women with SARS-CoV-2 from 76 different centers, showed that risks of composite adverse maternal outcome, severe respiratory symptoms and admission to ICU are higher in pregnant women with AMA than youngsters.

To our knowledge, this is the first study extensively assessing the role of AMA on the outcome of pregnancies complicated by SARS-CoV-2 infection. The WAPM study was one of the largest cohort of pregnant women with SARS-CoV-2 infection, with data collected from the beginning of the pandemic. Major strengths of the study are the enrollment of only confirmed SARS-

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**Table 2.** Comparison of the different maternal and fetal outcomes in pregnant women with those without advanced age.

<table>
<thead>
<tr>
<th></th>
<th>&lt;35 years (n=652)</th>
<th>≥35 years (n=235)</th>
<th>p-value</th>
<th>≥40 years (n=67)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite adverse maternal outcome</td>
<td>14.4 (94)</td>
<td>25.1 (59)</td>
<td>&lt;0.001</td>
<td>30.0 (20)</td>
<td>0.006</td>
</tr>
<tr>
<td>In hospital admission</td>
<td>35.3 (230)</td>
<td>30.6 (119)</td>
<td>&lt;0.001</td>
<td>50.7 (34)</td>
<td>0.016</td>
</tr>
<tr>
<td>Severe respiratory symptoms</td>
<td>12.1 (79)</td>
<td>17.4 (41)</td>
<td>0.045</td>
<td>23.9 (16)</td>
<td>0.012</td>
</tr>
<tr>
<td>Admission to intensive care unit</td>
<td>4.0 (26)</td>
<td>7.7 (18)</td>
<td>0.035</td>
<td>11.9 (8)</td>
<td>0.010</td>
</tr>
<tr>
<td>Invasive ventilation</td>
<td>2.3 (15)</td>
<td>4.3 (10)</td>
<td>0.165</td>
<td>9.0 (6)</td>
<td>0.009</td>
</tr>
<tr>
<td>Maternal death</td>
<td>0.3 (2)</td>
<td>0.4 (1)</td>
<td>1.000</td>
<td>1.5 (1)</td>
<td>0.255</td>
</tr>
<tr>
<td>Composite adverse fetal outcome</td>
<td>11.2 (73)</td>
<td>13.2 (31)</td>
<td>0.410</td>
<td>14.9 (10)</td>
<td>0.420</td>
</tr>
<tr>
<td>Intra-uterine death</td>
<td>2.5 (16)</td>
<td>2.6 (6)</td>
<td>1.000</td>
<td>6.0 (4)</td>
<td>0.107</td>
</tr>
<tr>
<td>Neonatal death</td>
<td>0.5 (3)</td>
<td>0.9 (2)</td>
<td>0.612</td>
<td>0 (0)</td>
<td>1.000</td>
</tr>
<tr>
<td>Perinatal death</td>
<td>0.8 (5)</td>
<td>1.3 (3)</td>
<td>0.443</td>
<td>0 (0)</td>
<td>1.000</td>
</tr>
<tr>
<td>Admission to neonatal intensive care unit</td>
<td>7.5 (49)</td>
<td>9.8 (23)</td>
<td>0.268</td>
<td>9.0 (6)</td>
<td>0.630</td>
</tr>
<tr>
<td>Vertical transmission</td>
<td>0.6 (4)</td>
<td>2.1 (5)</td>
<td>0.061</td>
<td>4.5 (3)</td>
<td>0.021</td>
</tr>
</tbody>
</table>
CoV-2 cases, large sample size, the inclusion of both tertiary centers and community hospitals from many different countries and multitude of outcomes explored.

The major limitation was that the study population came mostly from women referred for suspected SARS-CoV-2 infection, due to symptoms or exposure, and consequently tested, thus leading to an intuitively lower percentage of asymptomatic women in the study cohort. Furthermore, different income level of countries and healthcare systems, and the heterogeneity in the management of both the mother and the fetus might have independently affected perinatal outcomes.

Women who delay childbearing are at increased risk of adverse pregnancy outcome, including miscarriage, fetal anomalies, pre-eclampsia, gestational diabetes and cesarean delivery compared to getting pregnant at younger age. The reason for such association is likely to rely on the higher rate of chronic morbidities potentially affecting a pregnancy in advanced age.

In the present study, we reported that AMA represents an independent risk factor for adverse outcomes in pregnancies complicated by SARS-CoV-2 infection, irrespective of the presence of pregestational or gestational co-morbidities. The course of SARS-CoV-2 infection in pregnancy has been widely reported with a higher risk of maternal respiratory morbidity compared to non-pregnant counterparts, due to physiologic changes of pregnancy that might predispose them to a more severe clinical course.

One of the largest systematic reviews recently published on this topic showed that pregnant women affected by COVID-19 were significantly more likely to need admission to ICU and invasive ventilation, compared to non-pregnant women of same reproductive age, and that increased maternal age, higher BMI, chronic hypertension and pre-existing diabetes were all significantly associated with a more severe course of SARS-CoV-2 infection in pregnancy.

A likely explanation for the independent association between AMA and adverse pregnancy outcome may rely in the higher incidence of maternal chronic conditions in previous pregnancy of these women. However, the association between AMA and adverse maternal outcome persisted at logistic regression analysis, indicating an independent contribution of AMA in determining the outcome of pregnancies complicated by SARS-CoV-2 infection. Pregnancy induces marked changes in the respiratory and cardiovascular systems that are essential for meeting the increased metabolic demands of the mother and fetus. It is plausible that relative changes in the respiratory physiology with advancing age may predispose these women to a higher risk of developing pulmonary complications when affected by SARS-CoV-2 infection.

The findings from this study support an accurate risk stratification of pregnancies complicated by SARS-CoV-2 infection in order to maximize the maternal respiratory outcome. Pregnancies with co-morbidities and advanced age are at higher risk of developing complications. A prolonged observation of women presenting with mild symptoms or elective hospital admission may represent a reasonable option in order to improve maternal outcome, although this assumption would require confirmation in randomized controlled trials.

**Conclusion**

Advanced maternal age represents an independent risk factor for adverse maternal outcome in pregnancies complicated by SARS-CoV-2 infection. Accurate risk stratification of women presenting with suspected SARS-CoV-2 infection in pregnancy is warranted in order to identify a subset of women who may benefit of a personalized management, including prolonged surveillance or elective hospitalization, in order to improve maternal outcomes.


*It has been listed here accordingly to their contribution:*

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References


