The European Journal of Biomedical and Life Sciences 2026, No 1
ISSN 2310-5674

PREMIER Publishing
ppublishing.org

DOI:10.29013/EJBLS-26-1-7-10

COMPARATIVE ANALYSIS OF MATERNAL AND PERINATAL OUTCOMES IN PREGNANT WOMEN WITH DELTA AND OMICRON SARS-COV-2 VARIANTS

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Cite: *Tyan V.T., Alimova H.P. (2026). Comparative Analysis of Maternal and Perinatal Outcomes in Pregnant Women With Delta and Omicron Sars-Cov-2 Variants. The European Journal of Biomedical and Life Sciences 2026, No 1* https://doi.org/10.29013/EJBLS-26-1-7-10

Abstract

COVID-19 remains a significant global health concern, particularly in pregnant women, who are at increased risk of adverse outcomes. This retrospective single-center cohort study included 9,288 pregnant women with confirmed SARS-CoV-2 infection and compared clinical characteristics and maternal–perinatal outcomes between Delta (n=3,200) and Omicron (n=6,088) variants. The Delta variant was associated with a significantly higher incidence of complications, including uteroplacental insufficiency, acute respiratory distress syndrome, multiple organ dysfunction, preterm birth, and maternal mortality. It also required more frequent intensive care, mechanical ventilation, and cesarean delivery. In contrast, the Omicron variant demonstrated a milder clinical course with significantly higher 30-day survival and lower perinatal mortality. These findings indicate substantial differences in disease severity and outcomes between SARS-CoV-2 variants in pregnancy.

Keywords: *pregnancy, COVID-19, SARS-CoV-2 variants, Delta variant, Omicron variant, perinatal outcomes*

Introduction

COVID-19, caused by the SARS-CoV-2 virus, was declared a global pandemic in March 2020, resulting in more than 500 million infections and over 6 million deaths worldwide (World Health Organization. 2020). The pandemic substantially disrupted healthcare systems, limiting access to medical services, which particularly affected pregnant women who are considered a high-risk group due to potential complications for both mother and fetus (Rasmussen-Torvik L. J., 2022). Clinical management protocols for pregnancy were consequently modified, including restrictions on invasive interventions (Carbone L., Raffone A., Sarno L., Travaglino A., et al., 2022). Although evidence on vertical transmission remains limited, COVID-19 has been associated with an increased risk of adverse outcomes, including preterm birth and neonatal intensive care unit admission (Ferrazzi E., Frigerio L., Savasi V., Vergani P., et al., 2020; Cennamo M., La Civita E., Sarno L., Carbone G., et al., 2023). The increased

vulnerability of pregnant women is largely attributed to physiological changes that may predispose them to a more severe disease course (Vasilescu D. I., Rosoga A. M., Vasilescu S., Dragomir I., et al., 2023; Dobrokhotova Yu.E., Gumenyuk L. N., Puchkina G. A., Mikhailichenko V.Yu., 2022).

The emergence of the Omicron variant in 2021 was associated with a reduction in disease severity compared with the Delta variant, which had been linked to more adverse pregnancy outcomes (Dashraath P., Wong J. L.J., Lim M. X.K., Lim L. M., et al., 2020).

Materials and Methods

This retrospective single-center study included 9,288 pregnant women with confirmed COVID-19 admitted to the maternity complex of the Republican Specialized Hospital "Zangiota-1" (Tashkent, Uzbekistan) between December 2020 and December 2023. Diagnosis was established using antigen rapid diagnostic testing and PCR when indicated. Patients were divided into two groups: Delta variant (n=3,200) and Omicron variant (n=6,088). Statistical analysis was performed using SPSS v24. Continuous variables were compared using Student's t-test, categorical variables using Pearson's χ^2 test, and survival was assessed by the Kaplan–Meier method. Statistical significance was defined as $p < 0.05$.

Results

A total of 9,288 pregnant women with confirmed COVID-19 were included in the analysis. The mean maternal age was 31.5± ± 4.9 years, with the highest proportion observed in the 25–29-year age group (47.7%). The mean time from symptom onset to hospital admission was 11.6±3.8 days, with 41.6% of patients presenting within the first 7 days and 58.4% after 7 days.

At initial assessment, most patients demonstrated moderate disease severity (52%), while mild and severe forms accounted for 30% and 17%, respectively. Critical illness was relatively rare (2%). Lung involvement ≤50% was observed in 65.9% of cases, whereas 34.1% of patients had more extensive pulmonary damage requiring intensive management. The majority of women were multiparous (93%), and most pregnancies were full-term (93.8%).

Table 1. *Frequency of complications and delivery methods*

Parameter	Delta variant (n=3,200)	Omicron variant (n=6,088)	p-value
Uteroplacental insufficiency	512(16.0%)	670(11.0%)	< 0.001
ICU admission	682(21.3%)	774(12.7%)	< 0.001
Mechanical ventilation	314(9.8%)	267(4.4%)	< 0.001
Pregnancy completion	495(15.5%)	597(9.8%)	< 0.001
Term delivery	271(54.7%)	414(69.3%)	< 0.001
Preterm delivery	215(43.4%)	176(29.5%)	< 0.001
Miscarriage	7(1.8%)	7(1.2%)	–
Total deliveries	486(15.2%)	590(9.7%)	< 0.001
Spontaneous delivery	67(13.8%)	165(28.0%)	< 0.001
Labor induction	64(13.2%)	63(10.7%)	0.244
Cesarean section	355(73.0%)	362(61.4%)	< 0.001

Comparative analysis between SARS-CoV-2 variants (table 1) revealed significant differences in demographic and clinical characteristics. The mean age of women in the Delta group was lower compared to the Omicron group (30.7±6.1 vs 31.9±4.2 years, p < < 0.001). The Delta variant was more prevalent among younger women aged 18– – 24 years (31.2% vs 28.0%, p = 0.001).

The interval between symptom onset and hospital admission was longer in the Delta group (12.6 ± 4.2 vs 11.1 ± 3.7 days, p < 0.001), indicating delayed presentation. Moreover, more severe pulmonary involve-

ment was observed in patients with Delta infection, with a higher proportion of lung damage >50% compared to the Omicron group (40.0% vs 31.0%, p < 0.001).

Maternal complications were significantly more frequent in the Delta group. Uteroplacental insufficiency occurred in 16.0% of cases compared to 11.0% in the Omicron group (p < 0.001). The need for intensive care unit (ICU) admission was markedly higher in patients with Delta infection (21.3% vs 12.7%, p < 0.001). Similarly, the requirement for invasive mechanical ventilation was significantly increased (9.8% vs 4.4%, p < 0.001).

Pregnancy outcomes also differed substantially between groups. Completion of pregnancy during infection occurred more frequently in the Delta group (15.5% vs 9.8%, p < 0.001). Among those who delivered, full-term births were significantly less common in the Delta group (54.7% vs 69.3%, p < 0.001), whereas preterm delivery was more frequent (43.4% vs 29.5%, p < 0.001).

Mode of delivery analysis demonstrated a significantly higher rate of cesarean section in the Delta group (73.0% vs 61.4%, p < < 0.001), while spontaneous vaginal delivery was more frequent in the Omicron group (28.0% vs 13.8%, p < 0.001). No significant differences were observed in labor induction rates (p = 0.244).

Relative risk analysis confirmed that Delta variant infection was associated with significantly increased risks of major complications, including uteroplacental insufficiency (RR=1.45), ARDS (RR=2.14), multiple organ dysfunction (RR=2.17), preterm birth (RR=2.32), and maternal mortality (RR=30.92), all p < 0.001. The risks of ICU admission, mechanical ventilation, and cesarean delivery were also significantly elevated.

Maternal mortality was markedly higher in the Delta group (2.0% vs 0.1%, p < 0.001). Survival analysis demonstrated significantly improved 30-day survival in the Omicron group (99.7% vs 95.6%), including among ICU patients (98.2% vs 88.2%) and women with uteroplacental insufficiency (98.9% vs 86.1%).

Neonatal outcomes further confirmed the more severe impact of the Delta variant. Perinatal mortality was significantly higher in the Delta group (6.3% vs 3.0%, p=0.014). Additionally, antenatal fetal death was more frequent (3.4% vs 1.8%). Mean birth weight was lower in neonates born to mothers with Delta infection (3545 ± 625 g vs 3672 ± ± 594 g, p < 0.001), and large-for-gestational-age infants were more common in the Omicron group (32.2% vs 26.5%, p=0.014).

Discussion

When analyzing clinical factors influencing pregnancy outcomes in women with COVID-19, particular attention has been paid to risk determinants such as comorbidities and maternal health status, which may aggravate disease severity and increase complication rates (Huntley B. J.F., Huntley E. S., Di Mascio D., Chen T., et al., 2020). Previous studies have emphasized the importance of tailored management strategies for pregnant women with COVID-19 to minimize complications and improve outcomes (Di Mascio D., Khalil A., Saccone G., Rizzo G., et al., 2020). Consistent with published data, the Delta variant has been linked to higher ICU admission rates, preterm birth, and fetal growth restriction, whereas the Omicron variant is associated with reduced severity, potentially due to increased population immunity (Ellington S., Strid P., Tong V. T., Woodworth K., et al., 2020). Despite the relatively milder course of Omicron infection, continuous monitoring and appropriate management during pregnancy remain essential, particularly in high-risk and unvaccinated populations (Allotey J., Stallings E., Bonet M., Yap M., et al., 2020).

Conclusion

The Delta variant of SARS-CoV-2 is associated with a significantly more severe clinical course in pregnant women, characterized by higher rates of maternal complications, preterm birth, and increased need for intensive care, including mechanical ventilation and cesarean delivery. In contrast, the Omicron variant demonstrates a comparatively milder course with improved maternal and perinatal outcomes. These findings highlight the importance of variant-specific risk assessment and individualized management strategies to optimize outcomes in pregnant women with COVID-19.

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submitted 06.03.2026;
accepted for publication 20.03.2026;
published 31.03.2026

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