

Article

Impact of COVID-19 Severity on Obstetric and Neonatal Outcomes: A Study of Pregnant Women in Albania

Vera Beca ¹, Fatjon Balla ², Daniela Nakuci ¹, Zahide Sulejmani ³, Marsilda Danaka ², Enver Roshi ^{4,*} and Eliona Demaliaj ²

¹ Division of Nosocomial Infections, University Hospital of Obstetrics and Gynecology ‘Queen Geraldine’, 1000 Tirana, Albania

² Department of Gynecology, University Hospital of Obstetrics and Gynecology ‘Queen Geraldine’, 1000 Tirana, Albania

³ Head of the National Programme of Nosocomial Infection, Institute of Public Health, 1001 Tirana, Albania

⁴ Department of Public Health, University of Medicine, 1005 Tirana, Albania

* Correspondence: enver.roschi@umed.edu.al

Abstract

Background: SARS-CoV-2 infection during pregnancy has been associated with adverse maternal and neonatal outcomes, particularly in severe disease. However, evidence stratified by disease severity from Southeastern Europe remains limited. The aim of this study was to compare obstetric and neonatal outcomes between mild and severe COVID-19 among pregnant women managed in tertiary maternity hospitals in Tirana, Albania. **Methods:** A retrospective multicenter observational study was conducted between January 2020 and December 2022 in the two main tertiary maternity hospitals in Tirana. Pregnant or postpartum women with RT-PCR-confirmed SARS-CoV-2 infection were included. COVID-19 cases were classified as mild or severe according to clinical presentation and oxygen saturation. Maternal, obstetric, and neonatal outcomes were analyzed and multivariable logistic regression was used to evaluate associations between disease severity and selected outcomes. **Results:** A total of 270 pregnant women were included, of whom 212 (78.5%) had mild COVID-19 and 58 (21.5%) severe disease. The mean maternal age was 29.4 years and most infections occurred during the third trimester (80.8%). Severe COVID-19 was associated with significantly higher odds of NICU admission (aOR 2.87, 95% CI 1.36–6.05), Apgar score < 7 at 5 min (aOR 8.39, 95% CI 1.49–47.35), low birth weight (aOR 2.53, 95% CI 1.06–6.03), and emergency cesarean section (aOR 8.10, 95% CI 2.64–24.86). Maternal age, obesity, parity, and comorbidities were not significantly associated with the examined outcomes. **Conclusions:** Severe COVID-19 during pregnancy was associated with poorer neonatal condition at birth and increased obstetric intervention, highlighting the importance of close monitoring and coordinated obstetric–neonatal management in pregnancies complicated by severe SARS-CoV-2 infection.



Academic Editor: Emanuele Pontali

Received: 23 April 2026

Revised: 17 June 2026

Accepted: 25 June 2026

Published: 30 June 2026

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Keywords: COVID-19 in pregnancy; neonatal outcomes; cesarean section; NICU admission; SARS-CoV-2 severity

1. Introduction

COVID-19, caused by SARS-CoV-2, has remained an evolving global health threat, shifting toward endemicity, making up-to-date synthesis of its epidemiology essential for clinical and public health decision-making [1]. Severe COVID-19 is driven by dysregulated

immune and inflammatory responses, and the immunological changes of pregnancy may predispose affected women to increased maternal and perinatal complications [2].

Meta-analytic data indicate that SARS-CoV-2 infection in pregnancy is associated with increased risks of preeclampsia, preterm birth, and stillbirth, with substantially higher odds observed in cases of severe compared to mild COVID-19 [3]. National surveillance data from the United States further demonstrate that pregnant women with symptomatic COVID-19 have significantly higher risks of intensive care admission, invasive ventilation, extracorporeal membrane oxygenation, and death compared with nonpregnant women, reinforcing pregnancy as a risk factor for severe disease [4]. Moreover, nationwide prospective data from Sweden show that maternal SARS-CoV-2 infection during pregnancy is associated with increased neonatal morbidity, particularly higher rates of respiratory disorders and admission to neonatal care, without a significant difference in neonatal mortality [5].

National seroepidemiological evidence from Albania indicates substantial community transmission of SARS-CoV-2 in Albania [6], underscoring the relevance of evaluating maternal and neonatal outcomes within the local epidemiological context. Albania registers approximately 28,000 live births annually, while a substantial proportion of deliveries, particularly high-risk cases, were managed in the University Hospital of Obstetrics and Gynecology Mbretëresha Geraldinë and the University Hospital of Obstetrics and Gynecology Koço Gliozheni in Tirana, which serve as national tertiary referral centres [7–9]. Despite the growing international evidence, data stratified by disease severity from Southeastern European settings remain limited, particularly from tertiary referral centres managing high-risk pregnancies.

The study period (2020–2022) encompassed successive SARS-CoV-2 variant waves, including Alpha and Delta, which have been associated with differential disease severity in pregnancy [10,11]. COVID-19 vaccination during pregnancy has been documented to reduce disease severity and adverse perinatal outcomes; however, vaccination status was not systematically recorded in the clinical databases of the participating hospitals and could not be included in the analysis. The most directly relevant prior work from this setting is the prospective cohort study by Prifti et al. [12], which reported maternal and perinatal outcomes among RT-PCR-confirmed COVID-19 pregnancies at University Hospital “Koço Gliozheni”. The present study was conducted over a three-year period within Albania’s national tertiary maternity referral setting, including both national tertiary maternity referral centres in Tirana, thereby increasing statistical power, extending temporal coverage to encompass all major pandemic waves, and providing a more complete picture of the national tertiary obstetric experience with COVID-19 in Albania.

In this context, evaluating delivery patterns and neonatal outcomes according to COVID-19 severity is essential to better understand the clinical impact of the infection within the Albanian obstetric population.

2. Methods

A retrospective multicenter observational study was conducted in Tirana, Albania, during the period from January 2020 to December 2022. The study population included pregnant and postpartum women with laboratory-confirmed SARS-CoV-2 infection who were admitted to the two tertiary maternity hospitals in Tirana: the University Hospital of Obstetrics and Gynecology “Mbretëresha Geraldinë” and the University Hospital of Obstetrics and Gynecology “Koço Gliozheni.” During the pandemic period, cases requiring advanced management of COVID-19 could be transferred to specialized national referral facilities, including the Infectious Diseases Unit at the University Hospital Center “Nënë Tereza” and the University Hospital “Shefqet Ndroqi,” which served as the principal COVID-19 treatment centers in the country. Overall, 297 eligible cases documented between

2020 and the end of 2022 were identified, and 270 cases with complete data were included in the final analysis. Missing data rates exceeded 5% for several primary outcome variables, consistent with the retrospective nature of chart-based data collection.

Eligible participants were women who met the following conditions: confirmation of SARS-CoV-2 infection through a positive nasopharyngeal reverse transcription polymerase chain reaction (RT-PCR) test; hospitalization during pregnancy or in the puerperium due to COVID-19 infection or associated obstetric complications; availability of clinical follow-up information throughout hospitalization and the perinatal period, including delivery and the immediate postpartum stage; and diagnosis occurring during any trimester of pregnancy.

Women were not included if they had a negative molecular test for SARS-CoV-2 during pregnancy or the postpartum period, if clinical follow-up information during hospitalization or the perinatal phase was missing.

For analytical purposes, COVID-19 cases were categorized according to disease severity into mild and severe forms. Mild cases comprised asymptomatic patients or those presenting with mild clinical manifestations and peripheral oxygen saturation above 95%. Severe disease was defined by the presence of marked dyspnea, oxygen saturation below 95%, requirement for high-flow oxygen therapy, or admission to the intensive care unit.

Clinical variables were evaluated at three different stages.

The first stage corresponded to hospital admission during pregnancy. At this stage, baseline maternal characteristics were documented, including maternal age, gestational age at admission, trimester of pregnancy, parity (primiparous or multiparous), associated maternal conditions such as preeclampsia, eclampsia, or other comorbidities, body mass index (BMI), and COVID-19 severity. BMI categories were defined as $>30 \text{ kg/m}^2$ and $>40 \text{ kg/m}^2$. The second stage focused on maternal outcomes at delivery. Variables recorded included persistence of maternal SARS-CoV-2 positivity at the time of delivery, gestational age at delivery, and mode of delivery (vaginal delivery or cesarean section). The third stage addressed neonatal outcomes. The evaluated variables included neonatal SARS-CoV-2 test positivity, birth weight, the presence of low birth weight ($<2500 \text{ g}$), neonatal clinical management (routine neonatal care, admission to the neonatal intensive care unit [NICU], or neonatal death), as well as maternal SARS-CoV-2 positivity in the postpartum period.

Clinical information was extracted from hospital medical records and institutional databases by trained healthcare personnel from the participating hospitals under the supervision of the study investigators. To ensure confidentiality, patient identifiers were removed and the dataset was coded before analysis. All data were stored in a secure electronic database.

Descriptive statistics were used to summarize the data and included frequencies, percentages, means, and standard deviations where appropriate. Comparisons between mild and severe COVID-19 cases were performed using the chi-square or Fisher's exact test for categorical variables and Student's *t*-test or Mann-Whitney U test for continuous variables, as appropriate.

Multivariable logistic regression models were used to evaluate the association between COVID-19 severity and preselected maternal and neonatal outcomes (NICU admission, Apgar score <7 at 5 min, low birth weight, and emergency cesarean section), adjusting for maternal age, BMI $>30 \text{ kg/m}^2$, presence of comorbidities, parity, and stage of pregnancy. Adjusted odds ratios (aORs) with 95% confidence intervals (CIs) were calculated for these models. Prior to multivariable analysis, multicollinearity among covariates was assessed using the Variance Inflation Factor (VIF). All VIF values were well below the accepted threshold of 5, indicating no evidence of multicollinearity among the independent variables. Following multivariable logistic regression analysis, the Hosmer-Lemeshow goodness-of-

fit test was applied to each model to assess calibration, and all four models demonstrated adequate fit ($p > 0.05$ for all models).

Statistical significance was established at a p -value < 0.05 .

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS), version 26.0.

Confidentiality and privacy of patient information were strictly maintained throughout the study process. All procedures were conducted in accordance with the ethical standards of the institutional research committee and the principles of the Declaration of Helsinki. The study was approved by the Ethics Committee of the Faculty of Medicine, University of Medicine, Tirana (Protocol No. 472/6, dated 22 February 2024).

3. Results

During the study period, both participating hospitals admitted exclusively RT-PCR-confirmed positive cases; a test-negative comparison group was therefore not available within this institutional setting. Of the 297 RT-PCR-positive obstetric admissions initially identified, 27 were excluded due to incomplete clinical data, and 270 cases were included in the final analysis, comprising 212 (78.5%) mild and 58 (21.5%) severe COVID-19 cases (Figure 1).

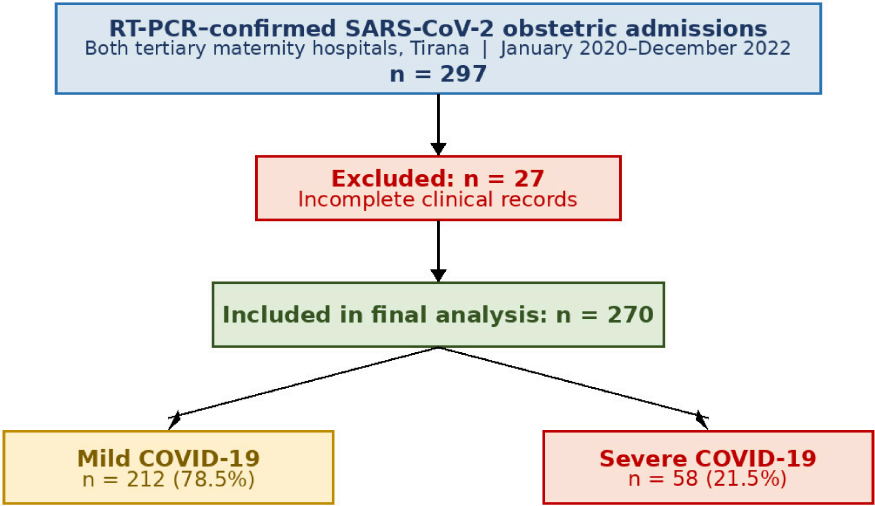


Figure 1. Patient flow diagram. Both hospitals served as national tertiary referral centres admitting exclusively RT-PCR-confirmed positive cases.

Table 1 presents the baseline characteristics of the study population. A total of 270 pregnant women with confirmed SARS-CoV-2 infection were included in the analysis. Of these, 212 (78.5%) were classified as mild COVID-19 cases and 58 (21.5%) as severe cases at presentation. The mean maternal age of the study population was 29.4 years (SD = 5.4). Gestational age at diagnosis and at birth were both higher among women with mild COVID-19 compared with severe cases (33.5 ± 9.0 vs. 32.4 ± 6.9 weeks, $p = 0.016$; and 37.0 ± 6.0 vs. 35.9 ± 4.6 weeks, $p < 0.001$, respectively). With regard to body mass index, 160 women (59.5%) had a BMI ≤ 30 kg/m², whereas 109 women (40.5%) had a BMI > 30 kg/m². A slightly higher proportion of obesity was observed among women with mild COVID-19 compared with severe cases (43.6% vs. 29.3%), although this difference approached but did not reach statistical significance ($p = 0.050$). Morbid obesity (BMI > 40 kg/m²) was uncommon in the study population, being present in only 3.0% of cases. Pre-existing hypertension was rare, affecting only 1.5% of the participants. Similarly, the presence of other comorbidities or associated diseases was relatively low, reported in approximately 4–5% of cases, without significant differences between mild and severe

COVID-19 groups. Most infections were diagnosed during the third trimester of pregnancy (80.8%), while 14.5% were diagnosed during the second trimester and 4.7% during the first trimester. In terms of parity, the majority of women were nulliparous (60.4%), whereas 39.6% were multiparous (Table 1).

Table 1. Baseline demographic and clinical characteristics of pregnant women with SARS-CoV-2 infection according to COVID-19 severity.

Variable	Total	Mild	Severe	<i>p</i> -Value *
Age (years), mean $\pm$ SD	29.4 $\pm$ 5.4	29.3 $\pm$ 5.1	29.9 $\pm$ 6.2	0.450
Gestational age at diagnosis (weeks), mean $\pm$ SD	33.3 $\pm$ 8.6	33.5 $\pm$ 9.0	32.4 $\pm$ 6.9	0.016
Gestational age at birth (weeks), mean $\pm$ SD	36.7 $\pm$ 5.8	37.0 $\pm$ 6.0	35.9 $\pm$ 4.6	<0.001
BMI category, <i>n</i> (%)				
≤ 30 kg/m ²	160 (59.5)	119 (56.4)	41 (70.7)	0.050
> 30 kg/m ²	109 (40.5)	92 (43.6)	17 (29.3)	
Morbid obesity, <i>n</i> (%)				
≤ 40 kg/m ²	261 (97.0)	204 (96.7)	57 (98.3)	0.100
> 40 kg/m ²	8 (3.0)	7 (3.3)	1 (1.7)	
Pre-existing hypertension, <i>n</i> (%)				
No	266 (98.5)	208 (98.1)	58 (100.0)	0.581
Yes	4 (1.5)	4 (1.9)	0 (0.0)	
Presence of comorbidities, <i>n</i> (%)				
No	258 (95.9)	200 (94.8)	58 (100.0)	0.128
Yes	11 (4.1)	11 (5.2)	0 (0.0)	
Associated diseases, <i>n</i> (%)				
No	257 (95.5)	199 (94.3)	58 (100.0)	0.075
Yes	12 (4.5)	12 (5.7)	0 (0.0)	
Trimester at diagnosis, <i>n</i> (%)				
First trimester	12 (4.7)	11 (5.5)	1 (1.8)	0.395
Second trimester	37 (14.5)	27 (13.6)	10 (17.9)	
Third trimester	206 (80.8)	161 (80.9)	45 (80.4)	
Parity, <i>n</i> (%)				
Nulliparous	163 (60.4)	133 (62.7)	30 (51.7)	0.129
Multiparous	107 (39.6)	79 (37.3)	28 (48.3)	

* $p < 0.05$; statistically significant. p values were calculated using the chi-square test or Fisher's exact test, as appropriate.

Table 2 summarizes neonatal outcomes according to COVID-19 severity.

Low birth weight (< 2500 g) occurred more frequently among severe COVID-19 cases compared with mild cases (20.8% vs. 11.2%), although the difference did not reach statistical significance ($p = 0.107$). However, significant differences were observed for some neonatal outcomes. Neonates born to mothers with severe COVID-19 had a higher prevalence of Apgar score < 7 at 5 min compared with those born to mothers with mild disease (9.8% vs. 1.7%, $p = 0.015$). Admission to the neonatal intensive care unit (NICU) was also more frequent among severe cases (38.5% vs. 23.5%, $p = 0.035$). Neonatal death was rare in both groups and occurred only among mild cases (1.5%), while no neonatal deaths were recorded among severe cases. Postnatal neonatal SARS-CoV-2 infection was uncommon and showed no significant difference between the groups. Similarly, readmission due to COVID-19 was infrequent (Table 2).

Table 2. Neonatal outcomes according to COVID-19 severity at presentation.

Variable	Mild COVID <i>n</i> (%)	Severe COVID <i>n</i> (%)	<i>p</i> -Value *
Low birth weight (<2500 g)			
Yes	22 (11.2)	11 (20.8)	0.107
No	174 (88.8)	42 (79.2)	
Apgar score < 7 at 5 min			
Yes	3 (1.7)	5 (9.8)	0.015
No	174 (98.3)	46 (90.2)	
NICU admission			
Yes	43 (23.5)	20 (38.5)	0.035
No	140 (76.5)	32 (61.5)	
Neonatal death			
Yes	3 (1.5)	0 (0.0)	1.000
No	196 (98.5)	53 (100.0)	
Postnatal COVID-19 infection			
Yes	5 (2.5)	0 (0.0)	0.588
No	192 (97.5)	54 (100.0)	
Readmission for COVID-19			
Yes	9 (4.6)	1 (1.9)	0.694
No	188 (95.4)	53 (98.1)	

* $p < 0.05$; statistically significant. *p* values were calculated using the chi-square test or Fisher's exact test, as appropriate.

Table 3 presents maternal and obstetric outcomes according to COVID-19 severity.

Table 3. Maternal and obstetric outcomes according to COVID-19 severity.

Variable	Mild COVID <i>n</i> (%)	Severe COVID <i>n</i> (%)	<i>p</i> -Value *
Postpartum status at presentation			
Yes	14 (6.6)	2 (3.4)	0.535
No	198 (93.4)	56 (96.6)	
Live birth			
Yes	186 (93.5)	52 (92.9)	1.000
No	13 (6.5)	4 (7.1)	
Intrauterine fetal death			
Yes	6 (3.0)	2 (3.6)	1.000
No	194 (97.0)	54 (96.4)	
Abortion			
Yes	8 (4.0)	2 (3.6)	1.000
No	191 (96.0)	54 (96.4)	
Mode of delivery			
Natural birth	18 (8.5)	3 (5.2)	0.131
Cesarean section	194 (91.5)	55 (94.8)	
Emergency cesarean section			
Yes	11 (18.0)	20 (60.6)	<0.001
No	50 (82.0)	13 (39.4)	
Preterm birth			
Yes	70 (43.5)	28 (57.1)	0.104
No	91 (56.5)	21 (42.9)	

Table 3. Cont.

Variable	Mild COVID <i>n</i> (%)	Severe COVID <i>n</i> (%)	<i>p</i> -Value *
Maternal indication for delivery			
Yes	34 (37.4)	23 (60.5)	0.020
No	57 (62.6)	15 (39.5)	
Preeclampsia			
Yes	5 (2.7)	2 (3.8)	1.000
No	180 (97.3)	50 (96.2)	
Intrauterine growth restriction			
Yes	3 (1.6)	0 (0.0)	1.000
No	182 (98.4)	52 (100.0)	
PPROM			
Yes	2 (1.1)	1 (1.9)	1.000
No	183 (98.9)	51 (98.1)	
Intrahepatic cholestasis of pregnancy			
Yes	1 (0.5)	0 (0.0)	1.000
No	198 (99.5)	56 (100.0)	

* $p < 0.05$; statistically significant. *p* values were calculated using the chi-square test or Fisher's exact test, as appropriate.

Most pregnancies resulted in live births in both groups (93.5% in mild cases and 92.9% in severe cases). The proportions of intrauterine fetal death and abortion were low and comparable between the two groups. Cesarean section was the predominant mode of delivery, accounting for more than 90% of births in both groups. However, emergency cesarean section was significantly more frequent among women with severe COVID-19 compared with those with mild disease (60.6% vs. 18.0%, $p < 0.001$). Preterm birth occurred more frequently among severe cases (57.1%) compared with mild cases (43.5%), although the difference did not reach statistical significance. Maternal indications for delivery (i.e., delivery prompted by maternal COVID-19 clinical condition, including compromised respiratory function, progressive hypoxia, or disease deterioration requiring early delivery) were significantly more common among severe COVID-19 cases (60.5% vs. 37.4%, $p = 0.020$). Other obstetric complications, including preeclampsia, intrauterine growth restriction, preterm premature rupture of membranes (PPROM), and intrahepatic cholestasis of pregnancy, were relatively uncommon and did not differ significantly between the two groups (Table 3).

Multivariable logistic regression models were used to evaluate the association between the severity of COVID-19 and selected neonatal and maternal outcomes, adjusting for maternal age, BMI $> 30 \text{ kg/m}^2$, presence of comorbidities, parity, and stage of pregnancy.

Severe COVID-19 was independently associated with several adverse outcomes. Specifically, women with severe COVID-19 had significantly higher odds of NICU admission (aOR = 2.87; 95% CI: 1.36–6.05; $p = 0.005$), Apgar score < 7 at 5 min (aOR = 8.39; 95% CI: 1.49–47.35; $p = 0.016$), and low birth weight (aOR = 2.53; 95% CI: 1.06–6.03; $p = 0.037$). Severe disease was also strongly associated with an increased likelihood of emergency cesarean section (aOR = 8.10; 95% CI: 2.64–24.86; $p < 0.001$). Regarding other predictors, late pregnancy was associated with lower odds of low birth weight (aOR = 0.35; 95% CI: 0.14–0.87; $p = 0.024$) but higher odds of emergency cesarean section (aOR = 8.52; 95% CI: 1.41–51.56; $p = 0.020$). Maternal age, BMI $> 30 \text{ kg/m}^2$, comorbidities, and parity were not significantly associated with the examined outcomes in the adjusted models (Table 4).

Table 4. Multivariable logistic regression analysis of factors associated with neonatal and maternal outcomes among pregnant women with COVID-19.

Variable	NICU Admission aOR (95% CI)	<i>p</i> -Value *	Apgar < 7 at 5 min aOR (95% CI)	<i>p</i> -Value *	Low Birth Weight aOR (95% CI)	<i>p</i> -Value *	Emergency Cesarean Section aOR (95% CI)	<i>p</i> -Value *
Severe COVID-19 (vs. Mild)	2.87 (1.36–6.05)	0.005	8.39 (1.49–47.35)	0.016	2.53 (1.06–6.03)	0.037	8.10 (2.64–24.86)	<0.001
Age (years)	1.04 (0.98–1.11)	0.193	0.96 (0.84–1.11)	0.600	1.03 (0.95–1.11)	0.528	1.02 (0.93–1.12)	0.662
BMI > 30 kg/m ²	1.52 (0.78–2.98)	0.223	0.33 (0.04–2.98)	0.323	1.63 (0.71–3.72)	0.250	0.72 (0.25–2.11)	0.550
Presence of comorbidities	1.11 (0.21–5.75)	0.900	9.07 (0.69–118.82)	0.093	0.78 (0.09–6.94)	0.827	N/A [†]	N/A [†]
Multiparity (vs. Nulliparity)	0.50 (0.24–1.03)	0.060	0.47 (0.07–3.05)	0.429	0.69 (0.29–1.66)	0.411	0.52 (0.16–1.73)	0.287
Late pregnancy (vs. Early pregnancy)	1.29 (0.51–3.30)	0.595	1.94 (0.21–18.27)	0.563	0.35 (0.14–0.87)	0.024	8.52 (1.41–51.56)	0.020

* $p < 0.05$ was considered statistically significant. aOR: adjusted odds ratio; CI: confidence interval. [†] Not estimable due to complete separation (no women with comorbidities experienced emergency cesarean section).

4. Discussion

In this multicenter cohort study including pregnant women with SARS-CoV-2 infection admitted to the two main tertiary maternity hospitals in Tirana, the majority of cases were classified as mild disease (78.5%), while 21.5% presented with severe COVID-19. The baseline clinical profile of the study population showed a relatively young maternal age (mean 29.4 years), a moderate prevalence of obesity (40.5%), very low rates of pre-existing hypertension (1.5%) and other comorbidities (4–5%), and a clear predominance of infections diagnosed during the third trimester of pregnancy (80.8%). Comparable epidemiological observations have been reported in the UK Obstetric Surveillance System (UKOSS) national cohort, where most pregnant women hospitalized with SARS-CoV-2 infection were also diagnosed in late pregnancy, while 69% were overweight or obese, 41% were aged ≥ 35 years, and 34% had pre-existing comorbidities [13].

In line with our findings showing that SARS-CoV-2 infection was most frequently diagnosed in late pregnancy (mean gestational age at diagnosis 33.3 weeks), Berry et al. reported a median gestational age of 36 weeks at symptom onset among pregnant women with COVID-19 and also observed a significant association between gestational age and disease severity [14]. The parity distribution in our cohort showed that most women were nulliparous (60.4%), whereas other hospital-based cohorts of pregnant women with COVID-19 have reported a predominance of multiparous patients [15], a difference that may reflect underlying demographic and obstetric characteristics of the studied populations rather than a direct effect of SARS-CoV-2 infection. In addition, our study demonstrated that preterm birth occurred more frequently among women with severe COVID-19 compared with those with mild disease (57.1% vs. 43.5%), although the difference did not reach statistical significance. Similarly, a large international cohort study reported that severe COVID-19 occurring after 20 weeks of gestation substantially increased the risk of preterm delivery compared with milder disease, with risk ratios approaching three-fold in late pregnancy [16]. In our study, severe COVID-19 was associated with higher odds of NICU admission (aOR = 2.87; 95% CI 1.36–6.05), a finding comparable to other cohort studies reporting a similar association between severe maternal infection and NICU admission (aOR $\approx$ 3.50) [17]. Severe maternal COVID-19 was also associated with increased odds of low birth weight in our cohort. Similar associations have been reported in

other studies, where more severe maternal infection has been linked to reduced neonatal birth weight [18,19].

Consistent with our findings, several studies have reported that increasing maternal COVID-19 severity is associated with poorer neonatal condition at birth, with neonates of mothers with moderate-to-severe infection more frequently presenting with lower Apgar scores, likely reflecting the combined effects of prematurity, maternal illness, and placental dysfunction related to SARS-CoV-2 infection [3,17,20]. In our cohort, emergency cesarean section was markedly more frequent among women with severe COVID-19 (60.6% vs. 18.0%), a pattern also reported in previous cohort studies where cesarean delivery rates approached 60% in severe–critical disease compared with about one third in milder infections [21,22].

A directly relevant point of comparison is the prospective single-centre cohort study from University Hospital “Koço Gliozheni” in Tirana ($n = 177$, May 2020–November 2021) [12]. That study documented a 26% rate of severe COVID-19 and similarly identified significant associations between severe disease and emergency cesarean section (aOR 9.39), prematurity (aOR 6.69), and ICU admission (aOR 57.36), and reported a maternal mortality rate of 2.8% [12]. While those investigators found that severe COVID-19 was not directly associated with low birth weight or NICU admission after adjustment for confounders, our two-centre national tertiary cohort, with greater sample size and extended follow-up through 2022, demonstrates significant adjusted associations between severe disease and NICU admission (aOR 2.87), low Apgar scores (aOR 8.39), low birth weight (aOR 2.53), and emergency cesarean section (aOR 8.10). The differences between studies may reflect the additional statistical power afforded by the two-centre design, the longer study period encompassing further variant waves, and differences in the distribution of confounders between cohorts.

In the broader European context, the CRONOS prospective registry from Germany [11], comprising data from multiple obstetric centres, documented high rates of ICU admission and obstetric intervention among severely ill pregnant women, with patterns of emergency cesarean delivery broadly consistent with our findings. The ItOSS national prospective cohort from Italy [10] further demonstrated that the Alpha-variant period was associated with a significant increase in severe COVID-19 among hospitalised pregnant women compared with the wild-type period, a finding directly relevant to the temporal span of our study. The INTERCOVID multinational cohort [21] demonstrated that COVID-19 in pregnancy was independently associated with a more than twofold increase in severe neonatal morbidity and a markedly elevated risk of medically indicated preterm birth across 18 countries, providing important global context for the emergency cesarean section and NICU admission rates observed in our cohort. The comprehensive meta-analyses by Marchand et al. [23] and Bellos et al. [24], which pooled data from tens of thousands of COVID-19-affected pregnancies, further confirm that preterm delivery and low birth weight are consistently elevated in this population, corroborating the descriptive findings of our study.

Taken together, these findings are consistent with evidence from a large systematic review and meta-analysis indicating that COVID-19 in pregnancy, particularly in more severe forms, is associated with a higher risk of adverse maternal and perinatal outcomes, including preterm birth and increased likelihood of neonatal intensive care admission [25].

Nevertheless, these findings should be interpreted in light of several limitations. The retrospective design and the possibility of residual confounding are inherent constraints. The severe disease group comprised only 58 patients, which limits the precision of the effect estimates, as reflected by the wide confidence intervals observed for several outcomes (notably aOR 8.39, 95% CI 1.49–47.35 for Apgar score below 7 at five minutes); individual

point estimates should therefore be interpreted with appropriate caution. Additionally, retrospective classification of COVID-19 severity based on clinical records may be subject to ascertainment bias, as distinguishing moderate from severe disease in pregnancy is inherently challenging without systematic diagnostic imaging. Variant-specific classification and individual vaccination status were not systematically recorded in the clinical databases of the participating hospitals during the study period, precluding temporal stratification or vaccine-adjusted analyses; this limits the generalisability of the pooled 2020–2022 findings in the context of the rapidly evolving pandemic. As both hospitals functioned as national tertiary referral centres admitting exclusively RT-PCR-confirmed positive cases, a test-negative comparison group was not available. The present study was conducted across both national tertiary maternity referral centres, which together manage the large majority of high-risk pregnancies in Albania; including both institutions increases statistical power and national representativeness.

5. Conclusions

This multicenter retrospective study conducted in two tertiary maternity hospitals in Tirana found that most SARS-CoV-2 infections during pregnancy were mild and occurred predominantly in the third trimester, while baseline maternal characteristics were broadly comparable between mild and severe cases.

Clear differences emerged in obstetric and neonatal outcomes according to disease severity. Severe COVID-19 was associated with poorer neonatal condition at birth, reflected by a higher frequency of Apgar scores below 7 at 5 min and increased need for NICU admission. Emergency cesarean section and maternal indications for delivery were also significantly more frequent among women with severe disease. Although low birth weight and preterm birth occurred more often among severe cases in crude comparisons, multivariable analysis confirmed that severe maternal COVID-19 remained independently associated with adverse neonatal outcomes, particularly low birth weight. Overall neonatal mortality remained low in both groups.

These findings suggest that the severity of maternal COVID-19 infection is associated with both obstetric management decisions and early neonatal outcomes in tertiary referral maternity settings; however, given the retrospective observational design, the limited size of the severe group ($n = 58$), the wide confidence intervals for several estimates, and the absence of vaccination and variant data, these findings reflect associations and should not be interpreted as causal. Further large-scale prospective studies are warranted to better clarify the mechanisms linking maternal disease severity with adverse perinatal outcomes and to inform optimized clinical management strategies for pregnancies complicated by COVID-19.

Author Contributions: V.B., E.R. and E.D. contributed to the conceptualization, methodology, data preparation, data analysis, and drafting of the initial manuscript. F.B., D.N., Z.S. and M.D. participated in the interpretation of results and provided critical comments and revisions to improve the manuscript. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the Faculty of Medicine, University of Medicine, Tirana (Protocol No. 472/6, approved on 22 February 2024).

Informed Consent Statement: Patient consent was waived due to the retrospective multicenter observational nature of the study.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.

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