

Overview of COVID-19 and GDM studies.

Author, Year	Location	Study design	Pregnant women, n	Patient characteristics and medical history	COVID-19	Maternal outcomes	Offspring outcomes
Blauvelt et al 2020	USA	Case report	1	<ul style="list-style-type: none"> 34-year-old pregnant women with coronavirus infection, 28 weeks of gestation Asthma, A2 gestational diabetes, obesity, three prior cesarean delivery Vital signs at admission: temperature 36.9°C, blood pressure 117/66 mm Hg, heart rate 110 beats per minute, respiratory rate 30–40/min, and SpO₂ 93% on non-rebreather mask at 15 L/min, transitioned to high-flow nasal cannula. Initial PaO₂/FiO₂ ratio was 163, plateau pressure 15 cmH₂O, static compliance 80 mL/cmH₂O and calculated dead space fraction 42% 	<ul style="list-style-type: none"> Fever, malaise, myalgias, cough, shortness of breath ongoing hypoxemia (pH 7.41, PaCO₂ 26 mm Hg, PaO₂ 64 mm Hg, HCO₃ 16 mmol/L). Higher risk for mortality and morbidity in pregnant women and Covid-19 Acute respiratory distress syndrome ICU admission, intubation Placenta showed acute chorioamnionitis Negative IgM and IgG incremental titration of positive end-expiratory pressure from 10 to 16 cmH₂O FiO₂ requirement remained high at 80% and her static compliance worsened 	<ul style="list-style-type: none"> lung overdistension, evidenced by decreased lung compliance and worsened hypercarbia indicating increased dead space develop hyperglycemia after antenatal corticosteroid administration required prolonged mechanical ventilation (until postpartum day 10) Shortly before delivery: FiO₂ increased to 100%, inhaled nitric oxide initiated at 20 ppm to temporarily improve oxygenation perioperatively, PaO₂ improved to 159 mm Hg (from 94 mm Hg). Following days PaO₂/FiO₂ ratio improved, lung mechanics remained relatively stable Extubated on postoperative day 10 	<ul style="list-style-type: none"> Intubated because of Respiratory distress syndrome Diffuse bilateral granular/ hazy opacities concerning for mild edema/ involving respiratory distress syndrome Laboratory test results showed leukopenia, neutropenia, lymphopenia, mild acidosis, and normal lactate Negative SARS-CoV-2 test and IgG and IgM 1920g Apgar score 4->8 Clear amniotic fluid At 16 days of life, neonate was clinically stable on high-flow nasal cannula at 3 L/min and 21% FiO₂ normal findings on neurologic examination.
Cooke et al 2020	UK	Case Report	1	<ul style="list-style-type: none"> 28-year-old, 28⁺⁶ weeks of gestation, GDM, Asian 	<ul style="list-style-type: none"> fever, cough, diarrhoea and vomiting, was tachypnoeic, and bibasal pulmonary infiltrates supported a presumed SARS-CoV-2 diagnosis mechanical ventilation because tachypnoeic, c-section 	<ul style="list-style-type: none"> recovered rapidly experienced psychiatric sequelae post-operatively 	<ul style="list-style-type: none"> no complication or bad outcome mentioned, birth weight 1400g, Apgar scores 1 -> 3
Vlachodimitropoul et al 2020	Canada	Case Report	1	<ul style="list-style-type: none"> 40-year-old women Gravida 2 para 1 Familia neutropenia diagnosed in infancy (by admission neutropenia (0.1-0.3 × 10⁹/L)) GDM lymphocyte count nadirs of 0.16 	<ul style="list-style-type: none"> admitted at 35 + 3 weeks' gestation with cough and pyrexia Normotensive, tachycardic (110-121 beats/min), febrile (39°C), with normal oxygen saturation in room air SARS-CoV-2 was confirmed by polymerase chain reaction (PCR) on a nasopharyngeal swab Normal chest X-ray Over 48 hours, progressive thrombocytopenia, declining fibrinogen, rising activated partial thromboplastin time with concomitant improvement 	<ul style="list-style-type: none"> sustained a postpartum hemorrhage of 1.5 L controlled with uterine artery ligation and B-Lynch compression, alongside uterotonics and blood products (tranexamic acid 2 g, fibrinogen 4 g, cryoprecipitate 10 units) C-section was performed 	<ul style="list-style-type: none"> obstetrical ultrasound demonstrated a well-grown fetus fetal heart rate monitoring was unremarkable healthy male infant was delivered, weighing 2.93 kg (Apgars of 9 and 9 at 1 and 5 minutes)

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					<ul style="list-style-type: none"> in neutrophil count, responding to G-CSF Significantly elevated D-dimers were observed Description of mild transaminitis (underlying infection) Coagulopathy improvement was noted on postoperative day 		
Govind et al 2020	UK	Letter	1	<ul style="list-style-type: none"> 36-years-old, 38 w.o.g, Mode of delivery: Em C-Section, diet controlled GDM 	<ul style="list-style-type: none"> Pneumonia, respiratory distress, Chest Xray revealed right basal consolidation and lymphopenia was noted (0.92 × 109/l; normal: 1.2–3.6) 	<ul style="list-style-type: none"> Following delivery, patient continued to desaturate (80–85 %) on 100 % of oxygen transferred to a tertiary centre for extracorporeal membrane oxygenation (ECMO) 	<ul style="list-style-type: none"> Birth weight: 4165 g Viral pneumonia day 6 but recovered well Apgar scores 5-> 9 Ventilated for 10 days Developed pyrexia and exhibited signs of pneumonia on 6th day
Kleinwechter / Laubner 2020	Germany	Case Report	1	<ul style="list-style-type: none"> 28-year-old pregnant women (Gravida 4, Para 2) GDM diagnosed in 25th w.o.g 75g-oGTT: 97 mg/dl fasted, 189 mg/dl after 1 h, 197 mg/dl after 2 (5.4 / 10.5 / 9.9 mmol/l) Admitted to University Hospital Freiburg (9ternistically) Day before admission, RT-PCR throat swab was positive. 	<ul style="list-style-type: none"> >39 °C fever, cough, loss of appetite Thrombocytopenia and lymphocytosis, elevated levels of LDH, creatine kinase, CRP and IL-6 Three days after admission increasing dyspnoea with oxygen demand up to 5 l/min (by mask) 	<ul style="list-style-type: none"> Deep-seated placenta occurred vaginal bleeding (temporary transfer to the delivery room and monitoring under tocolysis) Fever-free at day 6, oxygen requirement declining First control pharyngeal smear negative 	
Oliva et al 2020	USA	Case Report	1	<ul style="list-style-type: none"> 35-year-old pregnant women 29³⁷ weeks of gestation gravida 10 para 7 Pyelonephritis at 13 w.o.g GDM 	<ul style="list-style-type: none"> Fever (38,2 degree), dyspnea, myalgias, dysuria, cough Respiratory status worsen (by admission:95% to 92%), respiratory rate of 23/min, heart rate 109 (oxygen through venturi mask) Transaminitis and hypertriglyceridaemia because of medication Tachypneic D-dimer peaking at 3037 ng/mL 	<ul style="list-style-type: none"> Status improved rapidly post-caesarean 2 hours after delivery SpO2 to the low 90th percentile on room air, which improved to 100% on 15 L/min of oxygen by postoperative day 2, she was weaned to 4 L/min of oxygen via nasal cannula CT showed extensive bilateral patchy ground glass infiltrates and small consolidations Uncomplicated C-section 	<ul style="list-style-type: none"> ICU admission with supplemental oxygen Birth weight 1705g Early cord clamping Apgar scores 9-> 9 Required supplement oxygen CXR on day 3 showed no evidence of pulmonary disease
Smati et al 2020	France	Case Report	1	<ul style="list-style-type: none"> 36-year-old pregnant women from the Democratic Republic of Congo presented severe euglycaemic metabolic acidosis and significant ketonaemia (15.3 mmol/L) GDM (HbA1c at 6.1% (43.2 mmol/mol) on admission) BMI before pregnancy: 35,2 gravida 9, para7 	<ul style="list-style-type: none"> Due to suspected preeclampsia, the patient underwent emergency caesarean section Viral infection might cause euglycaemic ketoacidosis in pregnant women because of stress 	<ul style="list-style-type: none"> Plasma insulin, C-peptide, glucagon and free fatty acid levels were assessed 2 days after delivery, showed no indications of insulin deficiency or metabolic failure ICU admission because of abdominal pain with nausea and vomiting associated with non-febrile dyspnea 	<ul style="list-style-type: none"> Birth weight 2445g

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Uzel / Lakhno 2020	Turkey	Case Report	1	<ul style="list-style-type: none"> 35-year-old pregnant women (31 w.o.g.) GDM (Diagnosed at 24 weeks o.g.) Tested positive for Covid-19 	<ul style="list-style-type: none"> Dry cough, fever (38.2), dizziness Blood pressure 130/80 mm Hg Rate of respiratory 20 / minute Obese (BMI 40 kg/m²) Lymphopenia, hyperglycemia, trace of proteinuria and ketonuria were detected 	<ul style="list-style-type: none"> Leukocytosis ($19 \times 10^3/\mu\text{L}$) and mild anemia (hemoglobin was 10.1 g/dL) were found in the clinical blood test. increased variables of serum urea, serum creatinine, serum ALT, serum AST, serum alka- line phosphatase were detected activated partial thromboplastin time, prothrombin time and international normalized ratio were prolonged. Levels of C-reactive protein (179.7 mg/L) and procalcitonin (0.15 ng/ml) were raised. Hemodynamics was not stable (blood pressure 70/40 mm Hg, pulse rate 130 per minute). Low saturation (75%) ICU admission Maternal death 	<ul style="list-style-type: none"> fetal distress Apgar 1 -> 3 1900g NICU admission Early neonatal sepsis Negative tested for Covid-19
Tang et al 2020	China	Case Report	1	<ul style="list-style-type: none"> symptomatic, 34-years old, GDM (insulin treatment) 	<ul style="list-style-type: none"> fever, shortness of breath, dyspnea, negative PCR for SARS-CoV-2; positive IgM and IgG antibodies, in both lungs scattered patchy lesions and small amount of left-sided pleural effusion 	<ul style="list-style-type: none"> No serious complications at delivery C-section 	<ul style="list-style-type: none"> born at 37¹⁶, 4,000g birth weight, Apgar scores 9 -> 10, yellowish skin on second day, bilirubin of 11.3 mg/dL; negative tested; on day 7 IgG positive
D'Ambrosi et al 2020	Italy	Retrospective single center study	6	<ul style="list-style-type: none"> C1: 32-years-old, Caucasian, Insulin requiring, Gestational Age at Covid-19 diagnosis: 38+1, 6 days hospitalized C2: 26-years-old, Diet, Magreb, Gestational age at COVID-19 diagnosis: 38+2, 7 days hospitalized C3: 27-years-old, Magreb, Age at Covid-19 diagnosis: 33+1, 6 days hospitalized C4: 37-years-old, Hispanic, Diet, Age at Covid-19 diagnosis: 39+0, 11 days hospitalized C5: 32-years-old, Magreb, Diet, Age at Covid-19 diagnosis: 29,+1, 49 days hospitalized C6: 40-years-old, Caucasian, Insulin requiring, 7 days hospitalized, Age at Covid-19 diagnosis: 27+1 	<ul style="list-style-type: none"> 4/6 had COVID-Symptoms (fever, dyspnea) Two were asymptomatic 	<ul style="list-style-type: none"> Two vaginal deliveries, 4 elective C-Sections 5/6 multiparous 2/6 Radiological signs No ICU requiring or mechanical ventilations One woman required hospitalization for more than 7 days 	<ul style="list-style-type: none"> C1: birth weight 3670g, Apgar at 5 min: 10 C2: birth weight 3000g, Apgar at 5 min: 10 C3: birth weight 3766g, Apgar at 5 min: 10 C4: birth weight 3766g, Apgar at 5 min: 10 C5: birth weight 2095g, Apgar at 5 min: 10 C6: birth weight 3640g, Apgar at 5 min: 10
Fontanella et al 2020	Netherlands	Letter	1	<ul style="list-style-type: none"> 38-years-old Caucasian pregnant women, diet controlled GDM, BMI 46, admitted to hospital at 31¹⁶ weeks 	<ul style="list-style-type: none"> COVID symptoms: dry cough, dyspnea, oxygen desaturation (94 on 3 Liter of oxygen), thoracic pain with deep breathing, CPR, LDH, Glucose levels increased Needed oxygen support and molecular weight heparin 	<ul style="list-style-type: none"> Day 2 and 3 betamethasone administered and further conservative management Thromboprophylaxis started from day 1 No adverse outcome reported, mother left hospital after 5 days because of rapid improvement 	<ul style="list-style-type: none"> No adverse outcome Fetal lung maturations prevented by corticosteroids

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					<ul style="list-style-type: none"> CT scan found bilateral ground glass opacities suggestive of COVID-19 pneumonia First nasopharyngeal swab was negative, second positive 		
Gidlöf et al 2020	Sweden	Letter	1	<ul style="list-style-type: none"> 34-year-old pregnant women, dichorionic twin pregnancy, BMI 38 kg/m² and diagnosed with GDM at 29 weeks, hospitalized at 36^{+2/7} weeks, severe preeclampsia 	<ul style="list-style-type: none"> COVID symptoms: mild headache, hoarseness, increasing malaise at admission oxygen saturation 96%, respiration rate 11/min., body temperature 38,0 degree, BP 170/100 mm HG heart rate 85 beats/min., Creatinine: 89 µmol/L (reference <90 µmol/L) and uric acid 510 µmol/L (reference 155-350 µmol/L). 7 hours after hospitalization severe headache, photophobia, brisk patellar reflex On third day, oxygen dropped to 87%, CT showed typical COVID-19 pneumonia signs 	<ul style="list-style-type: none"> Three hours after delivery positive COVID-19 test result BP remained stable, the temperature normalized after first postoperative day On 3rd day, oxygen saturation dropped to 87%, which was managed successfully with oxygen, 1-3 L/min via a nasal cannula CRP reached 88 mg/L on 4th day but fell to 38 mg/L on the 6th day Test on breastmilk and maternal vaginal secretion on the 5th day were negative Emergency C-section, three hours later positive COVID test 	<ul style="list-style-type: none"> Babies (two girls) were delivered in good condition Because of GDM, both babies were formula-fed C1: 2680g, Apgar score 9,10 and 10 at 1,5 and 10 minutes, developed breathing problems at 22 minutes, cyanotic attack while feeding on day two C2: 2160g, Apgar 9,10 and 10 Both twins had negative nasopharyngeal swab
Majachani et al 2020	Grenada	Case Report	1	<ul style="list-style-type: none"> 31-year-old Hispanic women with SARS-CoV-2, HIV positive, GDM C-Section at 34 w.o.g 	<ul style="list-style-type: none"> COVID symptoms: shortness of breath and myalgia (mild symptoms) White blood cell count of 10.000 cells/mm³ Chest X-ray showed bibasilar opacities 		<ul style="list-style-type: none"> Initial examination was normal Apgar score 9/10 at 1 and 5 mins. NICU admission (for 10 days) for hypoglycemia monitoring and continuous cardiac, respiratory and pulse oximetry monitoring Nasopharyngeal swab after 24 h positive (no signs of respiratory distress and 95% oxygen)
Pulinx et al 2020	Belgium	Case Report	1	<ul style="list-style-type: none"> 30-year-old women (gravida 2, para 1) hospitalized at 22 w.o.g, pregnant with dichorionic diamniotic twins, GDM Negative tested for toxoplasma IgG and IgM antibodies at 21 w.o.g Tested positive for SARS-CoV-2 RT-PCR on a nasopharyngeal swab Preterm birth 	<ul style="list-style-type: none"> Rhinitis and fever (39,2 degree), oxygen saturation 98%, X-Ray showed no abnormalities Maternal Blood samples were tested positive for SARS-CoV-2 Aggregates of histiocytes and cytotoxic T lymphocytes in the intervillous space were also present and confirmed (findings supported the diagnosis of chronic intervillitis) 	<ul style="list-style-type: none"> In the fetal circulation, nuclear debris and an increase in erythroblasts (as can be seen in fetal hypoxia) 	<ul style="list-style-type: none"> The fetal demise of fetus one was diagnosed and fetus two showed fetal heart rate decelerations Prepartal intrauterine death of fetus one and prepartal death of fetus two
Kleinwechter et al 2021	Germany	Case series	21	<ul style="list-style-type: none"> Median age 34 years 1/3 was obese at the beginning of pregnancy 	<ul style="list-style-type: none"> Half of the women were asymptomatic (11/21) 	<ul style="list-style-type: none"> In 2 cases admission to the intensive care unit, and in 4 cases the women 	<ul style="list-style-type: none"> 17 live births (at the time of the evaluation) of which 1 time twins, median in the 39th week of pregnancy, no early births

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				<ul style="list-style-type: none"> GDM diagnosed at 24-28 weeks SARS-Cov-2 diagnosed at median 38 weeks 	<ul style="list-style-type: none"> Most common symptoms: cough (6/21), tiredness (6/21), malaise (6/21), nasal congestion (7/21) changes in smell and taste (5/24) Mostly mild to moderate course in women with GDM 	<p>received a symptomatic COVID-19-associated therapy</p> <ul style="list-style-type: none"> No invasive ventilation 56 % sectio (9/16) 	
Rabiei et al 2021	Iran	Case report	1	<ul style="list-style-type: none"> 38 year-old Iranian with triplet Blood pressure 140/90 mmHg Elevated liver enzymes Pregnant by ovulation induction Hpothyroidism 16 units insulin daily HbA1c 5.6% 	<ul style="list-style-type: none"> Mild fever No shortness of breath, diarrhea, nausea or vomiting Oxygen saturation above 96% 	<ul style="list-style-type: none"> Cesarean section 	<ul style="list-style-type: none"> First baby: birth weight: 1320g (5-min APGAR was 4) Second baby:: birth weight 1600g (5-min APGAR was 7) Third baby: birth weight 1250g (5-min APGAR was 6) Admission to Neonatal intensive care unit All three: symptoms of spsis and pulmonary hemorrhage COVID-19 test was negative for all three