Thieme

COVID-19 During Pregnancy and Puerperium – A Review by the Austrian Society of Gynaecology and Obstetrics (OEGGG)

COVID-19 während Schwangerschaft und Wochenbett – ein Review der Österreichischen Gesellschaft für Gynäkologie und Geburtshilfe (OEGGG)

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ABSTRACT

After the first case of COVID-19 pneumonia was reported in Wuhan, Hubei Province, China, in December 2019, the infection quickly spread to the rest of China and then to the wider world. The available information on pregnant women infected with COVID-19 is now significantly greater. There are now several case series and systematic reviews of cohorts, some of which include more than 100 cases. This review evaluates the scientific literature available until May 1, 2020 and discusses common questions about COVID-19 in the context of pregnancy and the postpartum period.

ZUSAMMENFASSUNG

Seit der erste Fall einer COVID-19-Pneumonie in Wuhan, Provinz Hubei, China, im Dezember 2019 gemeldet wurde, hat sich die Infektion schnell auf den Rest Chinas und mittlerweile weltweit ausgebreitet. Der Informationsstand betreffend Frauen mit COVID-19-Infektionen in der Schwangerschaft hat mittlerweile deutlich zugenommen. Mehrere Fallserien oder systematische Reviews überblicken Kohorten mit teilweise über 100 Fällen. Im vorliegenden Review wurde die bis 01.05.2020 verfügbare wissenschaftliche Literatur gesichtet und häufige Fragen zu COVID-19 im Zusammenhang mit Schwangerschaft und Wochenbett erläutert.

Introduction

Infection with the new coronavirus SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) results in a respiratory disease, which is referred to as COVID-19 (coronavirus disease 19). After the first case of COVID-19 pneumonia in Wuhan, Hubei Province, China, was reported in December 2019, the infection spread rapidly to the rest of China and then to the rest of the world [1, 2]. Globally, there are around 3.2 million confirmed cases with COVID-19, of whom 225 000 died and 1.1 million recovered [3,

4]. In Austria, COVID-19 was confirmed in around 15 500 people, of whom around 600 died and approximately 13 200 recovered [4].

Based on the currently available information, most people with COVID-19 only develop a very mild or uncomplicated form of the disease. However, some affected persons become seriously ill and may even develop life-threatening symptoms requiring hospitalisation, supplemental oxygen support or intensive care.

The level of knowledge about pregnant women with COVID-19 infection has increased significantly in recent weeks. There are now several case series and systematic reviews which have investigated cohorts, some of which had more than 100 cases [5 – 12].

Review

Frequently asked questions about COVID-19 and pregnancy are discussed below. The answers are based on international recommendations and recent scientific publications. The situation and the level of information about COVID-19 can change very quickly; it is therefore important to state that the following information is based on the state of knowledge and the scientific publications which were available up to and including May 1, 2020.

1. Are pregnant women particularly at risk from COVID-19?

Based on the currently available data, there is no indication that pregnant women are at greater risk of being infected by the new coronavirus (SARS-CoV-2) than the general population.

The findings so far suggest that COVID-19 does not have a more severe course in pregnant women than in non-pregnant women [10, 12 – 15].

The majority of pregnant women with COVID-19 only experienced mild or moderate symptoms, similar to those of a cold or a flu-like infection. In 95 % of cases, women were symptomatic, and presented with one or more of the following symptoms: fever (68–75 %), cough (34–73 %), chest pain (18 %), fatigue (13–17 %), myalgia (10 %), dyspnoea (7–12 %), sore throat (7 %), diarrhoea (6–7 %), headache (6 %) [5, 6, 8]. Transient anosmia and ageusia was also reported in some cases, sometimes as the only presenting symptoms [16].

Lymphopenia was found in 44–59 % of cases and elevated CRP levels in 70 % [6], while 79 % showed typical lung infiltrates on CT scan [5, 6].

According to the current level of information, severe disease with pneumonia or other complications requiring hospitalisation or intensive care is rare and affects fewer than 10 % of pregnant women with COVID-19 [5]. Pregnant women with chronic pre-existing conditions (e.g. cardiac or pulmonary disease, type 1 diabetes mellitus) may be affected more seriously.

There were no maternal deaths in any of the large series (> 100 cases), and the disease had a mild course in the overwhelming majority (> 90 %) of cases. This is borne out by the observations of smaller series, which also did not report any maternal deaths [7, 8, 10, 12, 17, 18].

2. Will infection with COVID-19 injure the unborn child?

There is currently no evidence to suggest that maternal infection is associated with an increased risk of malformation or miscarriage. It is also considered unlikely that the virus can be transmitted to the unborn child during pregnancy (also referred to as vertical transmission), as the overwhelming majority of children born to women with COVID-19 were born healthy, even if it is not possible to completely exclude the possibility of transmission based on a few case reports.

There is still no meaningful data on COVID-19 infection in the 1st and early 2nd trimester of pregnancy. There are a few individual reports of spontaneous and induced miscarriages in women with COVID-19, but because of the limited case numbers and incomplete clinical data, it is not possible to draw any conclusions about the impact of COVID-19 infection on miscarriage rates [5, 19]. A large Chinese study reported that COVID-19 was not associated with an increased rate of spontaneous miscarriage [10]. The rate of intrauterine foetal deaths in the existing cohort is very low, although there are reports of individual cases [20, 21].

There are also no reports on a possible influence on the rate of malformations as the data on infection with COVID-19 in the 1st trimester of pregnancy is insufficient. As fever often occurs in patients with COVID-19, one study reported the following. In a recent study of 80 321 pregnant women, the rate of cases with fever in early pregnancy was 10 % and the incidence of foetal malformations in this group was 3.7 % [22]. Of the 77 344 viable pregnancies for which data for the period "16th–29th week of gestation" were available, 8321 pregnant women had a temperature of > 38 °C between 1 to 4 days in early pregnancy; however, the overall risk of foetal malformation was not elevated compared to patients who did not have a fever in early pregnancy [22].

Studies on SARS-CoV, a better-known virus which has been studied longer, found no indications for congenital infections [23], and there are currently no data available on the risk of congenital malformations if the mother develops COVID-19 in the 1st or the early part of the 2nd trimester of pregnancy. Nevertheless, a 2nd trimester anomaly scan in women with suspected or confirmed COVID-19 infection in early pregnancy would be useful.

Based on the currently available case reports, there is no evidence of a significantly increased rate of foetal growth restriction, although most infections occurred relatively late in pregnancy (median 38 weeks of gestation) [10]. Because of the short period of observation, it is not possible to say whether foetal growth is impaired by maternal infection with COVID-19 [20, 24 – 26].

To date, very little information has been published on placental pathologies. A recent case report of a late miscarriage in the 19th week of gestation in a pregnant woman with nasopharyngeal confirmation of SARS-CoV-2 infection reported that SARS-CoV-2 was detected in the foetal compartment of the placenta, while maternal blood and vaginal smears and samples of foetal amniotic fluid, foetal tissue and foetal blood and smears of the axilla, oral cavity, and foetal meconium tested negative [21]. The authors therefore speculate about the possibility of a late miscarriage due to placental infection with SARS-CoV-2 [21].

In the investigations carried out to date, SARS-CoV-2 was not detectable in the genital tract of women who developed disease (vaginal and cervical smears) but was detected in anal smears [27].

3. How does suspected or confirmed infection with COVID-19 affect the mode and time of delivery?

Although the majority of pregnant women with COVID-19 reported on in publications were delivered by Caesarean section, there are currently no confirmed indications that vaginal delivery is detrimental or delivery by Caesarean section is safer if COVID-19 is suspected or confirmed. The mode of delivery should therefore be selected on an individual basis according to the obstetric indications and the wishes of the pregnant woman.

Infection with COVID-19 is not an indication for early delivery per se, unless support for maternal oxygenation is required [28].

The time and mode of delivery should be selected on an individual basis which should depend, in the first instance, on the patient's clinical status and the gestational age and condition of the foetus [12, 28, 29].

The large case series now available report a lower rate of spontaneous preterm births than was originally assumed based on initial case reports.

The preterm birth rate in the series from Wuhan was 21 % (18 % for women with a mild course of disease and 43 % for women with severe disease) and was due to iatrogenic causes in more than half of cases [5]. Another large Chinese case series reported a spontaneous preterm birth rate of 6.1 % (6/99) and concluded, based on these figures, that COVID-19 infection was not associated with an increased rate of spontaneous preterm births [10]. It does, however, appear to lead to a slightly increased rate of iatrogenic preterm births in women who have severe disease.

Women who have spontaneous onset of labour with good progress of labour can have a vaginal birth [12]. Shortening the expulsive phase by surgical vaginal delivery may be considered, as wearing a protective mask may make it more difficult to actively push during labour [30]. However, Caesarean section may become necessary in cases with severe disease which require fast delivery or if there are indications of foetal distress.

The reported Caesarean section rates of pregnant women with COVID-19 have ranged from 42.9 % in an Italian series from Lombardy [12] to 95 % in a large Chinese series from the Wuhan region [5], while a systematic review found a rate of 92 % [6]. The percentage of obstetric (non-COVID-19-related) indications in the Chinese series was just under 40 % and was 44.4 % in the Italian series [5, 12]. Although the majority of pregnant women with COVID-19 infection reported in the literature were delivered by Caesarean section, there is currently no confirmed evidence that a vaginal birth would be detrimental or that delivery by Caesarean section would be safer if COVID-19 is suspected or confirmed. Inducing the birth may be considered if the conditions are favourable (e.g. under favourable cervical conditions), but if foetal distress is present, the birth is protracted and/or the mother's condition deteriorates, the aim should be to terminate the birth as soon as possible. Delivery should be carried out by Caesarean section at any time in the event of septic shock, acute organ failure or foetal distress (or the pregnancy should even be terminated if the foetus is not yet viable and it is legally possible) [31].

Medical staff present at the birth when the mother has tested positive for COVID-19 must take protective measures, particularly in the event of direct contact, for example during vaginal examinations or amniotomy, etc. [28]. Such protective measures include the use of single-use caps, protective gowns, shoe covers, protective respiratory masks (e.g. N95, FFP2, FFP3), protective goggles or face shields and gloves. It is also important to ensure good hand hygiene at all times [28]. Water births should be avoided in the interest of protecting medical staff.

Depending on the patient's clinical condition and the anaesthesiologist's assessment, both regional anaesthesia and a general anaesthetic may be considered [28, 29]. The use of nitrous oxide can increase aerosol formation and promote viral spread – it is therefore not advisable to use gas.

4. What is the neonatal outcome of pregnancies of women with COVID-19 infection?

The majority of data published to date on neonatal outcomes was positive.

The majority of data published to date on neonatal outcomes was positive, with reported neonatal mortality rates of 0–2 % [5, 6, 8, 10]. In the large case series by Yan et al., there was only one infant with severe asphyxia among the 100 neonates, although 47 % of the neonates were monitored in the intensive care unit [10]. There was only one neonatal death: that of an infant delivered by Caesarean section in the 35 + 2 week of gestation whose mother suffered from severe pneumonia with septic shock. None of the 86 tested neonates were found to be infected with SARS-CoV-2 [10].

In another large case series by Chen et al., there were no cases with asphyxia and no deaths in the group of 70 neonates [5]. Eight neonates were tested for SARS-CoV-2 using a throat swab, but all of the tests were negative [5].

A systematic review by Zaigham et al. found one neonatal death (1/87) [6]. In this study, one newborn infant had positive qRT-PCR for SARS-CoV-2 around 36 hours after the birth, although the infant had been separated from his mother.

In another study by Chen et al., all 9 children were born at ≥ 36 weeks of gestation and remained without symptoms until they were discharged [24]. Nine out of 10 neonates were tested for COVID-19 and all test results were negative [26].

Chen et al. reported on 6 women with COVID-19 infection who were delivered by Caesarean section; tests of amniotic fluid, umbilical cord blood, neonatal throat swabs and breast milk samples were negative for COVID-19 in all cases [24].

Wang et al. reported on a pregnant woman who gave birth in week 30 due to foetal distress. The neonate was clinically unremarkable, and samples of amniotic fluid, gastric fluid, placenta and throat swab were negative for COVID-19 [25]. Liu et al. reported on 10 pregnant women who were all delivered by Caesarean section. There were no cases of vertical transmission to the neonates, although the article does not report on the type and method used to test the infants [20].

Recently, there was some speculation about the possibility of vertical transmission based on a few case reports [32, 33], but the question has not yet been conclusively answered.

5. Can a woman with COVID-19 breastfeed her infant?

There are currently no indications that the virus can be transmitted through breastmilk. It is therefore assumed that the well-known benefits of breastfeeding outweigh the potential risks of transmitting the virus.

The data published to date found no signs of SARS-CoV-2 in the investigated breastmilk samples of mothers with COVID-19. This means that, based on our current understanding, the recommendation is that these infants should be fed with their mother's milk [5, 10, 24, 26]. There is not much evidence available yet on whether neonates should be separated from their mothers. If the mother is seriously or critically ill, then separation appears to be the best option, although it would be good if it were possible to pump breastmilk to maintain milk production. Appropriate hygiene measures must be taken to clean the breast pump. If the patient is asymptomatic or only has a mild form of disease, then breastfeeding and rooming-in can be done in consultation with the healthcare staff looking after mother and child [8, 29]. As the virus is primarily transmitted through droplets and not through breastmilk, nursing mothers must regularly wash their hands and at least wear a 3-layer surgical mask before they touch their newborn infant [8, 29, 34]. Alternatively, it might be possible to pump the breastmilk and a healthy attendant could then feed it to the infant [35]. In single rooms, the cot should be at least 2 metres away from the mother's bed, and physical barriers (e.g. curtain, screen) could additionally be used [29]. Spatially separating mothers with COVID-19 infection from their newborn infants would prevent mothers from having the option to breastfeed their infants and could have a negative impact on the early mother-child bond and negatively affect lactation [36]. These issues can result in additional maternal stress in the postpartum period. In addition to caring for the mother's physical well-being, medical teams also need to look after her emotional well-being and offer support if needed [36, 37].

6. Should women with suspected COVID-19 attend prenatal examinations?

All pregnant patients who visit hospitals or doctors' surgeries must be carefully questioned about their prior medical history with respect to clinical symptoms and risk factors (most recent travel activities, professional exposure, direct contact with infected persons or risk groups [travel, occupation, significant contact and cluster = TOCC]) (▶ **Fig. 1**) [29].

Pregnant patients with known TOCC risk factors and patients with mild or asymptomatic COVID-19 infection should postpone their prenatal examinations and routine ultrasound examinations for 14 days.

Pregnant women who have been in contact with persons infected with COVID-19 and pregnant women with mild COVID-19 should contact their gynaecologist to inform them that they are currently self-isolating because of possible or confirmed coronavirus infection. It is very probable that routine prenatal appointments can be postponed without damage to mother or child until the mother no longer needs to self-isolate or the patient has recovered from the infection. If the physician is of the opinion that an examination is urgently required, then the necessary precautions must be taken to ensure that the examination can be performed safely.

Malformations which can be detected prenatally occur in at least 1 to 2 percent of all pregnancies [38, 39]; this means that, given an annual birth rate of around 80 000 children in Austria, between 65 and 130 children with congenital malformations are expected every month, many of which can be identified by 2nd trimester anomaly screening [40 – 42]. For this reason, it is important not to delay screening examinations any longer than need be.

The mother's partner or children must not attend prenatal examinations [43]. It is important to clearly inform the mother of this when making the appointment to avoid long discussions at the entrance to the hospital or surgery. Accompanying persons waiting in front of the doctor's surgery or hospitals facilities also represent a risk of infection [43]. In this context, we would like to draw attention to the recommendations of the Working Group for Obstetrics and Gynaecology of the Austrian Society for Ultrasound in Medicine (ÖGUM) (http://www.oegum.at).

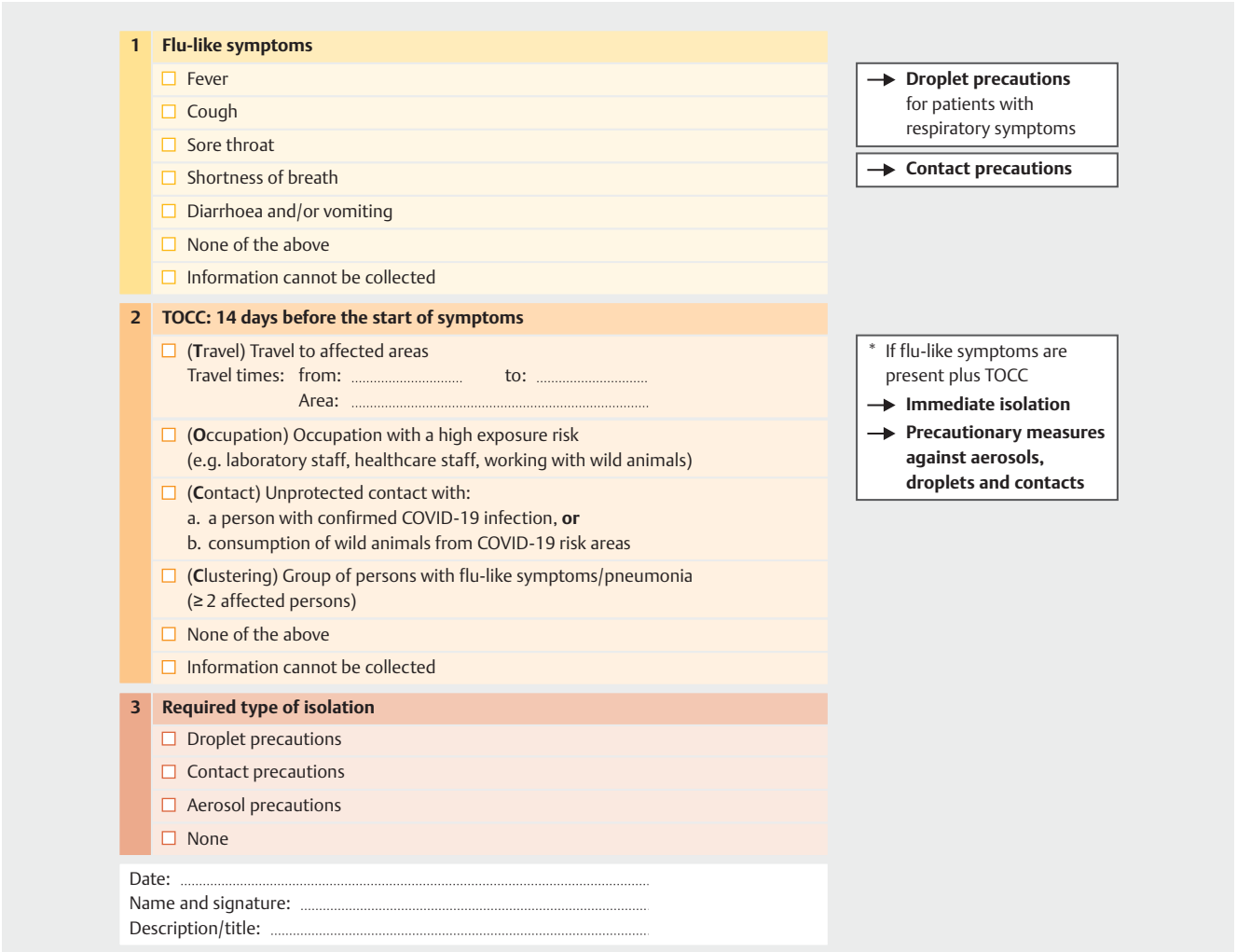
7. Will postponing or dispensing with the recommended screening examinations (mother/child-booklet examinations) result in financial disadvantages?

No. Because of the current coronavirus (COVID-19) situation, the following special rules have been issued by the Austrian Health Insurance Company (*Österreichische Gesundheitskasse*, ÖGK) and are currently applicable in Austria with regard to the required mother/child-booklet examinations (https://www.gesundheitskasse.at/cdscontent/?contentid=10007.857895&portal=oegkportal&viewmode=content) [44]:

a. Child benefit will not be reduced if it is impossible or unreasonable to require parents to attend appointments for to carry out mother/child-booklet examinations because of the current coronavirus situation. This is considered a reason for which parents cannot be held responsible (pursuant to Art. 7 Sec. 3 Para. 1 or Art. 24c Sec. 3 Para. 1 of the KBGG [Austrian Child Benefit Law]).
b. If the period in which the respective examinations must carried out has not expired when the current special circumstances have ceased to exist, then the examination must be carried out without delay. There are no provisions in the Mother/Child-Booklet Ordinance which would allow the period in which to carry out the examinations to be extended.
c. Late submission of the proofs that the examinations have been carried out is not permissible as the proofs do not have to be submitted in person. The proofs can also be sent by mail and photographs can be sent in good time by e-mail.

8. Which protective measures must be taken to protect pregnant employees?

a. The conditions for pregnant employees to be given leave of absence under Art. 3 Sec. 3 of the Austrian Maternity Protection Act are currently not fulfilled [45].



▶ **Fig. 1** Example of a symptom and TOCC checklist [29]. **Droplet precautions:** patient must wear a mask; isolation room; adequate protective equipment for medical staff entering the room (wearing a mask) [29]. **Contact precautions:** isolation rooms; adequate protective equipment for medical staff entering the room including gloves and gowns; use single-use protective clothing [29]. **Aerosol precautions:** patient must wear a mask; negative-pressure isolation room; adequate protective equipment for medical staff entering the room including appropriate protective respiratory mask, gloves, gown, face mask and goggles; limit access to room where possible; use single-use protective clothing [29].

b. However, the Austrian Labour Inspectorate [*Arbeitsinspektion*] recommends the following protective measures for pregnant employees (https://www.gesundheitskasse.at/cdscontent/?contentid=10007.857895&portal=oegkportal&viewmode=content) [45]:
   i) Pregnant women are not permitted to work in areas of direct care such as healthcare areas where protective masks FFP1, FFP2 or FFP3 have to be worn. These masks make it more difficult to breathe and are therefore prohibited for pregnant women.
   ii) In other areas which require a lot of contact with customers such as in supermarkets or pharmacies, pregnant women should be removed from areas where they work in direct contact with customers, if possible, and assigned to work in other areas. The employer must ensure that the necessary hygienic measures such as good hand hygiene and no touching of one's own face are complied with. In addition, a minimum distance of 1 m between people must be maintained.
   iii) If it is not possible to ensure minimum distancing, then other protective measures must be implemented. It would be useful to consult with the occupational healthcare officers on this point.
   iv) Pregnant women who work in healthcare or childcare must not be deployed to carry out tasks where it is not possible to comply with minimum distancing.
   v) Note: Surgical face masks do not provide the same level of respiratory protection as that provided by personal protective equipment. Pregnant women may use such surgical masks if necessary. But as the wearing of such masks is also associated with a certain level of respiratory resistance, it is important to ensure that the mask is not worn continu-

ously for more than one hour at a time, after which time the pregnant woman must take a break from wearing the mask.

vi) In an understanding issued by the Austrian social partners for commerce, companies have been asked to grant pregnant women leave of absence.

vii) Short-time work will not have an impact on maternity allowance.

Conclusion

Based on the currently available data, it can be concluded that in the majority of cases, a COVID-19 infection in the 2nd and 3rd trimester of pregnancy has an uncomplicated course and the overwhelming majority of children born to mothers with COVID-19 infection are healthy. The risk of intrauterine or perinatal transmission appears to be low even though a few individual cases of placental or neonatal infection have been described. There are very few reliable data on the effect of COVID-19 infection in early pregnancy.

Conflict of Interest

The authors declare that they have no conflict of interest.

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