BJOG An International Journal of Obstetrics and Gynaecology

Royal College of Obstetricians & Gynaecologists

DOI: 10.1111/1471-0528.16556
www.bjog.org

Original Article
General gynaecology

Detection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in vaginal swabs of women with acute SARS-CoV-2 infection: a prospective study

A Schwartz,[a,b] Y Yogev,[a,b] A Zilberman,[a,b] S Alpern,[a,b] A Many,[a,b] R Yousovich,[c] R Gamzu[a,b]

[a] Department of Obstetrics and Gynaecology, Lis Maternity Hospital, Sourasky Medical Centre, Tel Aviv, Israel [b] Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel [c] Maccabi Healthcare Services, Herzliya, Israel
Correspondence: A Schwartz, Lis Maternity Hospital, Sourasky Medical Centre, 6 Weizmann Street, 6423906, Tel Aviv, Israel.
Email: anatsch3@gmail.com

Accepted 28 September 2020. Published Online 8 November 2020.

Objective To determine whether severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is present in the vaginal secretions of both reproductive-aged and postmenopausal women during acute SARS-CoV-2 infection.

Design Prospective study.

Setting A single tertiary, university-affiliated medical centre in Israel. Time period, 1 June 2020 through to 31 July 2020.

Population Women who were hospitalised in a single tertiary medical centre, who were diagnosed with acute SARS-CoV-2 infection by a nasopharyngeal RT-PCR test.

Methods Women were diagnosed with acute SARS-CoV-2 infection by a nasopharyngeal RT-PCR test. Vaginal RT-PCR swabs were obtained from all study participants after a proper cleansing of the perineum.

Main outcome measures Detection of SARS-CoV-2 in vaginal RT-PCR swabs.

Results Vaginal and nasopharyngeal swabs were obtained from 35 women, aged 21–93 years. Twenty-one women (60%) were in their reproductive years, of whom, five were in their third trimester of pregnancy. Most of the participants (57%) were healthy without any underlying medical conditions. Of the 35 patients sampled, 2 (5.7%) had a positive vaginal RT-PCR for SARS-CoV-2, one was premenopausal and the other was a postmenopausal woman. Both women had mild disease.

Conclusion Our findings contradict most previous reports, which did not detect the presence of viral colonisation in the vagina. Although passage through the birth canal exposes neonates to the vaginal polymicrobial flora, an acquisition of pathogens does not necessarily mandate neonatal infection or clinical disease. Nevertheless, when delivering the infant of a woman with acute SARS-CoV-2 infection, a clinician should consider the possibility of vaginal colonisation, even if it is uncommon.

Keywords Severe acute respiratory syndrome coronavirus 2, vaginal secretion.

Tweetable abstract When delivering the infant of a woman with acute SARS-CoV-2 infection, a clinician should consider the possibility of vaginal colonisation.

Please cite this paper as: Schwartz A, Yogev Y, Zilberman A, Alpern S, Many A, Yousovich R, Gamzu R. Detection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in vaginal swabs of women with acute SARS-CoV-2 infection: a prospective study. BJOG 2021;128:97–100.

Introduction

The influence of severe acute respiratory coronavirus 2 (SARS-CoV-2) on the genitourinary system in general, and in particular on pregnancy outcome, remains controversial. Although positive polymerase chain reaction (PCR) tests were found in semen,[1] limited data exist regarding vaginal colonisation, which is clinically significant for assessment of the risk for both sexual and maternal–fetal transmission during vaginal delivery.[2–5] Moreover, data concerning possible neonatal infection due to viral acquisition during vaginal delivery are lacking.

Though reports of neonatal infection are anecdotal, doubt exists regarding route of infection. One study described neonatal infection with concomitant isolation of the virus from placental tissue, reinforcing the possibility of vertical transmission.[5] Others attributed neonatal infection to postnatal viral acquisition through environmental

exposure.[6,7] Intrapartum transmission through vaginal secretions, which resembles that of other pathogens like group B streptococcus, has not been reported.[8]

Previous studies that examined the presence of SARS-CoV-2 in vaginal secretions were limited by a small sample size and paucity of women of reproductive age;[9–11] we aimed to determine whether SARS-CoV-2 is present in the vaginal secretions of both reproductive-aged and post-menopausal women during acute SARS-CoV-2 infection.

Methods

This was a prospective study of women hospitalised in a single tertiary, university-affiliated medical centre, who were diagnosed with acute SARS-CoV-2 infection by a nasopharyngeal reverse transcription (RT-) PCR test.

Disease severity was defined according to Modified Early Warning Score (MEWS).[12] A score of 5 or more was shown to be associated with an increased risk of clinical deterioration and death.

Vaginal RT-PCR swabs were obtained from all study participants. If more than 48 hours elapsed from the nasopharyngeal swab confirming SARS-CoV-2, an additional nasopharyngeal swab was taken along with the vaginal swab. Only women with positive nasopharyngeal swab confirming SARS-CoV-2 were enrolled. To reduce the risk for faecal contamination, proper cleansing of the perineum was performed before sampling. Swabs were inserted 4–5 cm into the vaginal vault and rotated for 5 seconds. Immediately after sampling the kit was transferred to the microbiological laboratory. All samples were tested for SARS-CoV-2 using the sampling kit Cobas SARS-CoV-2 (Cobas 6800 machine; Rosche, Rotkreuz, Switzerland). Sample collection, processing and laboratory testing were performed in accordance with World Health Organization guidelines.[13]

The study was approved by the local institutional review board (No. 0260-20-TLV) and written informed consent was obtained from all participants.

Descriptive statistics were used to assess the demographic and clinical characteristics of the participants, and are presented as mean ± standard deviation or range.

There was no patient involvement or public involvement in the design and conduct of this research.

Results

Vaginal and nasopharyngeal swabs were obtained from 35 women, aged 21–93 years. Demographic and clinical characteristics of the participants are presented in Table 1. Twenty-one women (60%) were of reproductive age, and of them, five were in their third trimester of pregnancy, with mean gestational age of 34^{+3} weeks (± 4.9 weeks).

Table 1. Demographic and clinical characteristics of women with acute SARS-CoV-2 infection

Characteristic	
Age (years)	48.3 (21–93)
Reproductive-aged women	21 (60)
Pregnant	5 (14.2)
Postmenopausal	14 (40)
BMI (kg/m^2)	26.2 ± 5.7
Smoking	0
Underlying medical disorders	
Obesity (BMI >30 kg/m^2)	6 (17.1)
Chronic hypertension	7 (20)
Type II diabetes mellitus	4 (11.4)
Cardiac disease*	3 (8.6)
Dyslipidaemia	5 (14.3)
Lupus erythematosus	1 (2.8)
APLA	1 (2.8)
Asthma	1 (2.8)
Hypothyroidism	2 (5.7)
None	20 (57.1)
Presenting symptoms	
Headache	12 (34.3)
Respiratory**	25 (71.4)
Gastrointestinal***	10 (28.6)
Anosmia and ageusia	8 (22.9)
Chest pain	4 (11.4)
Fever (>38°C)	12 (37.4)
Asymptomatic	6 (17.1)

APLA, antiphospholipid antibody; BMI, body mass index.
Data are presented as *n* (%), mean ± SD or median (IQR).
*Cardiac disease included ischaemic heart disease and congestive heart failure.
**Respiratory symptoms included cough and dyspnoea.
***Gastrointestinal symptoms included nausea, vomiting, diarrhoea and anorexia.

Most of the participants (57%) were otherwise healthy with no underlying medical conditions.

Disease severity at the time of vaginal sampling is presented in Table 2. The mean time interval between symptom onset and vaginal sampling was 8.3 days (±4.6 days). Most patients (85%) had mild to moderate disease, and 74% of the study group did not require any respiratory support; moreover, 74% of the entire group were admitted for observation and did not require any medical treatment.

Of the 35 women sampled, 2 (5.7%) had a positive vaginal RT-PCR for SARS-CoV-2. The first patient was 86 years old, with a significant medical history of hypertension, cardiac and renal failure, type 2 diabetes mellitus and a previous deep vein thrombosis. During her admission, she was afebrile and remained haemodynamically stable, not requiring any medical treatment. She was categorised as MEWS 3. Vaginal sampling was performed 11 days after diagnosis of SARS-CoV-2. Two days after the first positive vaginal swab was

Table 2. Medical status at the time of vaginal sampling

	n (%)
Interval between onset of symptoms and vaginal sampling (days)	8.3 ± 4.6
MEWS ≥5	5 (14.3)
Treatment	
Dexamethasone	9 (25.7)
LMWH	8 (22.9)
Actemra (IL-6 receptor antagonist)	5 (14.3)
Convalescent plasma	1 (2.9)
Remdesivir	3 (8.6)
None	26 (74.3)
Respiratory support	
Nasal cannula/Vapotherm	8 (22.9)
Mechanical ventilation	1 (2.9)
Leucopenia <4 (10e3/μl)	4 (12.1)
Leucocytosis >12 (10e3/μl)	3 (9.1)
Neutrophilia >85%	4 (12.1)
Lymphopenia <1000 (10e3/μl)	12 (34.3)

IL-6, interleukin-6; LMWH, low-molecular-weight heparin; MEWS, Modified Early Warning Score.[13]
Results are presented as mean ± SD or *n* (%).

obtained, a repeat vaginal swab was performed to reduce the risk of faecal contamination, which was also positive.

The second participant with a positive vaginal RT-PCR for SARS-CoV-2 was a 21-year-old, healthy woman, who was admitted because of a short episode of dyspnoea that had resolved. During her admission, she developed a sore throat and fatigue. Vaginal sampling was performed 6 days after symptom onset. She remained afebrile and haemodynamically stable, did not require any medical treatment and was categorised as MEWS 1.

Discussion

Main findings

In the current study, we aimed to determine whether SARS-CoV-2 was detectable in the vaginal secretions of women with an acute SARS-CoV-2 infection. We found a positive vaginal RT-PCR in two women (5.7%), one of them was premenopausal and the other was postmenopausal. Our findings are supported by a previous case report of a 23-year-old primiparous woman with a positive vaginal RT-PCR for SARS-CoV-2.[5] However, our findings contradict previous reports, which did not detect the presence of viral colonisation in the vagina.[9–11] This discrepancy can be explained by the small number of cases in each group. As we assume that vaginal colonisation of SARS-CoV-2 has relatively low incidence, larger studies are required to confirm our findings. Another explanation could be a correlation between the presence of a high viral load and/or viraemia, and vaginal detection of the virus.

Strengths and limitations

The main strengths of our study are the relatively large study group, with a dominance of reproductive-aged women. Additionally, 85% of the participants presented with mild to moderate disease. We assumed that women with severe illness, who had respiratory and haemodynamic compromise, will most probably be delivered by a caesarean section, so the study group in the current study optimally reflects our group of interest. There are several limitations to our study. Although we performed proper cleansing of the perineum before sampling, we cannot rule out the possibility of a false-positive result. Additionally, a positive sample does not necessarily mean that the virus colonising the vagina is viable and/ or intact. Moreover, our sample size makes it difficult to draw conclusions regarding the incidence of vaginal colonisation and the possibility of maternal–fetal or sexual transmission, larger studies over longer periods of time are required to confirm our results.

Interpretation

Our findings may have significant clinical implications. Although passage through the birth canal exposes neonates to the vaginal polymicrobial flora, an acquisition of pathogens does not necessarily mean a neonatal infection or clinical disease. This can be influenced by many factors, including prematurity, underlying medical condition of mother and neonate, inoculum size and the virulence of the pathogen. The scarcity of evidence regarding the neonatal outcome of women in labour with acute SARS-CoV-2 infection should be taken into consideration at the time of delivery. Although we did not find vaginal colonisation by SARS-CoV-2 in any of the pregnant women in the study, it is still too early to determine the safety of vaginal delivery in women with acute SARS-CoV-2 infection. Further studies are needed before this can be definitively determined.

Conclusion

In conclusion, in the current study we found a positive vaginal RT-PCR in two women (5.7%). Although passage through the birth canal exposes neonates to the vaginal polymicrobial flora, an acquisition of pathogens does not necessarily mandate neonatal infection or clinical disease. Nevertheless, when delivering the infant of a woman with acute SARS-CoV-2 infection, a clinician should consider the possibility of vaginal colonisation, even if it is uncommon.

Disclosure of interests

All authors report no conflict of interests. Completed disclosure of interests forms are available to view online as supporting information.

Contribution to authorship

AS designed the study together with RY, YY and RG. AS applied for ethical approval; AS recruited the participants and collected the samples together with AZ and SA. In addition, AS analysed the data with support from YY and RG. AS wrote the manuscript. The manuscript was revised by YY, AM and RG and they also approved the final version.

Details of ethical approval

Ethical approval was obtained from the research ethics committee at Tel-Aviv Sourasky Medical Centre: registration number 0260-20-TLV, date of approval 22 April 2020. A written informed consent was obtained from all participants. The information given to the patients contains information that data from the registers may be used in research. Patients always have the possibility to remove any personal data from the registers.

Funding

None.

Acknowledgement

The authors thank Ms Ora Halutz for her contribution to the study.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article. ■

References

1 Li D, Jin M, Bao P, Zhao W, Zhang S. Clinical Characteristics and Results of Semen Tests Among Men With Coronavirus Disease 2019. *JAMA Netw open* 2020;3:e208292.
2 Chen S, Huang B, Luo DJ. Pregnant women with new coronavirus infection: a clinical characteristics and placental pathological analysis of three cases. *Zhonghua bing li xue za zhi = Chinese J Pathol* 2020;49:418–23.
3 Fan C, Lei D, Fang C. Perinatal Transmission of COVID-19 Associated SARS-CoV-2: Should We Worry? *Clin Infect Dis* 2020; ciaa226. https://doi.org/10.1093/cid/ciaa226.
4 Dong L, Tian J, He S. Possible Vertical Transmission of SARS-CoV-2 from an Infected Mother to Her Newborn. *JAMA - J Am Med Assoc* 2020;323:1846–8.
5 Vivanti AJ, Vauloup-Fellous C, Prevot S. Transplacental transmission of SARS-CoV-2 infection. *Nat Commun* 2020;11:1–7.
6 Yu N, Li W, Kang Q. Clinical features and obstetric and neonatal outcomes of pregnant patients with COVID-19 in Wuhan, China: a retrospective, single-centre, descriptive study. *Lancet Infect Dis* 2020;20:559–64.
7 Zeng L, Xia S, Yuan W. Neonatal Early-Onset Infection with SARS-CoV-2 in 33 Neonates Born to Mothers with COVID-19 in Wuhan, China. *JAMA Pediatr* 2020;174:722–5.
8 Prevention of Group B Streptococcal Early-Onset Disease in Newborns: ACOG Committee Opinion, Number 797. *Obstet Gynecol* 2020;135:e51–72.
9 Qiu L, Liu X, Xiao M. SARS-CoV-2 is not detectable in the vaginal fluid of women with severe COVID-19 infection. *Clin Infect Dis* 2020;71:813–7.
10 Aslan MM, Uslu Yuvacı H, Köse O. SARS-CoV-2 is not present in the vaginal fluid of pregnant women with COVID-19. *J Matern Neonatal Med* 2020;0;1–3.
11 Cui P, Chen Z, Wang T. Severe acute respiratory syndrome coronavirus 2 detection in the female lower genital tract. *Am J Obstet Gynecol* 2020;223:131–4.
12 Subbe CP, Kruger M, Rutherford P, Gemmel L. Validation of a modified early warning score in medical admissions. *QJM - Mon J Assoc Physicians* 2001;94:521–6.
13 World Health Organization. *Laboratory testing for coronavirus disease 2019 (COVID-19) in suspected human cases: interim guidance, 2 March 2020*. Geneva: World Health Organization; 2020.