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Original Article

Screening for COVID-19 in asymptomatic pregnant women: Which is better; rectal or oropharyngeal/nasopharyngeal swab?

Asemptomatik gebe kadınlarda COVID-19 taraması: Hangisi daha iyi; rektal mi orofaringeal / nazofaringeal süruntü mü?

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Abstract

Aim: The aim of the study was to evaluate the incidence of asymptomatic COVID-19 disease in pregnant women with rectal and oropharyngeal/nasopharyngeal swab to compare the efficacy of two samples.

Material and Method: This prospective cohort study included 234 asymptomatic pregnant women who had undergone planned cesarean section between May 7 and September 24, 2020 in obstetrics unit of a tertiary care center, in Ankara, Turkey. The oropharyngeal/nasopharyngeal swab, rectal swab, placental, amniotic fluid, and cord blood samples were obtained from all participants. The placental, amniotic fluid, and cord blood samples were tested when any of the oropharyngeal/nasopharyngeal or rectal samples were positive. The real-time reverse transcriptase-polymerase chain reaction (RT-PCR) test was performed to detect SARS-CoV-2 virus in the samples.

Results: The incidence of the asymptomatic COVID-19 disease was 0.42% (1/234) in the study population. One of 234 oropharyngeal/nasopharyngeal swabs was positive, while none of the rectal swabs including the one positive with oropharyngeal/nasopharyngeal swab were positive for SARS-CoV-2 virus. The RT-PCR test results of the placental, amniotic fluid, and cord blood samples of the COVID-positive case were negative.

Conclusion: The incidence of asymptomatic COVID-19 disease in pregnant women who had undergone elective cesarean delivery was low, in Ankara, Turkey. In asymptomatic pregnant women, oropharyngeal/nasopharyngeal swab was found to be more useful in detecting COVID-19 disease compared to rectal swab. No evidence was found about the intrauterine transmission of asymptomatic disease.

Keywords: COVID-19; SARS-CoV-2; coronavirus; pregnancy; oropharyngeal/nasopharyngeal swab; rectal swab

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Öz

Amaç: Çalışmanın amacı, rektal ve orofaringeal / nazofaringeal sürüntü ile gebelerde asemptomatik COVID-19 hastalık insidansını değerlendirerek iki yöntemin etkinliğini karşılaştırmaktı.

Gereç ve Yöntem: Bu prospektif kohort çalışmasına, Ankara'da üçüncü basamak bir merkezin obstetri ünitesinde 7 Mayıs-24 Eylül 2020 tarihleri arasında planlı sezaryen yapılan 234 asemptomatik gebe dahil edildi. Tüm katılımcılardan orofaringeal / nazofaringeal sürüntü, rektal sürüntü, plasental, amniyotik sıvı ve kordon kanı örnekleri alındı. Orofaringeal / nazofaringeal veya rektal örneklerden herhangi biri pozitif olduğunda plasental, amniyotik sıvı ve kordon kanı örnekleri test edildi. Örneklerdeki SARS-CoV-2 virüsünü tespit etmek için gerçek zamanlı ters transkriptaz-polimeraz zincir reaksiyonu (RT-PCR) testi yapıldı.

Bulgular: Asemptomatik COVID-19 hastalık insidansı çalışma popülasyonunda % 0,42 (1/234) idi. 234 orofaringeal / nazofaringeal sürüntüden biri pozitif iken, orofaringeal / nazofaringeal sürüntü ile pozitif olan dahil rektal sürüntülerin hiçbiri SARS-CoV-2 virüsü için pozitif değildi. COVID pozitif olgunun plasental, amniyotik sıvı ve kordon kanı örneklerinin RT-PCR testi sonuçları negatifti.

Sonuç: Ankara'da elektif sezaryen ile doğum yapmış gebelerde asemptomatik COVID-19 hastalığı insidansı düşüktü. Asemptomatik hamile kadınlarda, orofaringeal / nazofaringeal sürüntü rektal sürüntü ile karşılaştırıldığında COVID-19 hastalığını tespit etmede daha yararlı bulundu. Asemptomatik hastalığın intrauterin geçişine dair bir kanıt bulunamadı.

Anahtar Kelimeler: COVID-19; SARS-CoV-2; koronavirüs; gebelik; orofaringeal/ nazofaringeal sürüntü; rektal sürüntü

1. Introduction

The world is under the influence of a pandemic caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) since early 2020. World Health Organization (WHO) announced the name of respiratory illness caused by this novel type of coronavirus as Coronavirus Disease -2019 (COVID-19) on February 11,2020 (1).Clinical presentation of this infectious disease ranges from an asymptomatic presentation to a severe or fatal condition (2). Based on the data obtained from the SARS-CoV and MERS-CoV epidemics, it can be concluded that respiratory diseases during pregnancy may be associated with increased morbidity and high maternal mortality rates. Severe Acquired Respiratory Distress Syndrome epidemic caused by SARS-CoV exhibited a mortality rate of 25% (3) and the reported fetal demise rate was 27% in pregnant women with the Middle-East Respiratory Syndrome caused by MERS-CoV (4). Fortunately, according to the current available knowledge, the pregnant women with COVID-19 have not an increased risk of severe disease compared to general society (5,6). About 85% of pregnant women experienced mild disease, 10% had severe and 5% critical disease (5). Symptoms of the disease are generally nonspecific including headache, malaise, rash, sputum production, fever, cough, dyspnea, and diarrhea (5).

Some of pregnant women had asymptomatic COVID-19 disease. Reported asymptomatic disease rate ranges between 0.43 -17.6% in pregnant individuals (7-13). This wide range could prevent to universalize the management of pregnant women admitted for delivery during the pandemic. Close contact during labor and delivery increases the risk of disease transmission to the healthcare professionals. Cesarean section has also additive risks due to the nature of surgical procedure. Although there is currently no evidence, the possibility of SARS-CoV-2 virus presence in body cavities suggests an increased risk of disease transmission for the surgical team. For this reason, it is recommended to postpone elective gynecological surgeries if possible, and perform SARS-CoV-2 test preoperatively during pandemic (14). However it is not possible to postpone the cesarean deliveries. Knowing the exact incidence of asymptomatic pregnant women is important for the appropriate management.

The screening test for SARS-CoV-2 is carried out by oropharyngeal/nasopharyngeal swab (15). From a start point of symptomatology which includes diarrhea, we hypothesize that rectal swab could also be useful in screening of the disease. The aim of this study was to evaluate the incidence of asymptomatic COVID-19 disease in pregnant women with rectal and oropharyngeal/nasopharyngeal swabs and comparing the efficacy of two samples. In addition to this, we test for vertical transmission risk of asymptomatic disease to the fetus.

2. Material and Method

This is a prospective cohort study conducted between May 7 and September 24, 2020 in a tertiary care center, Ankara, Turkey. Asymptomatic pregnant women admitted to the

obstetrics unit for planned cesarean delivery were included in the study. The study protocol was approved by the Etlik Zübeyde Hanım Women's Health Training and Research Hospital ethical committee (2020/54) and complied with the Declaration of Helsinki and Good Clinical Practice guidelines. The signed informed consent was obtained from all participants.

Demographical and clinical characteristics of cases were recorded. Pregnant women older than 18 years old and without symptoms of COVID-19 disease (fever, cough, diarrhea, and respiratory distress) were included in the study. Women younger than 18 years of age, without consent, with the symptoms of upper respiratory tract disease, diarrhea, and fever above 37.5°C were excluded from the study. A power analysis was performed to calculate the sample size; assuming statistical significance as 0.05, we recruited 234 individuals to have an 80% power with 5% type I error level (13).

Pregnant women included in the study were screened for SARS-CoV-2 positivity upon admission to the obstetrics unit for planned cesarean delivery. Five samples for testing were obtained from all participants. A single swab from both oropharynx and nasopharynx was obtained firstly. Secondly, a rectal swab was taken in the operating room under spinal anesthesia before cesarean section. To assess the intrauterine transmission of COVID-19 to the fetus, amniotic fluid and cord blood samples with the amounts of 5 ml, and a placental sample with a volume of 2-3 cm3were obtained during the cesarean section and kept at -20°C until any of respiratory and/or rectal samples will be positive. The oropharyngeal/nasopharyngeal and the rectal swabs placed into 2 ml Viral Transport Medium (Lingen, Songjiang, Shangai and Bioeksen, Istanbul, Turkey). All samples were transferred to the laboratory and tested for SARS-CoV-2 within the 12 hours after collection. CoVirex extraction kit (Medamet, Ankara, Turkey) was used for RNA extraction. The real-time reverse transcriptase-polymerase chain reaction (RT-PCR) was carried out by using CoVirion SARS CoV-2 (2019nCOV) One Step RT-PCR targeting SARS CoV-2 specific S gene fragment (Ankara, Turkey) in Rotor-Gene Q device (Qiagen, Hilden, Germany).When any of the oropharyngeal/nasopharyngeal or rectal samples were positive; placental, amniotic fluid, and cord blood samples were tested.

Statistical analyses were carried out using IBM SPSS Statistics 17.0 software (SPSS Inc., Chicago, IL, USA). Descriptive statistics are expressed as mean ± standard deviation or median (min-max) for continuous variables and number and percentage for categorical variables. The incidence of asymptomatic COVID-19 in women who admitted for planned cesarean delivery was calculated from the number of women who had positive test per 100 women tested.

3. Results

During the study period, demographic and clinical characteristics of 241 women that had undergone planned cesarean delivery were evaluated. A woman with the age of 16 years old, 4 women who refused to undergo oropharyngeal/nasopharyngeal swab, and 2 women with the COVID-19 related symptoms were excluded from the study. A total of 234 women were included in the study.

Demographic and clinical characteristics of study population are shown in **Table I.** The mean age of women was 29.59 ± 5.29 years. The median gravidity and parity were 3 (min 1 - max 7) and 1 (min 0 - max 5), respectively. Five women (2.14%) had gestational age of less than 37 weeks at admission. The remaining 229 (97.86%) women had term pregnancy. The live birth rate was 100% in the study population and the mean newborn birthweight was 3291.31 ± 450.21 grams.

Positive RT-PCR test was detected in 1 of 234 (0.42%) oropharyngeal/nasopharyngeal samples. None of the RT-PCR tests obtained via rectal swab was positive. The COVID-19 positive case was a 23 year old multiparous woman. Due to the cephalopelvic disproportion, she delivered a 3770 gr boy by cesarean section at 40 weeks of gestation. Intrauterine transmission of SARS-CoV-2 was also evaluated by testing the placental, amniotic fluid, and cord blood samples obtained during cesarean section in this case. RT-PCR tests of these three samples were negative.

4. Discussion

According to study results, the incidence of asymptomatic COVID-19 was 0.4% in pregnant women. The oropharyngeal/nasopharyngeal swab detected the disease in the positive case, while the rectal swab could not. No evidence was found about the intrauterine transmission of disease in this asymptomatic woman.

The COVID-19 pandemic has influenced all countries in the world. Various numbers of patients continue to be reported from various regions. The incidences of asymptomatic pregnant women infected with SARS-CoV-2 were also different in different regions of the world. Approximately 13% asymptomatic SARS-CoV-2 positivity was reported in two different studies conducted in New York, the United States (13,16). Based on emerging evidence, the universal screening test for SARS-CoV-2 was offered in all pregnant women during the admission to the obstetrics units (17). However, lower rates of asymptomatic disease in pregnant women were also reported. The rates of SARS-CoV-2 positivity in asymptomatic pregnant women in California, Madrid, Toscana, and Geona were reported to be around 0.4-0.5% (7,8,18). These reports suggest that the universal screening of pregnant women may not be suitable for the whole regions in the world. The triage system testing cases that represent COVID 19 symptoms or contacted with COVID-positive people rather than universal screening in the regions with low disease incidence may be the more cost-effective.

Table I. Demographic and clinical characteristics of the study population	
Characteristics	
Age, years	29.59 ± 5.29
Gravidity	
0-1	24 (10.26%)
2	80 (34.19%)
≥3	130 (55.56%)
Parity	
Nulliparous	28 (11.97%)
Multiparous	206 (88.03%)
BMI, kg/m2	30.46 ± 4.69
Gestational age at admission, weeks	
34-34/6	1 (0.42%)
35-35/6	2 (0.86%)
36-36/6	2 (0.86%)
37-37/6	21 (8.97%)
38-38/6	47 (20.09%)
39-39/6	135 (57.69%)
40-40/6	19 (8.12%)
41-41/6	7 (2.99%)
Newborn birthweight, gr	3291.31 ± 450.21
Smoking	26 (11.11%)
Comorbidities	
Gestational diabetes mellitus	9 (3.85%)
Hypothyroidism	5 (2.14%)
Hyperthyroidism	1 (0.42%)
Thyroid nodule	3 (1.28%)
Thalassemia	1 (0.42%)
Genital wart	1 (0.42%)
Coagulopathy	1 (0.42%)
History of deep vein thrombosis	1 (0.42%)
Obstetrical complications	
Fetal anomaly	2 (0.86%)
IUGR	6 (2.56%)
PPROM	1 (0.42%)
Preterm delivery	1 (0.42%)
Polyhydramnios	2 (0.86%)
Cesarean indication	
Previous cesarean delivery	191(81.62%)
Cephalopelvic disproportion	28 (11.97%)
Noncephalic presentation	9 (3.85%)
Fetal macrosomia	4 (1.71%)
Multiple pregnancy	1 (0.42%)
Vaginismus	1 (0.42%)
Live birth	234 (100.00%)
Positive RT-PCR test	
Oropharyngeal/nasopharyngeal	1 (0.42%)
Rectal	0 (0.00%)
Amniotic fluid	0 (0.00%)
Cord blood	0 (0.00%)
Placenta	0 (0.00%)

Data are mean ± Standard deviation or number (%)
IUGR, intrauterine growth restriction; PPROM, preterm premature rupture of membrane; RT-PCR, real-time reverse transcriptase-polymerase chain reaction

In Turkey, asymptomatic COVID 19 rate among pregnant women was reported as 4% in Istanbul (11) and 1.4% in Ankara (19). In our series, the incidence of asymptomatic disease in women who undergone elective cesarean section was lower than these two studies (0.4%). The reason of these discordant results from the same country may be associated with centers that the studies conducted. The previous two studies conducted in the Coronavirus Pandemic Hospitals. Patients diagnosed with COVID-19 or people who have been in contact with a COVID-19 positive person mostly admit to these centers. Our hospital was not a pandemic hospital and our study cohort population was more representative of the general society.

The other concern about the COVID-19 disease in pregnant women is vertical transmission. The SARS-CoV-2 virus infects respiratory epithelial cells through Angiotensin Converting Enzyme 2 (ACE2) receptors (20). Increased expression of ACE2 receptors in the placenta (21) suggests a theoretical vertical transmission risk in infected pregnant women. According to the current data, there is little evidence of vertical transmission from the COVID-positive mother to the newborn. Fassett et al. (7), Prabhu et al. (9), and Zhu et al. (22) evaluated the nasopharyngeal and throat swabs of 98 neonates with COVID positive mother, and they reported no vertical transmission. Chen et al. (23) reported negative SARS-CoV-2 test results of amniotic fluid, cord blood, neonatal throat swab, and breastmilk samples obtained from nine pregnant women with COVID-19 pneumonia. However, in a systematic review including ten studies, 19 neonatal nasopharyngeal swabs were reported SARS-CoV-2 positive (24). Four placental samples and one cord blood sample were also reported positive in this review. In our series, RT-PCR test results of amniotic fluid, cord blood and placenta obtained from asymptomatic COVID-19 positive woman were negative. In the light of these findings, the current data are not sufficient to make a definitive decision if any about the rate and time (intrauterine, intrapartum or postpartum) of vertical transmission. Prospective comprehensive studies are needed to clarify this issue.

ACE2 receptors are predominantly found in type II alveolar cells (20). Additionally, these receptors have also been demonstrated in the digestive tract mucosa (25). Holshue et al. (26) isolated the virus in the stool and nasopharyngeal swab of the first case reported in the United States while the serum test was negative. In the presented study, oropharyngeal/nasopharyngeal swab was found to be more useful in detecting COVID-19 disease compared to rectal swab. However we observed only one positive case in the cohort. Thus, further studies including larger number of asymptomatic cases are needed to conclude that the rectal swab is not useful. Prospective design and the

large cohort are the strengths of this study. There are also limitations of the study. To compare the efficacy of the two sampling methods, the low number of positive case is one of the limitations. This issue also caused to insufficient data for the secondary outcome of the study, intrauterine transmission. According to study design, SARS-CoV-2 tests of amniotic fluid, cord blood and placenta samples were carried out if any of the oropharyngeal/nasopharyngeal and rectal samples were positive. So, these three samples could be tested in only one positive woman during the study period. Lack of the long term follow-up findings of positive case is the other limitation.

In conclusion, the study results showed that the incidence of asymptomatic COVID-19 disease rate in pregnant women who had undergone elective cesarean delivery was low, in Ankara, Turkey. The triage system could be more cost-effective than the universal screening preoperatively in the regions with low disease incidence. We observed a better disease detection rate with oropharyngeal/nasopharyngeal swab compared to rectal swab. Fetal transmission of asymptomatic COVID-19 disease was not observed in the study cohort. However, further larger series are required to clarify the issue of intrauterine transmission.

Conflict of Interest

There is no person/organization that financially supports the work and the authors have no conflict of interest.

References

1. WHO. Rolling updates on coronavirus disease (COVID-19). 2020. Available at<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-asthey- happen>.Accesion date: December 3, 2020
2. Wang D, Hu B, Hu C, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. JAMA. 2020;323:1061-1069.
3. Wong S, Chow K, Leung T, et al. Pregnancy and perinatal outcomes of women with severe acute respiratory syndrome. Am J Obstet Gynecol 2004; 191:292-297.
4. Alfaraj SH, Al-Tawfiq JA, Memish ZA. Middle East Respiratory Syndrome Coronavirus (MERS-CoV) infection during pregnancy: report of two cases & review of the literature. J Microbiol Immunol Infect 2019; 52:501-503.
5. Ryan GA, Purandare NC, McAuliffe FM, Hod M, Purandare CN. Clinical update on COVID-19 in pregnancy: A review article. J Obstet Gynaecol Res 2020; 46:1235-1245.
6. Damar Çakırca T, Torun A, Hamidanoğlu M, et al. COVID-19 infection in pregnancy: a single center experience with 75 cases. Ginekol Pol 2021; doi: 10.5603/GP.a2021.0118. Epub ahead of print. PMID: 34263921.
7. Fassett MJ, Lurvey LD, Yasumura L,et al. Universal SARS-Cov-2 Screening in Women Admitted for Delivery in a Large Managed Care Organization. Am J Perinatol 2020; 37:1110-1114.
8. Herraiz I, Folgueira D, Villalaín C, Forcén L, Delgado R, Galindo A. Universal screening for SARS-CoV-2 before labor admission during Covid-19 pandemic in Madrid. J Perinat Med 2020; 48:981-984.
9. Prabhu M, Cagino K, Matthews KC,et al. Pregnancy and postpartum outcomes in a universally tested population for SARS-CoV-2 in New York City: a prospective cohort study. BJOG.2020; 127:1548-1556.
10. Figueiredo R, Tavares S, Moucho M, Ramalho C. Systematic screening for SARS-CoV-2 in pregnant women admitted for delivery in a Portuguese maternity J Perinat Med 2020; 48:977-980.
11. Yassa M, Yirmibes C, Cavusoglu G,et al. Outcomes of universal SARS-CoV-2 testing program in pregnant women admitted to hospital and the adjuvant role of lung ultrasound in screening: a prospective cohort study. J Matern Fetal Neonatal Med 2020; 33:3820-3826.
12. London V, McLaren R Jr, Atallah F,et al. The Relationship between Status at Presentation and Outcomes among Pregnant Women with COVID-19. Am J Perinatol 2020; 37:991-994.
13. Sutton D, Fuchs K, D'Alton M, Goffman D. Universal Screening for SARS-CoV-2 in Women Admitted for Delivery. N Engl J Med 2020; 382:2163-2164.
14. Chiofalo B, Baiocco E, Mancini E,et al. Practical recommendations for gynecologic surgery during the COVID-19 pandemic. Int J Gynaecol Obstet 2020; 150:146-150.
15. World Health Organization (2020a) Laboratory testing for 2019 novel coronavirus (2019-nCoV) in suspected human cases. Available at <https://www.who.int/publications/i/item/laboratory-testing-of-2019-novel-coronavirus-(-2019-ncov)-in-suspected-human-cases-interim-guidance-17-january-2020.> Accesion date: December 3, 2020.
16. Vintzileos WS, Muscat J, Hoffmann E, et al. Screening all pregnant women admitted to labor and delivery for the virus responsible for COVID-19. Am J Obstet Gynecol 2020; 223:284-286.
17. GynaecologistsRCoO. Principles for the testing and triage of women seeking maternity care in hospital settings, during the COVID-19 pandemic. 2020.

18. Gagliardi L, Danieli R, Suriano G, et al. Universal SARS-CoV-2 testing of pregnant women admittedfor delivery in two Italian regions. Am J Obstet Gynecol 2020; 223:291-292.
19. Tanacan A, Erol SA, Turgay B, et al. The rate of SARS-CoV-2 positivity in asymptomatic pregnant women admitted to hospital for delivery: Experience of a pandemic center in Turkey. Eur J Obstet Gynecol Reprod Biol 2020; 253:31-34.
20. Dashraath P, Wong JLJ, Lim MXK, et al. Coronavirus disease 2019 (COVID-19) pandemic and pregnancy. Am J Obstet Gynecol 2020; 222:521-531.
21. Levy A, Yagil Y, Bursztyn M, Barkalifa R, Scharf S, Yagil C. ACE2 expression and activity are enhanced during pregnancy. Am J Physiol Regul Integr Comp Physiol 2008; 295:R1953-1961.
22. Zhu H, Zhu H, Wang L, et al. Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia. Transl Pediatr 2020; 9:51-60.
23. Chen H, Guo JMS, Chen W,et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. Lancet 2020; 395:809-815.
24. Pettirosso E, Giles M, Cole S, Rees M. COVID-19 and pregnancy: A review of clinical characteristics, obstetric outcomes and vertical transmission. Aust N Z J Obstet Gynaecol 2020; 60:640-659.
25. Xu H, Zhong L, Deng J, et al. High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa. Int J Oral Sci 2020; 12:8.
26. Holshue ML, DeBolt C, Lindquist S, et al. First Case of 2019 Novel Coronavirus in the United States. N Engl J Med 2020; 382:929-936.