

Screening for SARS-CoV-2 infection in women prepared for elective Cesarean Section: A tertiary hospital study

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Abstract

Background and objectives: The SARS-CoV-2 infection is a major concern as universal testing should be undertaken to pregnant women due to the high danger of transmission from a pregnant woman to her newborn. This study was conducted to report the rate of SARS-CoV-2 infection in women admitted to hospital for purpose of preparation for elective cesarean section and to find out their risk factors and any histories of the infection previously.

Methods: A cross sectional study was conducted on 1000 on late third trimester pregnant women whom were prepared for elective cesarean section at department of Obstetrics and Gynecology, Erbil-Iraq from 1st Aug 2021 till 30th Jul 2022, History of previous SARS-CoV-2 infection and current signs and symptoms of the infection were recorded. All women underwent SARS-CoV-2infection screening using nasal and throat swabs using polymerase chain reaction procedure.

Results: Only (21.2%) of them were positive for the virus. There was a significant association between the current confirmed polymerase chain test with education, being a smoker, and all known signs and symptoms of the infection, such as fever, cough, and shortness of breath. When the clinical and social characteristics of women with low-risk and high-risk pregnancies were compared, there was a strong link between education, smoking, and loss of taste.

Conclusion: Pregnant women may be advised to be tested for SARS-CoV-2 before cesarean section as almost one quarter of participant were positive for the infection regardless of having sign and symptoms or not.

Key words: Cesarean section; PCR; Pregnant women; SARS-CoV-2; Socio-demographic.

Introduction

The World Health Organization (WHO) proclaimed a pandemic caused by the SARS-CoV-2 coronavirus in March of 2020.^{1,2} SARS-CoV-2 mostly spreads via respiratory droplets, attaches to the ACE2 receptor, and penetrates lung epithelial cells to potentially cause pathogenesis, when infected to SARS-CoV-2, the majority of patients with a healthy immune system experience an asymptomatic illness, whereas 5–10% develops symptoms and 1-2% faces serious complications, due to an ineffective immune response, these very ill individuals exhibit a cytokine storm that

violently kills the damaged organs and can be fatal.³ High-risk demographic categories include the elderly and those with comorbid conditions, but pregnant women should also be considered because of the immunological and physiological changes that occur during pregnancy that make them more susceptible to respiratory infections.⁴ The pandemic of corona virus disease 2019 (SARS-CoV-2), caused by the severe acute respiratory syndrome coronavirus 2 (SARS- CoV-2), which lead to further consequences in especially pregnant women that have been poorly documented in all over the world, up to

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date, there is lack of comparisons with appropriate controls to determine whether pregnant women are at higher risk of developing severe complications than the general population or not, their risk factors for respiratory complications are suggested to mirror those in the general population.⁵ At the outset of the SARS-CoV-2 pandemic, the uncertain risk factors in the pregnant women stated, that affecting pregnant women's mental health. Due to the lack of evidences and reviews including a few studies that involved small numbers compared outcomes between pregnant women with and without infection.⁶ The initial knowledge of peripartum treatment connected to SARS-CoV-2 originated in China, where the disorder originally appeared, these expectant mothers pretty entirely had caesareans, were kept apart from their newborns for at least two weeks, and were not allowed to breastfeed.⁷ The risk of vertical transmission has been shown to be low; therefore according to recent Royal College of Obstetricians and Gynecologists (RCOG) guidelines and other research, typical vaginal deliveries are proven to be safe.^{8, 9} Likewise, if infection control procedures have been strictly followed, breastfeeding and rooming-in, the practice of keeping the baby in the same room as the mother for 24 hours straight after birth, may be feasible.^{10, 11} The feasibility of vaginal birth SARS-CoV-2 in positive women and the maintenance of postpartum bonding with the infant, however, are topics with insufficient literature, due to the continuous spreading of SARS-CoV-2 virus; another infection in pregnant women is likely to be appeared. Whether SARS-CoV-2 increases the risk of miscarriage, stillbirth, preterm delivery, fetal tachycardia and fetal distress is unknown, viral pneumonia is resulted in morbidity and mortality among pregnant women.¹² As shown by the recent studies the pregnant women with significant psychological burden are more opposed to

have mental disorders and leading to further difficulties regarding social function in the future. Thus, due to the mental and emotional problem of pregnant women, it may concern to the cognitive, emotional, and physical development of children. Therefore, it should be take it in to serious considerations and more attentions should be paid. Otherwise, the pregnant women will be at a high risk of SARS-CoV-2 infection due to suppression of immune system functions, although the limited data and lack of evidence have been suggested for higher maternal or fetal risks and vertical transmission, fetal complications including preterm labor, growth restriction, distress, and demise have been reported.¹³ Up to date, there is a limitation clue for pregnant women and SARS-CoV-2, as conducted to the recent studies the comparison between pregnant and non-pregnant women, the situation is not considered to be at increased risk of complications, they seem to be in a similar risk, nevertheless, an additional concern for pregnant women with SARS-CoV-2, certainly among those with severe symptoms, is increasing the restriction for those who over doses with some effective drugs, considering the scarcity of data on most drugs in pregnancy.¹⁴ As a health precautions during the quarantine wearing masks and social distancing, may also lead to severity of stress impact, especially in the vulnerable populations including pregnant women.¹⁵ Numerous recommendations made during this epidemic included avoiding unneeded hospital visits and delaying some non-emergency surgeries.¹⁶ Cesarean sections, whether necessary or elective, cannot be postponed indefinitely; a faster decision-to-delivery time has been shown to enhance outcomes, particularly in situations where fetal distress required emergency surgery.¹⁷ A SARS-CoV-2 prescreening procedure prior to a cesarean section is essential for the protection of the parturient, the newborn, and other patients admitted to the hospital, and medical

teams, however, before to a cesarean section, no guidelines have suggested a suitable screening procedure.¹⁸ This study was conducted to determine the rate of SARS-CoV-2 infection in women

Patients and methods

This current study design was hospital based cross sectional study, in which women prepared for elective cesarean section within the period of the study were all tested for SARS-CoV-2 PCR test at Maternity Teaching Hospital, Erbil city, Kurdistan region, Iraq from the beginning from 1st Aug 2021 till 30th Jul 2022, including 1000 women. History of SARS-CoV-2 infection took by direct interview with the participants after taking consent, by asking them from arranged questionnaire about sociodemographic characteristics, any woman couldn't write and read categorized as illiterate, and if could write and read, or completed any level of education of primary, secondary, high school, college or higher education categorized as educated, then asked about smoking history, gestational age signs and symptoms of SARS-CoV-2, history of previous SARS-CoV-2 infection, any woman with history of medical co morbidities; DM, heart disease, hypertension, thyroid disease, renal disease and multiple pregnancy categorized as high risk and if negative from history of these medical conditions as low risk, then after history taking women were sent to the lab for taking nasal and throat swab—after 24 hour. Results were obtained and categorized either positive or negative cases test. Women with positive test were followed up after 1-2 weeks for the result of another new SARS-CoV-2 test. One thousand pregnant women scheduled for cesarean section within the period of the study were included. The lab technicians reconstituted the lyophilized SARS-CoV-2 positive control (tube of red cap) in the 100 µL of Buffer a (tube of white cap) supplied. To ensure a complete resuspension, vortex the tube thoroughly. After first use dispensed into aliquots in

admitted to hospital for purpose of preparation for elective cesarean section, and to find out their risk factors and any histories of infection previously.

order to avoid multiple freeze-thaw cycles, and store them at -20 C. This component contains high copies number template and was a very significant contamination risk, therefore we recommended open and manipulate it in a separate laboratory area away from the other components. The positive controls used in each run, showed an amplification curve of SARS-CoV-2 in which validated the reaction. The Negative controls included in each run, showed the absence of signal for SARS-CoV-2 which validated the reaction. The internal controls showed amplification curves, which verified the correct functioning of the amplification mix. The detection of internal control was not necessary all the time because a high copy number of the pathogen RNA template could cause preferential amplification of target sequence. Positive sample: sample was assigned as positive for the target if the Ct value fell below 38. The internal control showed an amplification signal, although was dispensable if the amplification of the target sequence from a high copy number of RNA template could cause competition in the reaction. This study was submitted to the Research Protocol Ethics and Scientific committees of Obstetrics and Gynecology program at Kurdistan Higher Council of Medical Specialties for scientific and ethical approval which was granted with an official letter coded 935 dated 30/6/2021. This study was explained for each patient and a verbal consent was obtained from each patient. Confidentiality and anonymity of data were ensured. The statistical package for social science (SPSS, version 28) was used to analyze the data, and the Chi-square test of association was used to compare proportions. When the expected frequency (value) was less than 5 of more than 20% of the cells in the

table, Fisher’s exact test was used. A p-value of ≤ 0.05 was considered statistically

significant.

Results

Only about one fifth of participants were SARS-CoV-2 positive Figure (1). The mean age of the whole sample size was 29.45 ± 5.92 years, the mean BMI was

29.44 ± 4.50 kg/m², and the mean gestational ages for the whole sample size was 38.36 ± 1.19 weeks.

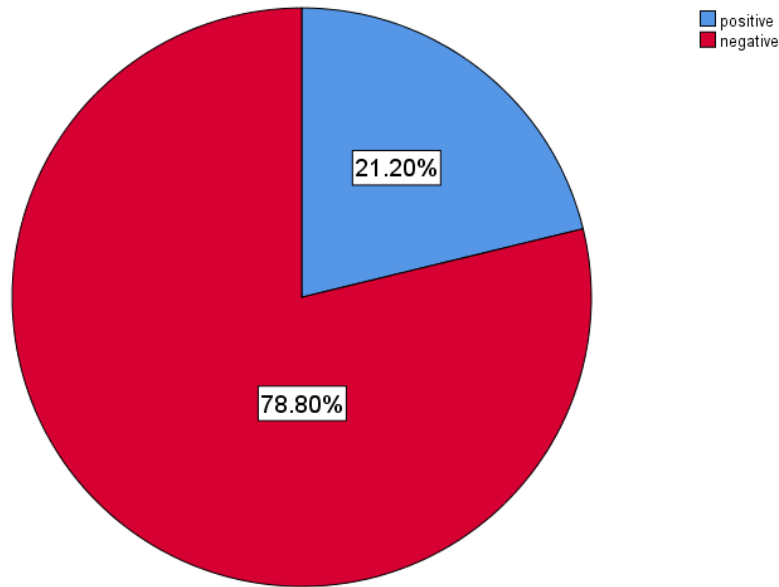


Figure (1): Current SARS-CoV-2 PCR tests

Results of Table (1) reveal that, there was a significant statistical association between current SARS-CoV-2 PCR test and

education, smoking, and all the symptoms of SARS-CoV-2 infection.

Table (1): Association between currentSARS-CoV-2PCR test and education, smoking, and symptoms of infection

| Variables | Categories | currentSARS-CoV-2 PCR test | | *p-value |
|------------|------------|----------------------------|--------------|----------|
| | | positive | negative | |
| Education* | Educated | 94 44.3% | 465 59% | < 0.001 |
| | Illiterate | 118 55.7% | 323 41% | |
| Smoking | Yes | 16 7.5% | 24 3% | 0.003 |
| | No | 196 92.5% | 764 97% | |
| Dyspnea | Yes | 184 86.8% | 736 93.4% | 0.002 |
| | No | 28 13.2% | 52 6.6% | |
| Fever | Yes | 162 76.4% | 40 5.1% | < 0.001 |
| | No | 50 23.6% | 748 94.9% | |

| | | | | |
|---------------------|-------|-------|------|---------|
| Rigor | Yes | 31 | 37 | < 0.001 |
| | | 14.6% | 4.7% | |
| No | 181 | 751 | | |
| | 85.4% | 95.3% | | |
| Head ache | Yes | 134 | 6 | < 0.001 |
| | | 63.2% | 0.8% | |
| No | 78 | 782 | | |
| | 36.8% | 99.2% | | |
| Dry cough | Yes | 78 | 36 | < 0.001 |
| | | 36.8% | 4.6% | |
| No | 134 | 752 | | |
| | 63.2% | 95.4% | | |
| Muscle pain | Yes | 125 | 54 | < 0.001 |
| | | 59% | 6.9% | |
| No | 87 | 734 | | |
| | 41% | 93.1% | | |
| Diarrhea | Yes | 68 | 11 | < 0.001 |
| | | 32.1% | 1.4% | |
| No | 144 | 777 | | |
| | 67.9% | 98.6% | | |
| Nausea and vomiting | Yes | 77 | 19 | < 0.001 |
| | | 36.3% | 2.4% | |
| No | 135 | 769 | | |
| | 63.7% | 97.6% | | |
| Loss of appetite | Yes | 93 | 54 | < 0.001 |
| | | 43.9% | 6.9% | |
| No | 119 | 734 | | |
| | 56.1% | 93.1% | | |
| Loss of taste | Yes | 74 | 11 | < 0.001 |
| | | 34.9% | 1.4% | |
| No | 138 | 777 | | |
| | 65.1% | 98.6% | | |
| Loss of smell | Yes | 69 | 19 | < 0.001 |
| | | 32.5% | 2.4% | |
| No | 143 | 769 | | |
| | 67.5% | 97.6% | | |

*Chie square test

Outcomes in Table (2) reveal that, there was significant statistical association between history of SARS-CoV-2 infection and rigor, loss of taste, loss of smell.

Table (2): The relationship between the presence of signs and symptoms, and previous history of SARS-COV-2 of infection with the result of SARS-COV-2positive PCR result.

| Variables | Categories | History of SARS-COV-2 infection | | *p value |
|-----------|------------|---------------------------------|-------|----------|
| | | yes | no | |
| Dyspnea | Yes | 26 | 158 | 0.218 |
| | | 96.3% | 85.4% | |
| No | 1 | 27 | | |
| | 3.7% | 14.6% | | |
| Fever | Yes | 22 | 140 | 0.507 |
| | | 81.5% | 75.7% | |
| No | 5 | 45 | | |
| | 18.5% | 24.3% | | |

| | | | | |
|---------------------|-------|-------|-------|-------|
| Rigor | Yes | 8 | 23 | 0.035 |
| | | 29.6% | 12.4% | |
| No | 19 | 162 | | |
| | 70.4% | 87.6% | | |
| Head ache | Yes | 20 | 114 | 0.210 |
| | | 74.1% | 61.6% | |
| No | 7 | 71 | | |
| | 25.9% | 38.4% | | |
| Dry cough | Yes | 13 | 65 | 0.190 |
| | | 48.1% | 35.1% | |
| No | 14 | 120 | | |
| | 51.9% | 64.9% | | |
| Muscle pain | Yes | 18 | 107 | 0.384 |
| | | 66.7% | 57.8% | |
| No | 9 | 78 | | |
| | 33.3% | 42.2% | | |
| Diarrhea | Yes | 11 | 57 | 0.302 |
| | | 40.7% | 30.8% | |
| No | 16 | 128 | | |
| | 59.3% | 69.2% | | |
| Nausea and Vomiting | Yes | 14 | 63 | 0.072 |
| | | 51.9% | 34.1% | |
| No | 13 | 122 | | |
| | 48.1% | 65.9% | | |
| Fatigue | Yes | 14 | 76 | 0.290 |
| | | 51.9% | 41.1% | |
| No | 13 | 109 | | |
| | 48.1% | 58.9% | | |
| Loss of appetite | Yes | 15 | 78 | 0.190 |
| | | 55.6% | 42.2% | |
| No | 12 | 107 | | |
| | 44.4% | 57.8% | | |
| Loss of taste | Yes | 14 | 60 | 0.048 |
| | | 51.9% | 32.4% | |
| No | 13 | 125 | | |
| | 48.1% | 67.6% | | |
| Loss of smell | Yes | 15 | 54 | 0.006 |
| | | 55.6% | 29.2% | |
| No | 12 | 131 | | |
| | 44.4% | 70.8% | | |

*Fisher's Exact Test

The women were followed up for up to two weeks after caesarean section the

result of new PCR test was negative for all of them.

Discussion

The study highlighted the significant importance of assessing the education level among women prepared for elective cesarean section and tested for SARS-COV-2 infection. It shows that the possibility of SARS-COV-2 infection decreased with increasing the level of

education. In contrast to the another study such as Orit Taubman et al.,¹⁹ they have showed that increasing of knowledge will lead to further infections with SARS-COV-2 pandemic, concerning spreading the virus among the society, as well as (87.4%) of the pregnant women had an

academic degree, and the rest had a high school or post-high school diploma. This study also describes self-reported tobacco substances, it illustrates that the percentage of positive current PCR test has a major role followed by smoker pregnant women. The results of this study reported rates of tobacco substance use were higher if compared to studies prior to the SARS-COV-2 pandemic, Preetikar et al.²⁰ suggested that affecting smoking on pregnancy is not widespread. Based to the observations of current study, there was a significant association between current SARS-COV-2 PCR test with SOB, cough and fever, Unlike to this finding, Yu Han et al.,²¹ have demonstrated that the pregnant women who were suffered from shortness of breath or dyspnea were only (23.86%), in addition to those pregnant women who faced dry cough and fever were (59.81%), and (64.78%) respectively. This may be due to differences in the sample sizes or mode of follow up of the women. The symptomatic pregnant women with a headache that have been infected with current SARS-COV-2infection the PCR test was (63.2%), In comparison to other findings. Zambrano et al.,²² was not similar to this finding as they have discovered that headache is the less frequent signs and symptoms by pregnant women than by non-pregnant women, followed by the other sever conditions among pregnant women reported by them such as diarrhea and vomiting, which were again more than findings in current study. This may be explained that SARS-COV-2 infection symptoms, findings and outcomes are different in different hospitals and different persons. More detailed alluded in this investigation, it is accepted that pregnant women are at increased risk of severe morbidity including presenting symptoms such as loss of appetite unlike to our research Gillian A. Ryan et al observed the contrast result based on their study they indicated that loss of appetite in

less than (5%) of all cases among pregnant women with the SARS-COV-2 infections has been reported.²³ This could be because of the different sample size and follow up period. There is currently a lack of information on infections caused by coronaviruses that arise during pregnancy. There is presently no indication that intrauterine infection may occur as a result of vertical transmission in COVID-19 pneumonia patients who are parturient. Several articles revealed that neonates delivered to women with COVID-19 were not infected, and the findings for SARS-CoV-2 in the amniotic fluid, cord blood, and breastfeeding were negative. On the other hand, a few papers indicated the potential of vertical transmission by using the positive findings of nasopharyngeal swab tests performed on neonates born to women who had COVID-19. Most of pregnant women did not experience loss of taste. Similar to this finding a study conducted by Jennifer L. Ames et al. (24) determined the self-reported SARS-COV-2 positive PCR test based on loss of taste or smell .Considering the current SARS-2 PCR test with muscle pain most (59%) of positive PCR test cases suffered from muscle pain conversely only (6.9%) of negative ones had pain in the muscle. In another study done in North Calorena according to what has been described in earlier studies of pregnant women, observed (40.1%) of patients concerning self-reported muscle pain.²⁴ Our report was limited in various ways. First, the risk of COVID-19 transmission in the community of Erbil city- Kurdistan region was relatively lower than in other countries, as mask-wearing and social distancing were strictly enforced by the Kurdistan region government and individuals suspected of having been exposed to SARS-CoV-2 were rigorously isolated even at the height of the COVID-19 outbreak. Second, the existing method of screening is labor-intensive and demands substantial medical resources.

Conclusions

Pregnant women tested for SARS-CoV-2 before cesarean section revealed one quarter to be positive for the infection

Conflicts of interest

The author reports no conflicts of interest.

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