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The correlation of chest x-ray findings and clinical parameters with outcome in COVID positive obstetric patients

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Abstract
Aim and Objectives: The present study was done to study correlation of chest x-ray findings and clinical parameters with outcome in COVID-19 pregnant subjects.
Materials and Method: The study was conducted after clearance from Board of Studies and Ethical committee in the Department of obstetrics and gynaecology, Muzaffarnagar medical college, Muzaffarnagar. The study population was selected on the basis of the inclusion and exclusion criteria. The study population consisted of 63 pregnant mothers.
Results: Majority of the study population belonged to 26-30 years age group (42.4%) and 20-25 years (41.3%). The most common symptoms at presentation was Sore throat (87.3%) followed by Cough (76.2%) and Fever (58.7. The chest X-ray showed that pneumonitis was seen among 38.1% patients with 23.8% having bilateral pneumonitis, 6.3% having left sided pneumonitis and 7.9% having right sided pneumonitis. Among symptomatic patients 91.6% patients showed chest x-ray findings of pneumonitis however, in asymptomatic patients only 40% showed positive chest x-ray findings.
Conclusion: Among the 5 patients who developed adverse outcome as mortality nd ICU admissions all had positive x-ray findings of pneumonitis. Also, majority of symptomatic patients had positive chest x-ray findings thus making chest x-ray an effective tool to predict outcome in COVID positive pregnant females.

Keywords: COVID-19, mortality, pneumonitis

Introduction

COVID-19 pneumonia first occurred in Wuhan, China, in December 2019 and has since spread rapidly throughout the world. After severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV), COVID-19 was established as a third kind of coronavirus causing severe pneumonia [1, 2].

One of the most common reason for pregnancy across the world is viral pneumonia [3]. The physiological changes associated with pregnancy, like reduction in the functional residual volumes, elevated diaphragm, and oedematous mucosa of the respiratory tract along with cellular immunity changes can increase chances for acquiring viral infections which might lead to adverse outcomes [4].

Chinese study reported severe complications among 8% pregnant women positive for corona virus infection [5]. However, the high rate of cesarean deliveries (>90%) in Chinese reports is concerning [6]. and whether mode of delivery is associated with maternal complications or neonatal transmission is unknown [7].

Viral pneumonia is thought to be the most common non-obstetric infectious disease during pregnancy, and is associated with maternal and neonatal morbidity and mortality during pregnancy [1]. Atypical pneumonia known as coronavirus disease (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is highly infectious and is currently spreading rapidly around the globe [2].

Many studies focusing on infected individuals from the general population have been reported; however, limited information is available on pregnancy outcomes for women with COVID-19. Maternal-neonatal outcomes and vertical transmission potential of COVID-19 pneumonia in pregnant women in the third trimester of pregnancy have been reported by *chen et al*. [10].

Pregnancy-related immunological and physiological changes that naturally occur during pregnancy can lead to worsening of respiratory infections due to systemic effects on the body. Increased heart rate, oxygen consumption, stroke volume, and decreased pulmonary capacity and functional residual capacity are the main physiological changes in the cardiovascular and respiratory systems during pregnancy that increase the complications of COVID-19 in pregnant women compared to the non-pregnant population [11, 12].

On the other hand, pregnancy is associated with immunosuppression. This situation makes pregnant women more susceptible to infectious diseases [11]. Moreover, there is a possibility of vertical transmission of SARS-CoV-2 from mother to fetus and creating significant infections in fetuses and neonates [11].

Studies have so far shown that the clinical, radiological, and laboratory characteristics of COVID-19 pneumonia in pregnant women are similar to those reported for non-pregnant patients [13-17]. Moreover, currently there has been no evidence of intrauterine vertical transmission of SARS-CoV-2 infection in pregnant women with COVID-19 [13-17].

Pregnancy may trigger important changes in respiratory functions, both anatomical and physiological, making pregnant women prone to respiratory disease. Pregnant women with COVID-19 pneumonia are more difficult to manage than nonpregnant patients, because drug therapy and intrapartum risk also need to be considered. Past studies have indicated that SARS/MERS infections were found to be associated with severe maternal illness, maternal death, and spontaneous abortion [17-19].

The present study was done to study correlation between chest x-ray findings and clinical parameters with outcome among COVID-19 pregnant subjects.

Materials and method

The study population included pregnant women reporting to OPD of Muzaffarnagar medical college. The study was conducted after clearance from Board of Studies and Ethical committee in the Department of obstetrics and gynaecology, Muzaffarnagar medical college, Muzaffarnagar. The study population was selected on the basis of the inclusion and exclusion criteria. The study population consisted of 63 pregnant mothers.

Study procedure

After approval from the Institutional Ethical committee all patients were selected as per inclusion and exclusion criteria. A detailed history, complete physical examination and routine & appropriate investigations were done for all patients. The study population included 63 pregnant women reporting to OPD of Muzaffarnagar medical college.

The study was conducted after clearance from Board of Studies and Ethical committee in the Department of obstetrics and gynaecology, Muzaffarnagar medical college, Muzaffarnagar. The parameter which was used to predict prognosis was chest x-ray finding of pneumonitis in unilateral or bilateral lungs.

Various parameters which were taken into consideration to assess maternal outcome were- fever, cough, sore throat, breathlessness to rule out pneumonia, ICU admissions for Ventilatory support or high flow oxygen and mortality.

Statistical analysis

The data was entered into the Microsoft excel and the statistical analysis was performed by statistical software SPSS version 21.0. The Quantitative (Numerical variables) were present in the form of mean and SD and the Qualitative (Categorical variables) were present in the form of frequency and percentage.

The student t-test was used for comparing the mean values between the 2 groups whereas chi-square test was applied for comparing the frequency. The p-value was considered to be significant when less than 0.05.

Results

Majority of the study population belonged to 26-30 years age group (42.4%) followed by 20-25 years (41.3%). Majority of the pregnancy were multigravida (69.8%) whereas 30.2% were primigravida. (Table 1)

Among total subjects 76.1% were symptomatic and 23.8% were asymptomatic.

The most common symptoms at presentation was Sore throat (87.3%) followed by Cough (76.2%), Fever (58.7%), Headache (22.2%), Vomiting (11.1%), Drowsiness (9.5%) and Dyspnea (4.7%). (Table 2)

Among symptomatic patients 91.6% patients showed chest x-ray findings of pneumonitis however, in asymptomatic patients only 40% showed positive chest x-ray findings.

The chest X-ray showed that pneumonitis was seen among 38.1% patients with 23.8% having bilateral pneumonitis, 6.3% having left sided pneumonitis and 7.9% having right sided pneumonitis. (Table 3)

In patients with positive chest x-ray findings of pneumonitis 10% had adverse outcome.

Normal delivery was done for 36.5% whereas LSCS for 63.5% women with 3.2% undergoing Elective LSCS and 60.3% underwent Emergency LSCS. (Table 4)

Mortality was reported among 2 (3.2%) and ICU admissions were seen in 3 (4.7%) of the study population in our study. (Table 5).

Table 1: Distribution of the study population according to Age and Gravida

		Frequency	Percent
Age groups	20-25 years	26	41.3%
	26-30 years	28	42.4%
	More than 30 years	9	15.2%
Gravida	Primi	19	42.4%
	Multi	44	69.8%

Table 2: showing History of exposure and COVID symptoms

Symptom	Frequency	Percent
Fever	37	58.7%
Cough	48	76.2%
Sore throat	55	87.3%
Headache	14	22.2%
Vomiting	7	11.1%
Drowsiness	6	9.5%
Dyspnea	6	9.5%

Table 3: showing the distribution of Chest X-ray finding

Chest X-ray finding	Frequency	Percent
Normal	13	20.6%
Bilateral pneumonitis	35	55.5%
Left side pneumonitis	10	15.8%
Right side pneumonitis	5	7.9%
Total	63	

Table 4: showing the distribution of Mode of delivery

Mode of delivery	Frequency	Percent
Normal delivery	23	36.5%
Elective LSCS	2	3.2%
Emergency LSCS	38	60.3%

Table 5: Distribution of adverse outcome among study population

Complications	Frequency	Percent
Mortality	2	3.2%
ICU admissions (excluding mortality)	3	4.7%

Table 6: Relation of chest x-ray with adverse outcome

Chest x-ray findings	No. Of subjects with adverse outcome	Percentage
Pneumonitis present(50)	5	10
Pneumonitis absent	0	0

Table 7: No of subjects with clinical features

Clinical symptoms	Frequency	Percentage
Symptomatic	48	76.1%
Asymptomatic	15	23.8%

Table 8: Correlation between chest x-ray and clinical features

Clinical features	Chest x-ray findings Of pneumonitis	Percentage
Symptomatic(48)	44	91.6%
Asymptomatic(15)	6	40%

Discussion

There are physiological changes in pregnancy that leads to alteration in the immune response [20]. The modulated immune system, can lead to much more severe symptoms without any effect on their susceptibility to acquire infection, albeit there is a low probability of this happening.

Symptoms

In our study, the most common symptoms at presentation was Fever among 58.7%, Cough among 76.2%, Sore throat among 87.3%, Headache among 22.2%, Vomiting among 11.1%, Drowsiness among 9.5% and Dyspnea among 4.7%.

Similar findings were reported by *Shah et al*. [21] most common symptoms at presentation were cough (61.6%) and fever (46.4%); 38.4% of pregnant patients did not present with symptoms, but most of these patients were diagnosed as having COVID-19 infection by intensive field testing and contact tracing during the initial phase of outbreak in India. FOGSI guidelines recommends that pregnant women residing in containment areas or in large migration gatherings/evacuees centre from hotspot districts presenting in labour or likely to deliver in next 5 days should be tested even if asymptomatic [22].

A prospective cohort study using the UK Obstetric Surveillance System (UKOSS) found fever and cough as common symptoms in pregnant women having COVID-19 [23]. A systematic review revealed that the most dominant initial symptoms in pregnant women with COVID-19 were fever and cough [24]. Similarly, a retrospective study found that common symptoms in pregnant women in the wake of SARS-CoV-2 infection are cough and fever, and less common symptoms include shortness of breath, diarrhea, and myalgia [25]. On the contrary, a study found the majority of women being asymptomatic and afebrile at presentation [26]. However, the majority of the studies have supported the evidence of fever and cough as the most common symptoms [27-32].

Mode of Delivery

In our study, among 63 deliveries, LSCS was performed among 63.5% with 3.2% undergoing Elective LSCS and 60.3% underwent Emergency LSCS. This was similar to the study by *Muhidin et al.* [24] cesarean section was the most common delivery method and vaginal delivery was done among 6% women.

Since there is limited evidence about vertical transmission and vaginal shedding of virus, vaginal delivery in stable patients may be considered. In cases of cesarean section, the choice of anesthesia needs careful consideration [33]. *Favre et al*. suggested that for every individual patient, vaginal delivery even by induction should be considered. Using instrumental delivery also is preferred to cesarean section to avoid unnecessary surgical complications and maternal exhaustion [34].

With regard to the mode of delivery, cesarean section was performed in the majority of cases and several authors [10, 15] cited fetal distress as the reason behind the decision. *Zaigham and Andersson* [35] could not find any adverse outcome among normal delivery patients with occasional tiredness, breath shortness and diarrhea. It was also found that about 21% pregnancies had early gestations.

Regarding the perinatal outcomes, most authors [10, 36-44] did not report any adverse events. In contrast, *Zhu et al*. [13] reported one neonatal death and a total of 6 admissions to the neonatal intensive care unit (ICU). The first symptom in the newborns was shortness of breath, observed in six neonates. Other initial symptoms were fever, thrombocytopenia accompanied by abnormal liver function, tachycardia, vomiting and pneumothorax.

The risk of perinatal transmission of SARS-CoV-2 is unknown. Additionally, since the risk of postnatal transmission remains to be elucidated, it is debatable whether the newborn should be immediately separated from the COVID-19 positive mother [45]. A study comprised of outcomes of 7 newborns necessitates the separation of newborns to avoid potential threats of SARS-CoV-2 infection [46]. In another study, contrary to the previous one, it is concluded that separation may not prevent infection, and early separation might increase neonatal risk of pneumonia [47].

However, the severity of postnatally acquired disease in the newborn is unknown. A case series of 10 COVID-19 negative neonates born to COVID-19 positive mothers reported fetal distress, premature labor, respiratory distress, thrombocytopenia accompanied by abnormal liver function, and even death among neonates [48]. This may indicate a possible association, but not necessarily a causal effect.

Complications

There was foetal distress among 3 infants in the present study. Whereas in the study by *Wu et al*, [49] only one patient had fetal distress, although it was unclear whether this was associated with COVID-19 or late pregnancy.

In current study, there were two mortalities among study population. *Fan et al.* [11] showed that one out of the 2 term baby developed low-grade fever and abdominal distension with lymphocytopenia on day 3 and the day after, a chest radiograph revealed diffuse haziness. Though, the baby was discharged without any complications 9 days after delivery. The other baby had mild neonatal pneumonia with lymphocytopenia, that got treated with antibiotics and recovered uneventfully within 2 days.

The WHO recommends for mothers with COVID-19 infection to be able to room in with their babies [50]. The mother should wear a surgical mask and practice hand hygiene when in close contact with her infant, particularly when feeding. Alternatively, if another healthy adult is in the room, they can care for the newborn. Asymptomatic newborns could be discharged after delivery and cared by an asymptomatic family member with the adequate isolation measures.

During this extremely delicate time of a rapidly evolving outbreak that has imposed a tremendous threat on public health, more attention should be given to the unique needs of pregnant women [12]. Further investigation and isolation should be considered for pregnant women with suspected COVID-19. In confirmed cases, prompt admission of mothers in a negative pressure isolation unit is crucial [43].

Summary and Conclusion

The available data revealed that clinical manifestations of pregnant women in late pregnancy are similar to those of non-pregnant adults. Among the 5 patients who developed adverse outcome as mortality and ICU admissions all had positive x-ray findings of pneumonitis. Also, majority of symptomatic patients had positive chest x-ray findings thus making chest x-ray an effective tool to predict outcome in COVID positive pregnant females.

Clinically, some recover without developing symptoms, some present few mild symptoms and others deteriorate. Similarly, imaging follow-up may reveal resolution (partial or complete), progression or no change. Another issue is whether natural vaginal delivery increases the likelihood of vertical transmission of the infection and if so, the possible mechanisms need to be clarified. Further investigations and follow-up studies of pregnant mothers infected by COVID-19 are warranted.

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